

DiPiro's Pharmacotherapy: A Pathophysiologic Approach, 12th Edition >

Chapter e5: Medication Adherence

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KEY CONCEPTS

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- 1 Medication adherence is defined as the degree to which an individual takes medications recommended by healthcare providers in terms of the dose, route, frequency, and length of time.
- 2 Better medication adherence is associated with optimal health outcomes.
- 3 Approaches to assessing medication adherence are classified as direct and indirect methods with various inherent limitations.
- 4 Direct methods of assessing medication adherence include bioassays or biomarkers to measure levels of drugs or their metabolites in body fluids.
- 5 Indirect methods of assessing medication adherence include self-report surveys, pharmacy refill rates, pill counts, clinical response monitoring, and electronic monitoring devices.
- 6 The World Health Organization suggests five interactive dimensions to describe factors associated with medication adherence: (1) social and economic, (2) healthcare team- and system-related, (3) condition-related, (4) therapy-related, and (5) patient-related factors.
- 7 To improve and sustain good adherence, healthcare interventions and services must overcome barriers to medication adherence and individualize care by considering multiple factors.

BEYOND THE BOOK

BEYOND THE BOOK

Watch "Medication Adherence," (<https://edhub.ama-assn.org/steps-forward/module/2702595>) a video from the American Medical Association. This video describes the common reasons for medication nonadherence from patients' perspectives. Then, watch the YouTube video from the FDA Drug Info Rounds (pharmacists), "Taking Medications Correctly—Medication Adherence," (<https://www.youtube.com/watch?v=Qh84l557-D0>). This video provides a glance at strategies for improving medication adherence.

INTRODUCTION

- 1 Based on the World Health Organization (WHO) definition, medication adherence refers to the extent to which an individual takes medications corresponding to the agreed recommendations from a healthcare provider.¹ Good medication adherence indicates a person takes medications as prescribed, with the appropriate dose via the suggested route at the right time.² Poor medication adherence is associated with suboptimal or adverse

health outcomes.³

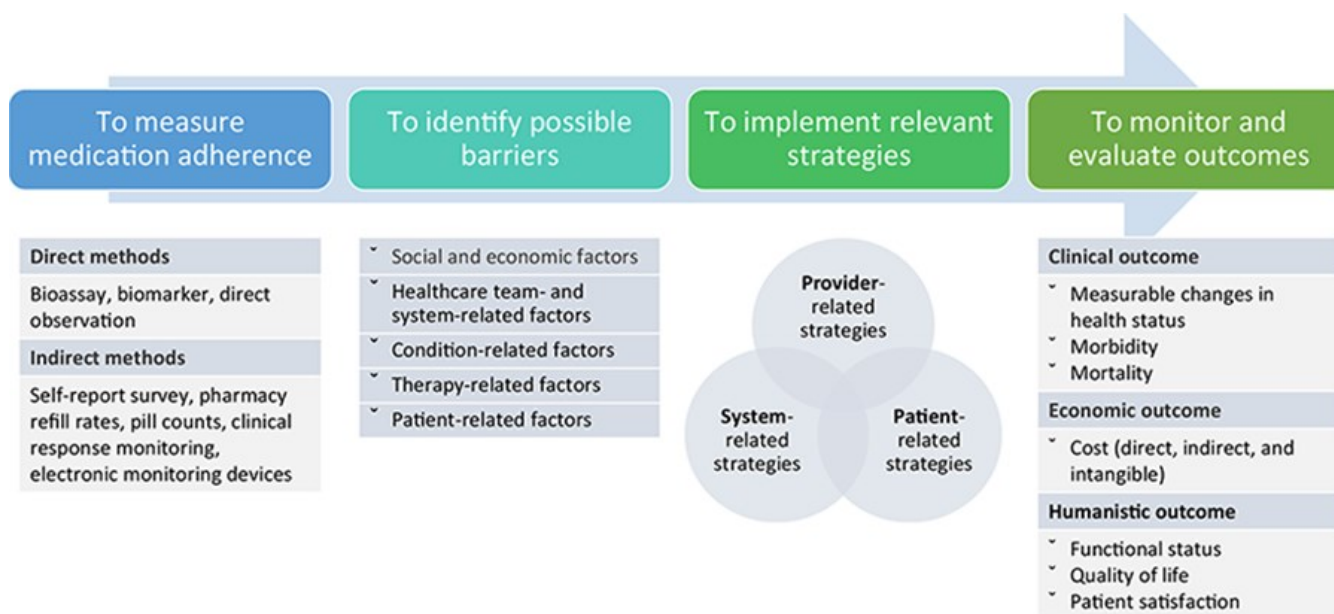
2 Compared with nonadherent patients, adherent patients have lower healthcare costs, including fewer hospitalizations and emergency department visits, reduced costs of acute and outpatient care, and better health outcomes and quality of life.⁴ For instance, for every patient with type 2 diabetes in an indigent population in Virginia, every 10% increase in medication adherence is estimated to save US \$450 annually in medical care⁵ and a decrease in glycosylated hemoglobin (HbA_{1c}) level by 0.16% (0.0016; ~1.8 mmol/mol).⁶ As a result, medication adherence is widely used as a proxy measure for evaluating disease management and treatment effects.⁷

