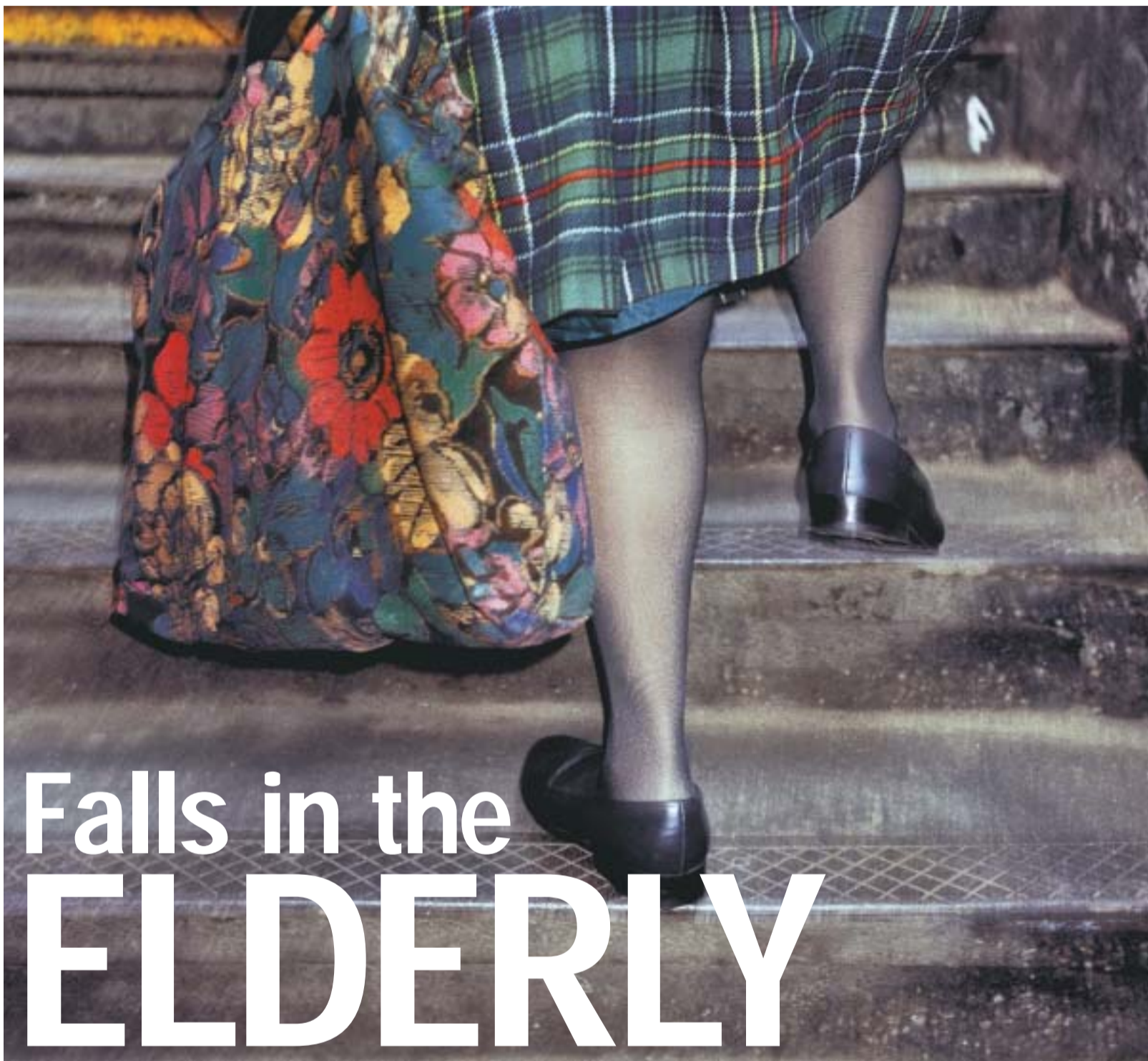


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Falls in the **ELDERLY**

Background

Incidence

FALLS present a major threat to the wellbeing and quality of life of older people. Studies in the community indicate that >30% of older people fall at least once a year and many have multiple falls. The rate increases to >50% in people aged 85 and over and in residents of intermediate-care hostels and nursing homes.

