

Medication adherence and cognition

Medical, personal and economic factors influence level of adherence in older adults

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Medication adherence is increasingly being recognized as a significant issue in treating geriatric patients. A report by the Institute of Medicine¹ identified medication nonadherence as a notable source of medical errors.

Poor adherence has been shown to decrease the effects of prescribed medications or other treatments and to increase the likelihood of poor outcomes.² Adherence has been related to intermediate clinical outcomes in several diseases. An increased incidence of adverse events has been linked to nonadherence in the elderly.³

Elders' adherence to prescribed medications is a complex phenomenon that depends on an interaction of medical, medication, personal, and economic factors.

► Medical factors that affect adherence include cognitive abilities, as well as overall health status (eg, number of chronic conditions).

► Medication factors related to adherence include the characteristics of

the medication (eg, dosing frequency or presence of side effects).

► Personal factors that affect adherence include:

▷ personal beliefs about the condition for which the medication is prescribed (eg, how serious the condition is and how likely the medication is to have a positive effect).

▷ individual cognitive abilities, including memory, overall intellectual ability, organization skills, and health literacy. Health literacy has emerged as an important factor that affects older persons' capacity, for example, to make health care choices.⁴

► Economic factors pertinent to medication adherence include whether patients have insurance or other financial resources to pay for the medication.

► Patients' relationship with their physician as well as the physician's communication style can affect adherence.⁵

► In the older adult with memory problems, we have found that whether patients depend on themselves or a caregiver can have a significant impact on adherence.⁶ Not all caregivers take responsibility for a patient's medication, and family members' beliefs about a medication can also affect the patient's adherence.

Evaluation of elders' medication adherence as a factor in treatment success or failure is thus potentially complex, difficult, and time consuming.

Role of cognitive abilities

Few studies have directly investigat-

ed the determinants of elders' medication adherence. In an ongoing study using electronic medication adherence monitoring (Medication Event Monitoring System [MEMS]), preliminary results have shown that patients' cognitive skills and health literacy are related to their adherence to medications prescribed for memory impairment (see <http://www.pat-cai.org>). The electronic monitoring system records the date and time of each medication dose, and a software application provides a report of the number of doses taken in a specific interval, at the correct time of day, and at the correct interval between doses. All study subjects have been diagnosed with some form of memory impairment and are taking one of the cholinesterase inhibitors (eg, donepezil, rivastigmine, galantamine). These are the only medications for which adherence is being monitored.

Preliminary analyses show that specific cognitive abilities are related to different aspects of adherence.⁷ In regression models, patients' delayed recall of a list of words was related to patients having taken the correct number of doses in a 30-day interval, without regard to dosing interval. When adherence was defined more strictly as taking the correct number of doses in approximately the correct interval, more complex cognitive abilities were involved.

While memory continued to be an important predictor of adherence, health

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literacy (as measured by the Test of Functional Health Literacy⁸), executive abilities (time taken to complete a maze task), and general cognitive status (Alzheimer's Disease Assessment Scale, cognitive subscale⁹) all contributed independently to medication adherence. Whether patients' memory is poor, as well as other abilities—including general ability and health literacy, may thus be related to how well they take their medications.

Patient traits and adherence

Although one might expect that older adults would have lower levels of medication adherence than younger adults, some studies have shown that older adults may have higher levels of adherence, perhaps because they are not as busy with other activities as are younger persons,¹⁰ or because they are more aware of the potential impact that medications may have on their health.⁶ However, in a study by Carney et al, depression was significantly associated with worse medication adherence in elders.¹¹

In some studies, age has not been directly related to adherence, although poorer cognitive function has. Since increasing age places elders at greater risk for deficits in memory or general cognitive function, the apparent relation between adherence and age may be mediated by cognition rather than age itself. Other patient characteristics, such as socioeconomic status, may be related to adherence.¹²

Patient beliefs and adherence

The Health Belief Model¹³ has been a stimulus for numerous studies of medication adherence. Starting with the idea that patients' beliefs about medications will impact how they take these medications, the model predicts that patients' beliefs about their conditions and the conditions' likely outcomes with and without treatment will affect adherence.

