

EXERCISES IN CLINICAL REASONING

Overcoming Inertia: an Exercise in Clinical Reasoning

Julia Loewenthal, MD^{1,2} , Houman Javedan, MD^{1,2}, and Andrea Wershof Schwartz, MD, MPH^{1,2,3}

¹Division of Aging, Department of Medicine, Brigham and Women's Hospital, Boston, MA, USA; ²Harvard Medical School, Boston, MA, USA; ³Division of Geriatrics and Palliative Care and New England Geriatrics Research Education and Clinical Center, Veterans Affairs Boston HealthCare System New England, Boston, MA, USA.

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In this series, a clinician extemporaneously discusses the diagnostic approach (regular text) to sequentially presented clinical information (bold). Additional commentary on the diagnostic reasoning process (italics) is integrated throughout the discussion.

A 91-year-old woman presented to the emergency department after a fall. The morning prior to presentation, she was ambulating in her kitchen and felt dizzy. She fell, landing on her back and hitting her head on the floor. Her granddaughter helped her off the ground and brought her to the emergency department, where the patient reported ongoing dizziness.

When an older adult reports “dizziness,” the differential is broad, including orthostatic hypotension, vertigo, cardiac arrhythmia, or central nervous system (CNS) hypoperfusion. The key to this patient’s presentation is that her fall is more than “tripping over something,” often referred to as a “mechanical” fall, but rather could be precipitated by a pre-syncope event. Additional history regarding the fall would be helpful—what time of day was it? What type of activity was she doing prior to the fall? Had there been any recent changes to her medications or health status?

The presentation of illness in an older person is often due to a multifactorial process rather than a single disease entity. Understanding context is of particular importance—clinical information needs to be grounded in detailed understanding of function and cognition, as well as the patient’s baseline. In older adults, possible diagnoses expand to include geriatric syndromes, which can be conceptualized as common end-points of different physiologic perturbations.

A useful framework for falls is considering predisposing vs. precipitating factors.¹ Predisposing factors include diseases or impairments that increase risk of falling, such as osteoarthritis, low vision, arrhythmia, cognitive impairment, gait impairment, and functional dependence. Precipitating factors include acute stressors directly leading to a fall, such as a tripping over an object in a cluttered home, alcohol intoxication, or new or adjusted medications.

The patient reported daily episodes of dizziness occurring in the morning for the past few weeks, describing it as a “wooziness” rather than room spinning. The patient lived alone with family next door. At baseline, she reported independence with grooming, cooking, and medication management. She was dependent on family members for transportation and financial management. She used a walker for mobility and reported several falls in the past year.

The additional history characterizing the patient’s dizziness is helpful; the lack of sudden onset and room spinning makes vertigo less likely, the chronicity makes CNS hypoperfusion or arrhythmia less likely. However, the detail of wooziness in the morning invites further questioning regarding the exact timing of the symptom: does it occur when she arises from bed, as one would expect with orthostatic hypotension, or does she notice it after eating, which may occur with post-prandial hypotension in older adults?²

The patient’s functional dependence on family for some of her instrumental activities of daily living (IADLs) as well as her history of frequent falls raise concerns for either cognitive or mobility limitations that may have neurologic or cardiovascular sequelae; could the patient have Parkinson’s disease or dementia with Lewy bodies that could affect both the executive function required to perform IADLs and/or contribute to autonomic dysfunction leading to dizziness? The clinician could explore the time course of her functional dependence to better understand her limitations.

Knowledge of a patient’s functional status is of the utmost importance in assessing the older person. Understanding a functional need and the reason for it helps geriatricians understand where a patient may be vulnerable (e.g., cognitive vs. physical deficits). The degree of dependence is also important—this patient is independent with ADLs but not the more complex IADLs. This not only lends practical information but also allows the clinician to refine their hypothesis. A

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patient with more functional dependence is likely to experience system perturbation, or acute illness, when exposed to a lesser insult. Therefore, the patient's wooziness could be due to medication change, impaired sleep, or a change in living environment, in addition to medical illness such as arrhythmia, vertigo, or cardiac ischemia.

The patient's medical history was notable for coronary artery bypass grafting and bioprosthetic aortic valve replacement for aortic stenosis, paroxysmal atrial fibrillation, congestive heart failure, diabetes mellitus, and hypertension. Her medications included warfarin, metoprolol, lisinopril, amlodipine, furosemide, potassium, glipizide, pioglitazone, omeprazole, ferrous sulfate, gabapentin, celecoxib, docusate, senna, and acetaminophen. Metformin was discontinued in the past due to fluctuating renal function.