The estimated rate of medication adherence for chronic illnesses in developed countries is around 50%, even with patients who have easy access to medications.⁸ As such, the WHO further indicated that improving medication adherence may have a far greater influence on public health than any improvement in specific medical treatments.⁹

In this chapter, key aspects of the medication adherence process are presented. These include methods of assessment, barriers, and improvement strategies. When the patient is taking the medication as agreed upon, optimal clinical, economic, and humanistic outcomes can be achieved (Fig. e5-1).

FIGURE e5-1

Conceptual framework for assessing and improving medication adherence.



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MEASURES OF MEDICATION ADHERENCE

3 The critical first step in improving medication adherence is to appropriately measure how an individual takes medications as prescribed by healthcare providers. Various methods have been proposed to measure medication adherence; however, there is no agreement among clinical practitioners and researchers on the best method for assessing medication adherence.

Approaches to assessing medication adherence include drug level tests, physiological measures, self-report surveys, pharmacy claims, refill rates, pill counts, clinical response monitoring, and electronic monitoring devices. Each approach to medication adherence evaluation has inherent limitations, and therefore, mixed results were found when integrating these measures into studies. These various approaches are classified as direct and indirect and can be divided into subjective and objective methods.¹⁰

Direct Methods

4 Direct methods of assessing medication adherence include bioassays and biomarkers to measure the level of drug or its metabolite in the body fluid (eg, blood or urine).¹¹ In addition, direct observation of medication administration is considered a direct approach to medication adherence evaluation.¹²

Direct measures are thought to be the most accurate and can provide physical evidence to prove that the patient has taken the medications. However, direct measures only generate a yes/no result without revealing any patterns or causes of nonadherence. Tests themselves are sometimes intrusive and may cause patients to be anxious and intimidated.¹³

Moreover, direct measures are expensive and require qualified professionals and techniques to perform. Drug-drug and drug-food interactions may hinder the assay accuracy, and plasma drug concentration could vary among individuals with the same dose of the same medication. Biases may also occur if patients know the schedule of the tests and only take medications just before the upcoming tests.¹⁰

Indirect Methods

5 Indirect methods of assessing medication adherence include self-report surveys, pharmacy refill rates, pill counts, clinical response monitoring, and electronic monitoring devices.¹²

Measures involving a secondary claims database could help identify patients at risk for treatment failure based on the pattern of medication refills. Proxy quantitative measures such as medication possession ratio (MPR, defined as the proportion of a given time period when medication supply is available for the patient, assuming that a given refill is all taken as directed) or proportion of days covered (PDC, defined as the proportion of days in a given time period covered by the refills) may be estimated. These methods assume that medication-taking behavior corresponds to the prescription refills and medications are taken as they were prescribed. However, the analysis of a secondary database is limited as it cannot identify partial adherence (eg, occasional missed or incorrect doses) or determine what barriers might have contributed to detected nonadherence (eg, inconvenience of obtaining refills, lack of money for copayments, or out-of-pocket purchases). In addition, claims records can be incomplete in some situations such as when the prescriber or other health professionals advise the patient to early discontinue a drug (temporarily or permanently), or when the medication is obtained through means other than insurance plan.¹³

The Medication Events Monitoring System (MEMS) is a popular form of electronic medication monitoring device that gives a highly accurate assessment of adherence. It comprises a conventional medication container with a special closure that logs the time and date of each opening and closing of the medication container. This electronic device provides a means of keeping track of the number of doses taken as well as the individual pattern of medication taking. Nevertheless, the bulkiness of the container and the high expense of equipment restrict the widespread use of MEMS.¹⁴ In addition, adherence may be overestimated if patients actuate the container by accident or on purpose.¹³

Pill counts calculate the adherence ratio by comparing the number of prescribed dosage units that have been taken to the total number of units received by patients (through initial or refill prescription fills) in a given time period. This method's low cost, simplicity, and availability in various forms contribute to its popularity. However, this approach is improper for medications used as needed, and it cannot identify the pattern of medication taking or the causes of nonadherence. Also, underestimated adherence may occur due to early refill, and the cutoff value to differentiate adherence and nonadherence is arbitrary.