In a study of patients at a memory disorders clinic based partly on this model, a complex pattern of connections was found among patient beliefs and adherence as reported by caregivers.⁶ Numer-



Medication adherence in older adults is a poorly understood phenomenon with multiple determining factors. Asking open-ended questions may be the best tool available to determine whether older adults with cognitive impairments are compliant.

Illustration for GERIATRICS by Michael Morgenstern

ous variables were assessed, including cognitive status as an index of dementia severity, number of medications, total number of medication doses per day as an index of regimen complexity, and

whether the patient depended on a caregiver or him- or herself to remember to take the medication. Patients' beliefs about the seriousness of their condition were significant predictors of their rat-

Table 1 Key risk factors for nonadherence

- ▶ Low levels of health literacy
- ▶ Poor understanding of the purpose for medication
- ▶ Poor understanding of the impact of a medication on health outcomes
- ▶ Memory or general cognitive impairment
- ▶ Living alone or not having a caregiver
- ▶ Regimen complexity
- ▶ Communication difficulties between physician and patient
- ▶ Lack of insurance or other inability to pay for medication

Source: Created for GERIATRICS by RL Ownby.

ing of its likely outcome without treatment; this rating was, in turn, related to adherence. In this study, older age was related to better adherence, while the presence of side effects was related to lower levels of adherence.

Risk factors for nonadherence

Given the complexity of medication adherence and the difficulties that practicing clinicians face in assessing and addressing it, clinicians should be advised to focus on significant factors in nonadherence (table 1). In our ongoing study of medication nonadherence in patients with a mean age of 82.3 years, analysis of preliminary data reveal two distinct patterns of adherence.¹⁴ A majority (ie, 80% to 90%) of patients have high levels of medication adherence as determined by electronic monitoring. These patients still function at independent levels in activities of daily living, and their memory impairments are mild. They often live with a spouse or another caregiver.

A smaller, but distinct, second group (10% to 20%) of patients has been identified as having low levels of adherence. They may still live independently, but show clear evidence of memory impairment. They typically live alone and report that they rely on themselves and not a mechanical aid (eg, pillbox) to remember to take their medication.

These observations are similar to those of other adherence studies of the elderly.^{15,16} A European study with a population-based random sample of persons age 75,¹⁵ for example, showed that evidence of cognitive impairment (MMSE

score less than 24) increased the likelihood of nonadherence nine times, and that elders living alone were twice as likely to have medication errors. This study did not explore the effect of the presence of a caregiver, but it showed that the use of a compliance aid (eg, pillbox) increased adherence by nearly 4.5 times. The study showed that many patients had low levels of knowledge about medications and the purpose for which they had been prescribed. In fact, 40% of patients did not know the purpose of the medication, 79% did not know

Factors associated with medication nonadherence include regimen complexity, acuity, and economics

the consequences of not taking medication, and 95% were not aware of the possibility of a toxic drug reaction.

Communication patterns, and most likely, the physician-patient relationship they reflect, affect medication adherence.¹¹ Stewart et al¹⁷ argue that three physician behaviors may be critical for medication adherence:

- 1) **Provide** a full explanation of the rea-

son for prescribing the medication and provide the expected outcome. Tell the patient **WHY** you are prescribing this drug and what you expect it will do.

2) **Emphasize** the shared responsibility of the patient and physician in health outcomes. Tell the patient that you have done what would be expected given these symptoms or this condition, and what you expect him or her to do as well.

3) **Explore** factors in the patient's life relevant to obtaining and using the medication as scheduled. Ask the patient if there are any reasons why he or she may not be able to do as you have instructed.

Although time consuming, developing a relationship with individual patients and providing them with this type of information may aid in improving adherence.