The patient's vascular risk factors do raise the likelihood of a cardiac or neurologic etiology for the patient's near syncopal event, such as atrial fibrillation with rapid ventricular response, cardiac ischemia, heart failure exacerbation, or pulmonary embolism. However, her medication list also raises the possibility of a medication adverse effect contributing to her presentation. The geriatrician's adage "any new symptom in an older adult should be considered a medication adverse effect until proven otherwise"³ bears remembering in this situation, as the patient is on several medications that could lead to this presentation. For example, her diuretic furosemide could contribute to orthostatic hypotension or to hypokalemia that could precipitate an arrhythmia. She is on multiple antihypertensives and a beta-blocker, the latter of which may contribute to orthostasis by suppressing the physiologic increase in heart rate upon standing. Gabapentin may cause dizziness and falls, and her sulfonylurea may cause hypoglycemia.

In addition to changes in aging physiology, older people have a higher burden of multimorbidity. Multimorbidity contributes to a patient's vulnerability to stress since each disease may impact many bodily systems. For example, diabetes mellitus increases the risk of cognitive impairment, cardiovascular disease, and peripheral neuropathy. Here, the clinician acknowledges the contribution of multimorbidity and begins to prioritize diagnoses. However, they also acknowledge that medication use itself may be contributing to the presentation, which is an important consideration in the older patient.

Physical examination was notable for BP 119/57, pulse 72 bpm, and regular. She was afebrile with normal oxygen saturation on room air. Orthostatic vital signs were negative. Physical examination was notable for normal jugular venous pressure. Heart rhythm was regular and there were no murmurs or gallops. The lungs were clear to auscultation. There was a trace amount of pitting edema to the ankles bilaterally. Gait was unsteady and slow. She required use of a walker for ambulation. Transitioning from sitting to standing did not worsen her sense of dizziness.

The patient's physical exam is reassuring that she is not in acute distress or ill-appearing. She has a trace amount of peripheral edema, but otherwise does not appear volume-

overloaded. She has several predisposing risk factors to falls including her slow gait and inability to rise from a chair without using her hands, both of which independently predict a higher risk of falling. The most frequently recommended screening test for mobility is the Get Up and Go Test, which asks the patient to stand from a chair, walk 10 ft, turn, return to the chair, and sit down. Abnormal findings are associated with increased risk of falls.¹

Orthostatic vital signs should always be checked in an older patient with falls—at the time of this patient's physical exam, they were negative, but this does not completely rule out orthostasis at the time of the fall. Older adults are at increased risk of orthostasis due to decreased beta-receptor responsiveness to sympathetic stimulation, which impairs the ability to increase heart rate response upon standing. Diastolic dysfunction, which increases in prevalence with age, may reduce diastolic ventricular filling, further predisposing the older adult to orthostatic hypotension.

Geriatricians use their knowledge of age-related changes in physiology to develop hypotheses and guide further diagnostic testing. For example, in older patients, an audible fourth heart sound (S4) may be present due to a physiologic decrease in ventricular compliance with aging. The presence of an S4 should still raise the possibility of additional cardiac work-up, but the clinician may be less inclined to pursue invasive diagnostic testing in the initial work-up, understanding this is a common finding in older adults.

Serial cardiac enzymes were normal. Creatinine was 0.92 (CrCl 57 mL/min), which was at baseline. The remainder of admission labs were unremarkable. Computed tomography evaluation of the head and cervical spine did not show evidence of CVA or trauma. An ECG showed normal sinus rhythm without ischemic changes. She was admitted for further work-up.

An etiology for the presentation has not yet been elicited by routine diagnostic testing. Because infection may present without overt fever in an older adult due to immunosenescence, but with objective symptoms such as prolonged dizziness, a basic infectious work-up should be sent.

Infectious work-up, including urinalysis and chest X-ray, was unremarkable. Home medications were restarted. The morning after admission, the patient again reported dizziness and was found to be hypoglycemic to 40 mg/dL. Her dizziness resolved after being given a cup of apple juice. Hemoglobin A1c was checked and noted to be 5.6%. Glipizide and pioglitazone were discontinued. On subsequent days, the patient denied dizziness and the fasting glucose level ranged 80–140 mg/dL.