Unlike many other methods of measuring adherence, self-report surveys are cheap, easy to administer, less intrusive, and able to provide information on beliefs and barriers to adherence.¹⁵ In addition, its real-time feedback and flexibility to accommodate different conditions have resulted in its common use in clinical practice.¹⁶ Considerations of using a self-report survey include the ability to understand the questionnaire items, communication skills of interviewers, and the possibility of patients' overestimation of adherence or desire to report good medication adherence. These factors can bias response accuracy and affect the survey validity.¹⁷

Since each method has its pros and cons, and thus, none of the methods described is generally accepted as the gold standard of medication adherence measurement for all settings.¹¹ The selection of an appropriate measure depends on the attributes of each method, how well the method

matches the goals, and the resources available for the intended use.¹⁵ For example, PDC has been the most commonly used adherence measure for cardiovascular disease; self-report measures have been used most often in patients with sexually transmitted diseases.¹⁸

Self-report survey is the most widely adopted method for assessing medication adherence in clinical practice and research.¹⁴ Self-report measures are often used in studies to allow researchers to assess both the extent of nonadherence and patient’s reasons for nonadherence.¹⁵

Some generic self-report questionnaires were developed specifically for measuring medication taking and have been used to assess medication adherence across a wide range of chronic diseases. These include the Adherence to Refills and Medications Scale (ARMS),¹⁹ Brief Medication Questionnaire (BMQ),²⁰ Hill-Bone Compliance Scale (HBCS),²¹ Medication Adherence Questionnaire (MAQ),²² Medication Adherence Rating Scale (MARS),²³ Medication Adherence Reasons Scale (MAR-Scale),²⁴ and Morisky Medication Adherence Scale (MMAS-8).²⁵ Table e5-1 compares the characteristics of generic self-report medication adherence instruments commonly used in clinical practice and research.

TABLE e5-1
Characteristics of Generic Medication Adherence Instruments

Scale	ARMS	BMQ	HBCS	MAQ	MARS	MAR-Scale	MMAS-8
Number of items	12	3	14	4	10	20	8
Reliability (Cronbach’s α)	0.81	0.66	0.65	0.61	0.75	0.85-0.95	0.83
Concept that can be measured	Medication taking as prescribed, refilling medications on schedule	Regimen complexity, forgetfulness	Forgetfulness, adverse effects	Forgetfulness, adverse effects	Forgetfulness, adverse effects, value of medication	Concern beliefs about medication, necessity beliefs in medication, logistic issues of medication taking, forgetfulness	Forgetfulness, logistic issues of medication taking
Validated in patients with low literacy	Yes	No	No	Yes	Yes	Yes	Yes

ARMS, Adherence to Refills and Medications Scale; BMQ, Brief Medication Questionnaire; HBCS, Hill-Bone Compliance Scale; MAQ, Medication Adherence Questionnaire; MARS, Medication Adherence Rating Scale; MAR-Scale, Medication Adherence Reasons Scale; MMAS-8, Morisky Medication Adherence Scale.

FACTORS ASSOCIATED WITH MEDICATION ADHERENCE

6 When considering factors related to medication adherence issues, the WHO suggests the following five interacting dimensions: (1) social and economic factors, (2) healthcare team- and system-related factors, (3) condition-related factors, (4) therapy-related factors, and (5) patient-related factors (Table e5-2).¹ These factors interact to determine whether an individual takes medications as prescribed. Having a comprehensive understanding of the factors associated with medication adherence helps healthcare professionals and researchers identify the barriers to medication adherence and aid patients in tackling problems in medication use. Healthcare professionals should pay attention to several significant factors in assisting populations prone to nonadherence.

TABLE e5-2

Common Barriers to Medication Adherence from Literature

Dimension	Barrier to Medication Adherence
Social and economic factors	<ul style="list-style-type: none"> • Lower socioeconomic status (eg, education, poverty, employment) • Cost and lack of insurance coverage • High out-of-pocket drug costs • Lack of caregivers and family social support • Lack of transportation
Healthcare team- and system-related factors	<ul style="list-style-type: none"> • Inadequate transmittal of information about disease condition and medications • Shortage of time during appointments with general practitioners • Challenges and time constraints on inquiring about medication adherence • Difficulties in obtaining accurate patients' history of medication availability and use at home • Lack of discharge planning, follow-up, or continuity of care • Unsatisfactory skills in coaching self-management • Poor access to care and medications • Inadequate provision of service at patients' locations • Problems with keeping the medication list updated • Poor information technology (IT) systems and ineffective communication within healthcare systems
Condition-related factors	<ul style="list-style-type: none"> • Status and severity of the disease under treatment • Disease progression or previous treatment failures leading to loss of faith in medical treatment • Depression leading to reduced motivation • Impaired cognitive function limiting correct medication use • Comorbidities leading to changes in functionality (such as self-care, medication taking), mobility, or mental status
Therapy-related factors	<ul style="list-style-type: none"> • Complex treatment regimen and burden of medication taking • Polypharmacy • Frequent changes in treatment • Delayed onset of beneficial effects • Required treatment duration (temporary, permanent) • Adverse effects
Patient-related factors	<ul style="list-style-type: none"> • Limited health literacy to navigate health information and make health-related decisions • Inadequate awareness of the illness • Health beliefs about the condition • Lack of understanding of the role of medications, need for treatment, and proper medication-taking behaviors • General and cultural beliefs (eg, stigma) about medications and drug therapy • Concern about adverse effects of medications • Previous experiences with pharmacological treatments • Less trust in advice from healthcare professionals (poor provider-patient relationship) • Forgetfulness • Lack of competence in self-management • Substitution of prescription medications with self-administered medications, dietary supplements, vitamins

