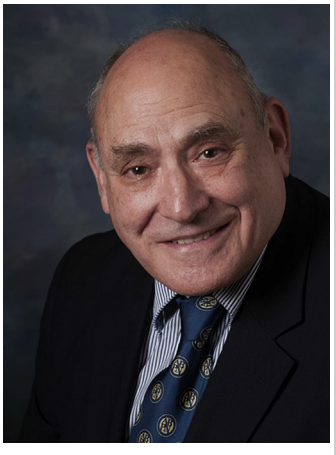
Editor-in-Chief's Note

Falls, Frailty, Vision, and Aging

We're not built to last forever
Eventually some parts will wear out
We will see things less clearly
And ask others to shout
Short-term memory grows faulty
And long-term comes under doubt
We can't stop the clock
Or squeeze water from a rock
There's no cure for aging
And no clout from a pout



Richard I. Shader, M.D.

This month's Update on frailty in the elderly and its recognition and treatment was assembled by our Geriatric Therapeutics Topic Editor, William Hung, MD.[1–4] As life expectancy increases around the world, frailty in elderly persons is a growing public health concern. Frail elderly are likely to be functionally impaired and have comorbid conditions such as reduced mobility and delirium.[5] Frailty is also a risk factor for falls and even for death.[6] Some prescription medications have also been linked to falls.[7] My personal view is that visual difficulties, many of which are correctable, do not receive enough attention in research on risk factors for falls, particularly in studies of prescription medicines.

As many older couples do, my wife and I recently downsized from a single-family home to an apartment. Two months ago, the front steps in our apartment building were replaced. As a result of an acknowledged error by the contractor, the rise on one step was 2 inches higher than on all of the other seven. I tripped on the aberrant step. Fortunately, I only experienced a small abrasion on a shin. My fall may have been caused by an age-related alteration in depth perception. When I went for my next cataract checkup with my optometrist, I asked that my depth perception be tested; she found it to be impaired. We cannot be certain that this was the sole cause of my fall. However, my balance is good, the lighting was adequate, the surface was not slippery, and I do not take any medicines that have been linked to a higher incidence of falls. I hasten to add that I am anything but frail. However, I do wear multifocal (continuous) glasses. A study by Haran et al found that in nonfrail, active elderly, a switch from multifocal to single-lens glasses reduced their likelihood of falling by 40%.[8] Both bifocal and multifocal glasses impair depth perception, lower contrast sensitivity, and reduce acuity in the lower visual fields.[9–13] Cataracts also increase the likelihood of falling.[14] All in all, correcting visual impairments significantly reduces the likelihood of falls in the elderly.[13]

Harwood[15] published a useful review of the three elements of vision that are usually implicated in vision-related falls. The first is depth perception. Altered depth perception involves changes in binocular stereopsis. When functioning properly, the slightly different images perceived by each eye are integrated to create the sense of depth needed for seeing three dimensionally. A good demonstration of this is the integration of the two images used in a stereopticon. Visual acuity is the second key element. It involves the spatial resolution needed to discern fine details.

Altered visual acuity is central to the impairments related to cataracts. The third factor is contrast sensitivity, which involves the detection of different levels of brightness when more than one object is present or when one object has more than one surface. Although each of these factors can be separately defined, they are highly interrelated, and all three contribute to the role impaired vision plays in falls. Another useful review was recently published by Saftari and Kwon.[16] In addition to discussing the functions covered by Harwood, the authors consider age-related lens changes, alterations in visual field size, and the interaction of visual motion perception and postural balance control. Last, a useful overview of the factors underpinning age-related visual decline appears in an article by Andersen.[17]

When studying falls, it is essential to specify the environmental conditions and the frequency of falls in order to establish that the cohorts compared are indeed comparable. For example, it would be inappropriate to count a person who reported one slip on the ice as equivalent to a person who has reported repeated falls while walking on level ground. Similarly, someone who trips over an object may be different from someone who falls when getting up from bed (ie, orthostatic/postural hypotension), or from someone who faints. Studies that use variables coded into large databases may not make distinctions or subclassify variables before comparing cohorts. For example, a study by Knudtson et al[18] used persons who answered "yes" to this question: "During the past 12 months, have you fallen and landed on the floor or ground, or fallen and hit an object like a table or stair while not doing sports?" Those who answered "yes" were then asked how many times they had fallen within the past 12 months. Only persons who had fallen 2 or more times were chosen for study.