Since hypoglycemia reproduced her symptoms, it seems to be explanatory for the dizziness which precipitated the fall, though dizziness and falls in older adults are almost always multifactorial, involving multiple predisposing risk factors.

In terms of causes of hypoglycemia, the sulfonylurea is the most likely culprit. Glyburide appears in the American Geriatrics Society (AGS) Beers Criteria,⁴ a list of potentially

inappropriate medications in older adults, given risk of prolonged hypoglycemia with its use, especially in the presence of renal dysfunction. Glipizide has a lower risk of hypoglycemia, though it can still occur. Thiazolidinediones (e.g., pioglitazone) also appear in the AGS Beers Criteria, given they can contribute to fluid retention and heart failure.

The goals for glycemic control in older patients with diabetes are important to consider. The American Diabetes Association stratifies glycemic goal based on patient characteristic and health status.⁵ These guidelines suggest aiming for a hemoglobin A1c goal of 7.5 to 8.5% in most older adults, with consideration of higher targets for those with functional impairment, cognitive dysfunction, and coexisting severe medical conditions. This patient likely does not need any oral hypoglycemic medications.

The clinician has identified potentially inappropriate polypharmacy. Here, the concept of therapeutic inertia arises. Older patients often accumulate diagnoses and medications over time. In the past, it was probably appropriate that this patient was on glipizide and pioglitazone, but physiologic changes, renal dysfunction, and loss of muscle mass over the years gradually decrease need for oral hypoglycemic medications. Clinicians may feel a reluctance to change chronic medications, given the absence of prior adverse events and a desire to avoid negative consequences occurring as a result of change. Understanding physiologic changes with aging, assessing functional status, and performing indicated cognitive testing can help the clinician to reexamine the risk-benefit ratio and take a fresh look at the medication list.

Hemoglobin and iron studies were checked and normal, so ferrous sulfate was discontinued. As a result, constipation resolved and docusate and senna were discontinued. Potassium was monitored while the patient was hospitalized, and the patient's supplement was able to be discontinued.

Adverse drug effects may be misinterpreted as a new medical problem, which can lead to another prescription medication. This entity is known as a prescribing cascade. Iron supplementation often causes constipation, even in young patients, which can lead to the prescription of stool softeners and laxatives. Potassium is another potential prescribing cascade with diuretics. Prescribing cascades are often necessary, but it is important to periodically reassess the indication for the initial medication.⁶

The patient has a history of coronary artery disease but is prescribed neither an aspirin nor a statin for secondary prevention. If possible, the clinician should attempt to elicit a history of all conditions and then consider the lag time to benefit for each medication. For example, in patients with known atherosclerotic cardiovascular disease, the time to benefit of a statin for secondary prevention is estimated to be approximately 6 months to 2 years.⁷ Several tools exist to help estimate life expectancy in older adults,⁸ including ePrognosis, a freely accessible online repository of these published geriatric indices.

The use of both an anticoagulant (warfarin) and aspirin should prompt co-prescription of a proton pump inhibitor, given the increased risk of upper GI bleeding in older patients; this is an

example of a necessary prescribing cascade.⁹ Proton pump inhibitors, however, are associated with a higher risk of fractures, *Clostridium difficile* infection, community-acquired pneumonia, and vitamin B₁₂ deficiency, so the underlying indication must be carefully considered and weighed against these risks.

Older adults experience both over- and under-treatment with medications. Over-treatment with unnecessary, harmful, or ineffective medications is common and affected by both individual and systemic factors. Under-treatment may stem from lack of knowledge of time to benefit for particular medications or assumptions about life expectancy.

The patient reported neck pain associated with her fall injury. Acetaminophen dose was increased and scheduled, and the patient worked with physical therapy with improvement in pain. As a result, celecoxib was stopped. The patient's gabapentin dose was lowered to account for renal function.

The patient was discharged home on warfarin, metoprolol, lisinopril, amlodipine, furosemide, omeprazole, gabapentin (reduced dose), acetaminophen, aspirin, and atorvastatin, 10 medications from a total of 15 upon admission. Seven medications were deprescribed and two were added. Most importantly, this regimen was personalized for the patient in terms of her age, multimorbidity, function, cognition, life expectancy, and goals.

Medications for this older patient were optimized by deprescribing inappropriate or unnecessary medications and adding indicated medications. This process should ideally continue after an acute hospitalization in the post-acute and ambulatory settings with further monitoring and adjustment.