and minerals, or folk remedies

- Independent pausing or stopping medications when feeling asymptomatic
- Receiving incorrect medication information from biased sources (eg, media, neighbors)

Social and Economic Factors

Socioeconomic status has been an independent predictor of medication adherence across diseases. For instance, among people with cardiovascular diseases, higher socioeconomic status positively affects medication adherence.²⁶ Education level has been shown to positively impact medication adherence in this group.^{27,28} In addition, some evidence indicated that ethnic minorities, compared with its counterpart, are less adherent to cardiovascular medications.²⁷ Black patients have been reported to express more concerns about medication use for diabetes management and more concerns about the competence of their physicians than White patients.²⁹

Employment status is also a significant factor. For example, having a job positively affects medication adherence among people living with human immunodeficiency virus (HIV).^{30,31} Among people taking oral anticancer agents, better financial status positively affects medication adherence.^{32,33} Marital status and social support have mixed results on medication adherence across a range of diseases (eg, cardiovascular diseases, HIV, Parkinson's disease, rheumatoid arthritis, and cancers treated with oral medications).^{28,30,33-36}

Higher out-of-pocket costs of medications consistently show a negative association with medication adherence.^{37,38} Higher patient copayments hamper medication adherence among people across certain chronic diseases.³⁹ For example, patients with cardiovascular diseases and paying no copayments are more adherent to their medications than those with any copayments.⁴⁰ For people with inflammatory arthritis or taking oral anticancer agents, medication costs have always been a burden of medication adherence.^{32,41} Programs that reduce patients' out-of-pocket costs for medications increase adherence. For instance, health insurance status is a potential positive influencer on medication adherence.^{28,42}

Healthcare Team- and System-Related Factors

A small number of studies have been conducted on the impact of the healthcare team- and system-related factors on medication adherence.¹ Medication distribution systems, reimbursement structure of health services, and patient-provider relationships affect whether patients take medications as prescribed. Mail-service pharmacies provide better access to medications, facilitating adherence to medications.³⁸ Communications between patients and their providers can also improve medication adherence. Studies show that good patient-provider relationships and effective patient-physician communications positively affect medication adherence.^{38,43}

Condition-Related Factors

Condition-related factors include aspects of specific diseases that can affect medication adherence. Condition-related determinants of medication adherence include the severity of symptoms, disease progression, availability of effective treatments, and level of disability.¹ These factors affect how patients perceive the risk associated with disease and the importance of treatment and how they prioritize their decisions about disease management. For instance, people with diabetes sometimes do not take their medications regularly because of insensible symptoms associated with poor control of serum glucose concentrations.⁴³ In addition, comorbidities (eg, depression and drug- or alcohol-use disorders) can modify patients' medication-taking behaviors. Duration of disease is another condition-related factor, but it has shown inconsistent effects on medication adherence.^{28,34,41,44,45}

Therapy-Related Factors

Various therapy-related factors have been identified that can affect medication adherence. The complexity of the medication regimen, duration of treatment, frequent changes in treatment, immediacy of beneficial effects, fear of adverse effects, and the availability of medical support are notable factors associated with medication adherence.¹ The complexity of regimen is determined by several medication factors: type of drug and route of administration, frequency of administration, quantity of daily dosage, forms or length of time required for infusions, and size of solid oral dosage

forms. For example, fear of injections deters patients from taking insulin products for diabetes care.³⁸ In addition, a need for numerous daily administrations, swallowing too many tablets or capsules or large amounts of liquid medications, and large size of some tablets and capsules make it difficult for patients to take medications as prescribed.⁴³

Patient-Related Factors

Patient-related factors include the demographics, knowledge, attitudes, beliefs, perceptions, and expectations of the patient.¹