Other factors associated with medication nonadherence in the older adult include:

- ▶ **Regimen complexity.** Consider simplifying regimen complexity (eg, reducing the number of times medications are taken daily) to improve adherence.¹²

- ▶ **Acuity.** How well a patient understands the medical condition for which he or she is being treated has an impact on adherence, with decreasing adherence over time in chronic, largely asymptomatic conditions, such as hypertension¹⁸ and dyslipidemias.¹⁶

- ▶ **Economics.** The importance of economic factors should not be neglected. Patients who have difficulty paying for medication report skipping medications a majority of the time.^{19,20}

Assessing adherence

One research finding on the assessment of patient medication adherence is consistent: patient self-report of adherence is unreliable. Therefore, clinicians must be careful to use supplementary information when assessing patients' medication adherence. If self-report is used, MacLaughlin et al²¹ argue that open-ended questions are more likely to elicit accurate information than specific ques-

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Table 2 Adherence assessment in older patients

Assessing current adherence behavior

First, evaluate how the patient takes his or her medications

- ▶ From pharmacy bottle, other packaging (eg, blister pack)
- ▶ Is the patient assisted by a caregiver?
- ▶ Does the patient use any organizing device, such as a weekly pill organizer?

Ask that the patient bring all medications to each visit

- ▶ Assess number of doses available for each medication in relation to refill date
- ▶ Check refill dates to ensure that medications are refilled at appropriate intervals

Self report or pill counts – not recommended because of inaccuracy

- ▶ If this strategy is used, ask patients open-ended questions about how they take their medications

Caregiver report – accuracy unclear but may be discrepant from patient report²

Source: Created for GERIATRICS by RL Ownby based on information from references 2, 6, 22-24.

Table 3 Assessing functional ability to adhere

Mental status screening: Scores on cognitive screening instruments, such as the Mini-mental State Exam (MMSE) may be related to medication adherence,^{6, 15-17} although none of these have provided cutoff scores that might be used in clinical assessment.

MedTake inventory¹⁵ assesses accuracy of patients' knowledge of medication regimen by asking them to describe how they take their own medications and then scoring their response on four dimensions: (1) dose, (2) indication, (3) whether taken with food and water, (4) dosing regimen. For each medication, 25% correct is awarded, and then an overall average percentage is calculated. In one study, the MedTake score was significantly related to MMSE performance.

Hopkins Medication Schedule¹⁶ provides a standard scenario for taking aspirin and an antibiotic. The patient is asked to indicate when doses should be taken in relation to meals and snacks on a paper form. He or she is then asked to fill a pillbox to further demonstrate his or her understanding of how to take the medication. Scores on this measure have been related to memory and executive function.

DRUGS inventory¹⁷ requires patients to identify each of their own medications they should be taking on a specific day, open the appropriate container, take out the correct dose of medication, and indicate the timing of each dose on a recording form.

Informal assessment of patient's ability to put medication in organizer or complete a calendar. This approach might be useful in clinical settings. The clinician can ask the patient to demonstrate how and when he or she takes prescribed medications. Difficulties with this task in the office would imply that difficulties are likely at home.

Source: Created for GERIATRICS by RL Ownby based on information from references 2, 6, 22-24.

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tions with yes or no answers. Rather than asking the patient "Are you taking your medications as prescribed?" it may be preferable to say, "Tell me how you take your medications," or to ask the patient to demonstrate how he or she takes their medications with a pillbox.

The clinician may ask the patient about side effects as a means of assessing adherence, since the presence of

side effects may reduce patients' adherence. The clinician can ask open-ended questions, or ask specific questions about common side effects, opening the conversation to possible reasons why a patient does not take a specific medication.

Several systematic methods of assessing a patient's functional ability to adhere are listed in tables 2 and 3.²²⁻²⁴ In general, these methods provide standardized assessments of medication adher-

ence-related behaviors, such as understanding directions on a prescription label and identifying correct times to take doses.