DISCUSSION

In this case, we highlight two common geriatric syndromes: falls and polypharmacy. We then demonstrate how a comprehensive geriatric assessment can be used to frame the care of an older patient—in this case, to deprescribe medications that were contributing to adverse outcomes. Most clinicians do not routinely perform comprehensive geriatric assessments, especially in the acute care setting. However, understanding overarching geriatric principles allows the clinician to personalize care to each older patient while reducing harm.

Falls are common in older adults—more than a third of community-dwelling adults over age 65 fall each year, and approximately 10% of these falls result in serious injury.¹⁰ A fall is a common endpoint for dysfunction in multiple systems, including musculoskeletal, neurologic, cardiovascular, urinary (e.g., incontinence), and many others. These predisposing factors are operating in conjunction with precipitating factors, such as trip hazards, poor lighting, alcohol use, and medications themselves. Identifying issues in each of these areas for an older adult can help the clinician understand how and why a fall happened and how to reduce future risk. In the case here, hypoglycemia, specifically oral hypoglycemic medications, served as the

Table 1 Deprescribing Tools

Tool	Description
American Geriatrics Society Beers Criteria ⁴	An explicit list of potentially inappropriate medications for older adults in most circumstances, specific situations, or certain diseases or conditions
Anticholinergic Risk Scale ¹⁴	A list of commonly prescribed medications with different levels of anticholinergic effects. Higher anticholinergic risk scale risk score was associated with an increased risk of anticholinergic adverse events in older adults
Deprescribing.org	Guidelines and algorithms focused on deprescribing specific medication classes (e.g., proton pump inhibitors)
MedStopper.com	Online tool to help clinicians make decisions about reducing or stopping medications Clinician enters the patient's entire medication list and MedStopper sequences drugs from "more likely to stop" to "less likely to stop"
STOPP/START Criteria ¹⁵	Describes potentially inappropriate medications (STOPP criteria) and potential prescribing omissions (START criteria). The criteria have been applied during acute hospitalization and shown to improve medication appropriateness and reduce adverse drug reactions

precipitating event. This highlights another common geriatric syndrome, polypharmacy.

Polypharmacy is generally defined as taking five or more prescribed drugs.¹¹ It increases risk of adverse events in older people due to alterations in pharmacokinetic and pharmacodynamic responses to drugs that occur in the context of aging physiology.¹² Deprescribing is an important part of the prescribing continuum that is under-emphasized during medical training and in clinical practice. It is defined as the systematic process of identifying and discontinuing drugs in instances in which existing or potential harms outweigh existing or potential benefits within the context of an individual patient's care goals, current level of functioning, life expectancy, values, and preferences.¹³ There are several tools available to assist with deprescribing (Table 1). Systematic approaches to deprescribing have been described in the literature—we conceptually followed the approach described by Scott et al.,¹³ which balances appropriate prescribing and deprescribing in a nuanced manner.

Oftentimes, "deprescribing" can seem too simplistic, given the presence of multimorbidity and serious risks with discontinuing certain medications. This case illustrates that older patients are also at risk of under-treatment, such as this patient with history of coronary artery disease who was prescribed neither an aspirin nor a statin. Ultimately, it is the optimization or personalization of the regimen that should be emphasized.

Sound clinical reasoning in the care of older adults is dependent upon information about the patient's function, cognition, life expectancy, and personal goals. This allows the

clinician to understand the individual patient's physiologic reserve, or tolerance for stress, and signals them to be alert for a geriatric syndrome as the etiology of a clinical presentation.

CLINICAL TEACHING POINTS

- Falls in older patients are often multifactorial. Clinicians can utilize the framework of predisposing vs. precipitating factors to aid diagnosis and management.
- Polypharmacy is prevalent and increases risk of many adverse outcomes in older adults. Deprescribing is a systematic approach that can be used to address polypharmacy.
- Treatment targets for chronic conditions, such as diabetes mellitus, change with aging and are affected by geriatric variables such as function and cognition.
- Treatment goals may evolve with patients' stated goals. Clinicians should be aware of both over- and under-treatment of chronic medical conditions.

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Corresponding Author: Julia Loewenthal, MD; Division of Aging, Department of Medicine, Brigham and Women's Hospital, Boston, MA, USA (e-mail: JLoewenthal@bwh.harvard.edu).

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