Ample research has investigated the effect of patients' demographics on medication adherence, but findings have been inconsistent. Some evidence found older populations report better medication adherence among people with cardiovascular conditions,⁴⁶ HIV,⁴⁷ and Parkinson's diseases.³⁵ In contrast, a few studies on anticancer agents found better medication adherence among people of younger ages.³⁴ A gender effect was noted on medication adherence among people with cardiovascular disease, with higher medication adherence in women.²⁷ Nonetheless, a few other studies found that there was no difference in medication adherence rate due to gender effects.^{32,35,48}

While inherent characteristics associated with medication adherence may be difficult to change in clinical practice, some patient-related factors that affect medication adherence can be addressed to improve medication adherence. Several studies have indicated that patients' knowledge and perceptions about their diseases affect medication adherence, so does the motivation to control disease and patients' confidence in achieving needed changes in disease-management behaviors.¹ For example, medication adherence among people with mental diseases is associated with health beliefs and psychological personalities, such as self-efficacy, disease perception, and locus of control.⁴⁹ Medication-taking behaviors among people with breast cancer are affected by their knowledge of the disease, perceptions of the balance between risks and benefits of treatment, and confidence in coping with disease management.⁵⁰ Healthcare professionals should be more attentive when treating specific populations who are prone to medication nonadherence and provide tailored interventions to modify their medication beliefs and behaviors.

Of note, health literacy is positively associated with medication engagement among people with diabetes or chronic obstructive pulmonary disease (COPD).^{51,52} Health literacy is an individual's ability to obtain, process, understand, and apply the information about interventions in making an appropriate health-related decision.⁵³ People with diabetes need to understand readings on a glucose meter and adjust their medications accordingly.⁵⁴ Similarly, people with COPD need to gauge the number on a peak flow meter to know if the disease is under proper control.⁵²

Forgetfulness, psychosocial stress, concerns about possible adverse effects, low motivation, inadequate knowledge and skill in disease management, and negative beliefs in medications have been reported as barriers to adherence to the prescribed medication. Factors that improve medication adherence include greater understanding of the disease, positive perception of health risk related to the disease, complete comprehension of treatment instructions, being well-informed about disease monitoring, keeping appointments for follow-up or counseling, and perceiving greater autonomy regarding disease management.⁴³

Subsequent to research into these factors, healthcare professionals can tailor their intervention by accounting for patients' psychosocial factors and thereby changing their medication-taking behaviors. The time constraint of clinic visits has been recognized as one of the main factors hampering the delivery of effective interventions; however, healthcare providers may strategically address modifiable factors to improve medication adherence in clinical practices. Building on a patient's intrinsic motivation by increasing the perceived importance of adherence and strengthening confidence by building self-management skills are behavioral treatment targets that must be addressed concurrently with biomedical ones if overall adherence is to be improved.¹

STRATEGIES FOR IMPROVING MEDICATION ADHERENCE

Numerous strategies for improving patients' adherence to antidiabetic medications have been proposed, including easier access to medication, provision of printed or digital materials, and use of medication reminders.⁴ However, the increase in medication adherence rates has been limited and less than expected.⁵⁵

7 The multidimensional nature of nonadherence is one of the reasons that no single strategy is effective across all conditions and settings.⁵⁶ For

instance, a multidisciplinary approach addresses multiple factors associated with medication nonadherence.⁵⁶ The framework recognized that medication nonadherence involves not only patient and provider issues but also system problems. It provides a SIMPLE strategy to improve medication adherence in clinical practice by (1) **S**implifying regimen characteristics, (2) **I**mparting knowledge, (3) **M**odifying patient beliefs, (4) **P**atient communication, (5) **L**eaving the bias, and (6) **E**valuating adherence.⁵⁶ Hence, to improve and sustain adherence, interventions must account for barriers to medication adherence and address multiple factors.⁵⁷ Multifactorial solutions include efforts to improve patients' understanding of medication benefits and increase access and trust in their providers and the health system in general (Table e5-3).

TABLE e5-3

Examples of Strategies for Improving Medication Adherence

Aspect	Strategy
Provider related	<ul style="list-style-type: none"> • Understanding patients' values, preferences, disease perceptions, and behaviors towards management • Developing trust and rapport with patients and healthcare stakeholders • Considering patients' schedules when prescribing medication • Simplifying the amount of medications and dosing frequency • Medication counseling for patients and caregivers; checking and teaching the right use of medications and medical devices • Supplying appropriate adherence aids or providing reminders • Pharmacists as coaches for drug therapies • Mental health screening and support
Patient related	<ul style="list-style-type: none"> • Focusing on health outcomes of self-management and drug therapies • Support for patients to better understand their disease and its management • Support from caregivers • Peer groups for chronic conditions, and training in peer groups • Using reminder devices or text messages
System related	<ul style="list-style-type: none"> • Interprofessional practices for updating the drug lists • Interprofessional practices and interventions, such as medication reconciliation, medicine optimization, and medication review • Continuity of care and permanent doctor-patient relationships • Equal partnerships with patients, with a coaching attitude • Setting achievable goals • Healthcare-wide patient information sharing and better IT systems