Electronic medication adherence monitors, although most often used in research contexts, are potentially useful in clinical settings. These monitors record the time and date at which doses of medication are taken. Information can be recorded centrally by telephone or at each visit.

Table 4 Strategies for improving medication adherence in older patients

Patients with low levels of health literacy

- ▶ Offer structured or guided support for medical problem solving by providing information about medication and asking patient to explain consequences of not taking it or how to cope with adverse effects.
- ▶ Provide information to patient orally and in writing at a level understandable to the patient. When in doubt, assess readability level of written information through measures available in standard word processing software (search for “readability” in software help function).

Patients with lack of understanding of the medication’s purpose or impact on a disease

- ▶ One-to-one educational intervention that includes questions and answers to ensure patient understanding
- ▶ Provide written information, individually tailored if possible
- ▶ Include the purpose of the medication in the written prescription so that it is printed on the prescription bottle label (eg, “Sig: donepezil, 10 mg: One every day for memory problems”).
- ▶ Provide the patient with an easy-to-read summary of the medication or medication changes that includes the purpose.

Patients with memory or general cognitive impairment

- ▶ Provide a pillbox or blister pack
- ▶ Encourage patient to enroll in an automated reminding service when available
- ▶ Coaching the patient on using daily routine as a support for medication adherence (eg, always taking medication at breakfast)

Patients living alone or not having a caregiver

- ▶ Mobilize patient’s family to assist in supervision (even if via telephone)
- ▶ Investigate local visiting nurse and social work services

Patients with complex regimen dosing

- ▶ Simplify medication regimen to fewest possible doses each day

Communication difficulties between physician and patient or patient-caregiver dyad

- ▶ Explain why the medication is prescribed and what outcome is expected
- ▶ Emphasize the shared responsibility of the patient and physician in health outcomes
- ▶ Explore factors in the patient’s life relevant to obtaining and using the medication as scheduled

Lack of insurance or other inability to pay for medication

- ▶ Provide information on manufacturers’ programs to provide medications
- ▶ Assist patients in enrollment in programs
- ▶ Consider switching to generic medications when suitable alternatives are available

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Improving adherence

Several extensive reviews evaluate the effectiveness of methods to improve medication adherence.²⁵⁻²⁷ Methods for improving patient adherence are listed in table 4. In general, studies of interventions to improve patient adherence to medication regimens have shown small, but statistically significant, effects. Small changes in adherence may be difficult for clinicians to detect and interventions that produce them may thus appear ineffective.

Further, studies have typically included participants with a wide range of levels of adherence. Since studies have shown that older patients may have high levels of adherence, the effect of an intervention on groups of persons with high and low levels of adherence may be watered down in these studies.


Research studies have shown different rates of adherence in patients with different demographic characteristics (eg, non-white¹⁶), in different diseases, and with different medications. Ultimately, it may be necessary to develop individually tailored interventions that consider patient, disease, and treatment characteristics.

Use of technology-based interventions may be a useful strategy for dealing with poor medication adherence.²⁸ For example, while tailored information interventions (interventions that target patient adherence by providing information tailored to patients’ interests or needs) are known to improve adherence, preparation of tailored medication information for each individual may be excessively time-consuming. Creation of educational materials can be automated through a computer-based application, making the preparation and dissemination of individually-tailored materials part of clinical office practice.²⁹ Other automated interventions (eg, computer-based telephone reminding), have also been shown to improve adherence.³⁰

Conclusion

Although critically important, medication adherence in older adults is a poorly

understood phenomenon with multiple determining factors. Research on interventions to improve adherence has shown modest, but statistically significant, effects. However, results of existing studies make it difficult to determine the most important factors for improving adherence.

It is not clear the extent to which observed effects on adherence are related to already high levels of adherence in some patients. Future efforts to improve adherence may require individually-targeted interventions that consider important patient and disease characteristics. Technological devices may aid in this time- and labor-intensive effort. 

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