With regard to medications and falls, a review by de Jong et al[7] provides a useful overview. I have looked at a number of additional articles that associate falls with various medications, and I found no evidence that the role of compromised vision or drug-exacerbated visual difficulties was taken into account.[19–21] I am not arguing that some drugs are not associated with falls in the elderly. Rather, I am suggesting that results are confounded in studies in which the effects of other risk factors are not considered. Importantly, some clinicians may be advising patients to stop otherwise helpful medications when their fall risk might actually be eliminated by correcting their vision.

Some drugs do affect vision. For example, the anticholinergic properties of some antidepressants (eg, amitriptyline, paroxetine) may have deleterious effects. The US Food and Drug Administration-approved label for amitriptyline contains this language: "…can cause mild pupillary dilation, which in susceptible individuals, can lead to an episode of angle-closure glaucoma...blurred vision, disturbance of accommodation, increased ocular pressure, mydriasis…."[22] Some of my past patients referred to experiencing a fuzziness or lack of sharpness when taking these and similar agents. Stefanous et al[23] studied a cohort of 30 patients who had long-term exposure to benzodiazepines. They reported that 19 patients complained of "…irritation, blurred vision or difficulty in reading." None, however, had reduced visual acuities apart from two in whom the cause was longstanding amblyopia. Thirteen patients had some form of retinal finding (9 macular and 4 nonmacular). It is impossible to know whether any of these unwanted findings were attributable to benzodiazepine use.

Having diabetes mellitus is also a risk factor for falls in the elderly.[24–26] Falls in patients with diabetes are likely related to complications such as diabetic neuropathy, diabetic retinopathy, hypoglycemia, or orthostatic hypotension.[27] In a study by Sumantri et al,[28] metformin was found to have a protective effect against frailty in elderly patients with diabetes. This finding raises the question of whether metformin could lower fall risk in frail elderly diabetic patients. I found no studies addressing this possibility. An argument against the use of metformin for this purpose would be that long-term metformin use can cause vitamin B_{12} deficiency and its related peripheral neuropathy.[29]

It is also important to note that complications from falls are typically more serious in the old-old (ie, those aged $\geq$85 years), whose bones may be more brittle from osteopenia or osteoporosis, or whose balance may be more compromised. Treating clinicians must identify persons at risk and advise them about possible preventive measures. One obvious preventive measure is regular eye examinations and corrective eye care. Another is avoiding or reducing the dosages of any medications that may cause or exacerbate eye problems. Frail elderly who wear multifocal glasses are in double jeopardy, as are those who take medications known to cause eye problems such as blurred vision.

In the 1965 blockbuster film, *The Sound of Music,* Julie Andrews sang the memorable Rodgers and Hammerstein hit, "My Favorite Things."[30] Parodies of that song with words attributed to Dame Andrews have appeared over the

years. For example, in a posting lauding Andrews on her 80th birthday in 2015, Margaret Manning wrote: "One of the reasons that Julie means so much to our community is that she has embraced aging with style. She even wrote a song parody on her 70th birthday, taking light-hearted swings at the aging process."[31] Manning clearly did not do her homework. Andrews did not write this parody nor did she sing it. Tragically, she lost her singing voice following surgery for benign vocal cord nodules in 1997.[32] These fake news parodies typically indicate that Andrews wrote and sang this song at events honoring her birthday. These tributes allegedly took place at Radio City Music Hall in New York City sponsored by the American Association of Retired Persons (aka AARP)—none of which is true.[33–35] If you have never read the complete wording of this marvelously creative takeoff, I urge you to do so. Here are some isolated lines taken from different verses that are particularly relevant to this month's Note: "…Walkers and handrails and new dental fittings…Cadillacs and cataracts, hearing aids and glasses…When the pipes leak, When the bones creak, When the knees go bad…Thin bones and fractures and hair that is thinnin'…And we won't mention our short shrunken frames…." For me, the parody's final refrain is the most memorable: "When the joints ache, When the hips break, When the eyes grow dim, Then I remember the great life I've had, And then I don't feel so bad."

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This month's Geriatric Therapeutics Update is a special feature which is available as FREE ACCESS content on the journal's website. One of the previous Geriatric Therapeutics Updates, entitled "Cancer Care in Older Adults" was published in Volume 40, Number 4 of Clinical Therapeutics. To view the previous Update, see the articles below:

Hung WW. Optimizing Cancer Treatment for Older Adults

Rupper RW. Historical and Current Advances That Incorporate Competing Risk for Benefit and Mortality in Older Patients With Cancer

Woodrell CD, Hansen L, Schiano TD, Goldstein NE. Palliative Care for People With Hepatocellular Carcinoma, and Specific Benefits for Older Adults

Fabrikant MS, Wisnivesky JP, Marron T, Taioli E, Veluswamy RR. Benefits and Challenges of Lung Cancer Screening in Older Adults

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