Provider-Related Strategies

Improving providers' recognition and understanding of patients' beliefs, difficulties, fears and values, as well as their own biases, are necessary to achieve increased medication adherence and better health.⁹

Each healthcare professional engaged in patient care (eg, physicians, pharmacists, nurses, case managers, and health educators) understands and respects one another's responsibilities and roles. For example, understanding and accepting pharmacist's role in imparting medication-related information to patients may help clinicians focus on other aspects of treatment plans.⁵⁶ Trained pharmacists are equipped with full skillsets to overcome the asymmetric knowledge gap between patients and healthcare professionals, enhance shared decision making, and provide strategies to empower patients to have regular medication-taking.⁵⁸ Pharmacists can provide comprehensible drug information, identify potential adverse drug reactions, and supply appropriate adherence aids to help patients adhere to their medication regimens. Other healthcare staff can mail or text

reminders and provide social support to ease adherence-related hurdles that patients may encounter.

In addition, telehealth interventions have positively affected medication adherence among people with rheumatoid arthritis.⁵⁹ In addition to traditional printed educational materials and face-to-face interactions, the application of advanced technology can facilitate adherence to medication using diverse formats based on patients' preference (eg, generation differences, lifestyle issues) and geographical feasibility (eg, remote communication, pandemic hindrance, and transportation issues).

Patient-Related Strategies

Motivational interviews are found to improve medication adherence among people with cardiovascular conditions.^{60,61} This counseling technique enhances individuals' motivation to change their behaviors by means of four principles, denoted by the acronym RULE: **R**esist the righting reflex, **U**nderstand the patient's motivations, **L**isten with empathy, and **E**mpower the patient.⁶² Interviewers help patients link medication use to the task that patients deem the most important, motivating patients to achieve the goal they set through improved adherence to medications.

Some research into chronic diseases has addressed modifiable determinants of medication adherence in interventions and shown positive effects on adherence.⁶³ A few studies incorporated several psychological factors to increase medication adherence by strengthening patients' beliefs in medications, comprehensive perceptions of illness, stronger confidence in disease management, and alleviating concerns about medication use.^{57,64} For people with HIV, some interventions used medication schedule reminders and treatment support through electronic platforms to facilitate better medication adherence.^{65,66}

Other interventions help providers improve their communications with patients about medication taking. Perceptions of disease and treatment can be shaped differently because of cultural differences. Some interventions have been adopted to improve medication adherence in patients with ethnically diverse backgrounds.^{29,67} Moreover, several studies have identified ways to improve medication adherence through peer coach approaches, in which patients share experiences and learn from each other.⁶⁸ As patients come from similar communities and social backgrounds, they easily relate one another's barriers to optimize disease management and control, empowering patients through greater internal motivation.⁶⁹

System-Related Strategies

When addressing medication adherence through policymaking and reform of healthcare system, time is needed to discuss options and negotiate across different sectors. Confidentiality-ensured healthcare-wide patient information sharing and better information technology (IT) systems could facilitate information circulated seamlessly among the healthcare team. Provision of continuity of care with close interprofessional collaboration may make the process of patient care delivery more consistent and sustainable. Development of equal partnerships with patients could foster strong rapport between providers and patients. A growing body of intervention research guided by psychosocial behavioral models focuses on tailoring individual and interpersonal factors to improve patients' awareness, attitudes, and behaviors related to medication taking.⁷⁰ Stakeholders of healthcare system need to set achievable goals and check the progress accordingly to better allocate available resources for improved medication adherence.

CONCLUSION

Medication adherence is critical to improving health outcomes. Assessing adherence to medical treatment is important to clinicians and researchers but various measures all have inherent limitations. Successful attempts to improve patient adherence depend on a set of key factors. To optimize medication adherence, the multifactorial causes of decreased adherence must be understood. Patients should be involved in treatment plans, and personalized approaches tailored to each patient's issues should be taken to improve and sustain adherence.

ABBREVIATIONS

ARMS	Adherence to Refills and Medications Scale
BMQ	Brief Medication Questionnaire
COPD	chronic obstructive pulmonary disease
HbA _{1c}	glycosylated hemoglobin
HBCS	Hill-Bone Compliance Scale
HIV	human immunodeficiency virus
MAQ	Medication Adherence Questionnaire
MAR-Scale	Medication Adherence Reasons Scale
MARS	Medication Adherence Rating Scale
MEMS	Medication Events Monitoring System
MMAS-8	Morisky Medication Adherence Scale
MPR	medication possession ratio
PDC	proportion of days covered
WHO	World Health Organization

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SELF-ASSESSMENT QUESTIONS

1. Which of the following is not an example of patient medication nonadherence?
 - A. Incorrect inhaler technique
 - B. Unintentional dose omission
 - C. Adjusting the daily dose of a medication without a logical reason
 - D. Discontinuing PRN medication
2. Which of the following outcomes is most likely to occur in patients with poor medication adherence?
 - A. Lower healthcare costs
 - B. Fewer emergency department visits
 - C. Increased costs of acute care
 - D. Better quality of life

3. Which of the following is a direct approach to measure medication adherence?
 - A. Using a self-report survey
 - B. Measuring drug metabolites in urine
 - C. Calculating the pharmacy refill rate from a claims database
 - D. Counting the pills remaining in the pill box in a given time period
4. Which of the following is an indirect method to evaluate medication adherence?
 - A. Analyzing drug concentrations in the blood
 - B. Watching patients swallow every dose of prescribed medications
 - C. Measuring drug metabolites in urine
 - D. Using electronic devices to keep track of exact medications taken by patients
5. Which of the following is the *most widely* adopted indirect approach to assessing medication adherence in clinical practice?
 - A. Administering self-report survey
 - B. Calculating pills left in the pill box
 - C. Measuring the levels of drug metabolites in urine
 - D. Using the Medication Events Monitoring System to trace medications taken by patients
6. Which of the following is the *most appropriate* way to describe the characteristics of various approaches to assessing medication adherence?
 - A. Analysis of a secondary database can determine the exact reasons for medication nonadherence.
 - B. Overestimated medication adherence may occur due to early refill when using pill counts to calculate the adherence ratio.
 - C. The Medication Events Monitoring System is a low-cost device to accurately assess medication adherence.
 - D. The use of self-report surveys can provide information on barriers to medication adherence.
7. Inadequate provision of medication counseling belongs to which of the following dimensions associated with medication adherence?
 - A. Social and economic factors
 - B. Healthcare team- and system-related factors
 - C. Therapy-related factors
 - D. Patient-related factors
8. A complex treatment regimen belongs to which of the following dimensions associated with medication adherence?
 - A. Healthcare team- and system-related factors
 - B. Condition-related factors
 - C. Therapy-related factors
 - D. Patient-related factors

9. Which of the following barriers to medication adherence is a social factor?
 - A. Inadequate interaction time with general practitioners
 - B. Limited health literacy to make health-related decisions
 - C. Lack of social support from family
 - D. Less trust in advice from healthcare professionals
10. Impaired cognitive function may limit correct medication use. Into which of the following categories of factors medication nonadherence does that situation fall?
 - A. Healthcare team-related factors
 - B. Healthcare system-related factors
 - C. Condition-related factors
 - D. Therapy-related factors
11. Which of the following barriers is not a condition-related factor associated with medication nonadherence?
 - A. Impaired cognitive function
 - B. Previous experience of treatment failure
 - C. Depression and reduced motivation
 - D. Patients' health beliefs about the disease condition
12. Patients are more likely to become nonadherent to which of the following treatments?
 - A. Albuterol to prevent an asthma attack
 - B. Imatinib to treat chronic myelogenous leukemia
 - C. Enalapril to treat hypertension
 - D. Diphenhydramine to relieve cold symptoms
13. To help improve medication adherence, which of the following patient-related factors is *most modifiable*?
 - A. Understanding the treatment need
 - B. Having a low level of education
 - C. Changing social norms about certain drug therapies
 - D. Being an old person
14. Which of the following activities is *most likely* to help a patient with diabetes understand the readings on a glucose meter and appropriately adjust the dose of insulin?
 - A. Gaining more knowledge of insulin per se
 - B. Empowering adequate health literacy in diabetic self-care

- C. Equipping more concerns about adverse effects of insulin
 - D. Participating in discussions with peers with negative beliefs about medications
15. Which of the following strategies is related to providers for improving medication adherence?
- A. Providing patient information sharing throughout healthcare
 - B. Participating in peer groups for the management of chronic diseases
 - C. Facilitating the support of caregivers
 - D. Developing trust and rapport with patients and healthcare stakeholders

SELF-ASSESSMENT QUESTION-ANSWERS

1. **D.** Medication adherence is defined as the extent to which patients are able to follow the recommendations for prescribed treatments. Medication nonadherence may be intentional or unintentional, and patients' reasons for deviating from the (agreed) treatment plan are diverse. Patients may decide not to fill their prescriptions in the pharmacy or not start their treatment at all. Patients may use more or less than the prescribed treatment and use their medication at the wrong time or in the wrong way. They may also discontinue treatment prematurely. See the [Introduction](#) section of Chapter e5 for more information.
2. **C.** Compared with nonadherent patients, adherent patients have lower healthcare costs (including fewer hospitalizations and emergency department visits), reduced costs of acute and ambulatory care, and better health outcomes and quality of life. See the [Introduction](#) section of Chapter e5 for more information.
3. **B.** Direct methods for assessing medication adherence include bioassays and biomarkers to measure the level of a drug or its metabolite in body fluids (eg, blood or urine). In addition, direct observation of medication administration is considered a direct approach to assessing medication adherence. See the section on "[Measures of Medication Adherence \(Direct Methods\)](#)" in Chapter e5 for more information.
4. **D.** Indirect methods for assessing medication adherence include self-report surveys, pharmacy refill rates, pill counts, clinical response monitoring, and electronic monitoring devices. See the section "[Measures of Medication Adherence \(Indirect Methods\)](#)" in Chapter e5 for more information.
5. **A.** Currently, self-report survey is the most widely adopted method for assessing medication adherence in clinical practice and research. See the section "[Measures of Medication Adherence \(Indirect Methods\)](#)" in Chapter e5 for more information.
6. **D.** Analysis of a secondary database is limited, as it cannot identify partial adherence (eg, occasionally missed or incorrect doses) or determine what barriers might have contributed to detected nonadherence (eg, inconvenience of obtaining refills, lack of money for copayments or out-of-pocket expenses). The bulkiness of the container and the high expense of equipment restrict widespread use of the Medication Events Monitoring System. Underestimated medication adherence can occur due to early refill when using pill counts to calculate the adherence ratio. See the section "[Measures of Medication Adherence](#)" in Chapter e5 for more information.
7. **B.** The patient-provider relationship is one of the factors related to the healthcare team and system that impacts adherence to medications. Studies have shown that good patient-provider relationships and effective patient-physician communication positively affect medication adherence. See the "[Factors Associated with Medication Adherence](#)" section and [Table e5-2](#) for more information.
8. **C.** Various therapy-related factors have been identified that affect medication adherence. The complexity of the medication regimen, duration of treatment, frequent changes in treatment, immediacy of beneficial effects, and drug-related adverse effects are notable factors associated with medication adherence. See the "[Factors Associated with Medication Adherence](#)" section and [Table e5-2](#) for more information.
9. **C.** Socioeconomic status has been an independent predictor of medication adherence across diseases. Lack of social support from caregivers and family is also one of the social factors associated with medication adherence. See the "[Factors Associated with Medication Adherence \(Social and Economic Factors\)](#)" section and [Table e5-2](#) for more information.

10. **C.** Condition-related factors include aspects of specific diseases that can affect medication adherence. Condition-related determinants of medication adherence include the severity of symptoms, disease progression, availability of effective treatments, and level of disability. See the “[Factors Associated with Medication Adherence](#)” section and [Table e5-2](#) for more information.
11. **D.** Health beliefs about the disease condition are patient-related factors of medication nonadherence. Adherence is highly correlated with patients’ beliefs about severity of the disease to be prevented or treated. See the “[Factors Associated with Medication Adherence](#)” section and [Table e5-2](#) for more information.
12. **C.** Patients most often become nonadherent to chronic diseases, such as hypertension, where they do not have any unpleasant symptoms even without strict adherence to medication regimens. Studies have shown that adherence rates may drop dramatically when medication is taken over a long period for disease prevention or cure. See the “[Factors Associated with Medication Adherence \(Condition-Related Factors\)](#)” section and [Table e5-2](#) for more information.
13. **A.** Although the inherent characteristics associated with medication adherence may be difficult to change in clinical practice, some patient-related factors that affect medication adherence can be addressed to improve medication adherence. Educating patients to understand the purpose and need of treatment is one of the important strategies to improve medication adherence. See the “[Factors Associated with Medication Adherence \(Patient-Related Factors\)](#)” section in Chapter e5 for more information.
14. **B.** Health literacy is an individual’s ability to obtain, process, understand, and apply information about interventions to make an appropriate health-related decision. People with diabetes need to understand the readings on a glucose meter and adjust their medications accordingly. See the “[Factors Associated with Medication Adherence \(Patient-Related Factors\)](#)” section in Chapter e5 for more information.
15. **D.** Studies have shown that good patient-provider relationships and effective patient-physician communication positively affect medication adherence. See the “[Strategies for Improving Medication Adherence \(Provider-Related Strategies\)](#)” section and [Table e5-3](#) for more information.