Common injuries include bruises, abrasions and fractures of the distal forearm, proximal humerus and pelvis. More than 95% of hip fractures are the result of falls. Falls can lead to disability, reduced physical activity, loss of independence and a fear of falling — factors that impair quality of life.

They are also a crucial determinant in the placement of an older person in institutional care. In terms of overall morbidity and mortality, falls are the leading cause of injury-related hospitalisation and death in people aged 65 and over. Health care costs for the treatment of fall-related events are set to double over the next

50 years, in part because of a significant increase in the number of people aged 75 and over.

Risk factors

Over the past three decades there has been a great deal of research focusing on risk factors for falls (table 1, page 28).

Falls are associated with physical frailty, so it is not surprising that advancing age and impaired ability in performing activities of daily living have been found to be strong risk factors for falls. Women have higher rates of falls than men, which may be primarily due to reduced lower-limb strength. As a risk factor for falls, living alone is probably confounded by gender and by age, in that older women comprise the majority of this group.

Physical activity can improve strength, balance and functional ability in older people and can prevent falls. However, being more physically active does not always prevent falls, probably because the more physically active

older person takes part in activities that increase exposure to risk situations. Clearly, this risk should be balanced against the benefits of increased physical functioning and independence that exercise brings.

Alcohol consumption has not been found to be a risk factor for falls, and there is some evidence that moderate drinkers may have fewer falls than those who abstain. However, this may be due to response and selection biases, in that older people who drink heavily may under-report their alcohol consumption or decline participation in research studies.

One of the strongest risk factor domains is impaired balance. Many studies have shown that tests of standing, leaning, reaching, stepping and walking can discriminate fallers from non-fallers. Impaired functioning of sensory and neuromuscular systems due to age, inactivity or disease processes are also strong risk factors for falls.

Measures of vision, peripheral sen-

sation, strength and reaction time are also significant and independent predictors of falls. There is now emerging evidence that, if measured rigorously, vestibular impairments, reduced muscle power and endurance are also important risk factors for falls in older people. Poor hearing is the only physiological parameter found not to be a risk factor for falls, despite systematic study.

Fear of falling is prevalent in older people and can be disproportionate to true risk, leading to unnecessary restriction of physical and social activity. This fear is strongly associated with instability and falls. With increasing age, balance tasks demand more attention and even simple tasks such as answering a question may interfere with standing, stepping and walking. There is preliminary evidence that risk-taking behaviours increase the risk of falling in older people.

Medical conditions strongly associated with falls include impaired

cont'd next page

inside

Clinical assessment and management

Successful approaches to preventing falls

Case studies

The authors



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from previous page

cognition, stroke and Parkinson's disease. Other conditions commonly posited as falls risk factors (such as vestibular disease, dizziness, orthostatic hypotension, foot problems and arthritis) require more rigorous investigation to adequately establish their contribution.

Establishing an association between falls and intermittent conditions such as orthostatic hypotension is inherently difficult, as patients may test negatively at assessment but experience drops in blood pressure leading to falls during the surveillance period.

Community and institutional studies have consistently found strong associations between falls and use of multiple medications or psychoactive drugs. Results of studies into use of antihypertensive medications have been contradictory, and a meta-analysis concluded there was not sufficient evidence to consider the use of these drugs to be a risk factor for falls.

There is little evidence that environmental factors or inappropriate footwear play a role in falls. Despite the common finding that environmental hazards are involved in many falls, it appears that the interaction between the person and their environment is more important than the environment itself, as the homes of people who fall are not more hazardous than those who do not fall.

It appears that the interaction between the person and their environment is more important than the environment itself.

Table 1: Risk factors for falls

Factors	Risk
Psychosocial and demographic factors	
Advanced age	***
Female gender	**
Living alone	**
History of falls	***
Inactivity	**
Limitations on activities of daily living	***
Alcohol consumption	—
Balance and mobility factors	
Impaired stability when standing	**
Impaired stability when leaning and reaching	**
Inadequate responses to external perturbations	*
Slow voluntary stepping	**
Impaired gait and mobility	***
Impaired ability in standing up	***
Impaired ability with transfers	***
Sensory and neuromuscular factors	
Visual acuity	**
Visual contrast sensitivity	***
Visual field dependence	*
Reduced peripheral sensation	***
Reduced vestibular function	*
Reduced muscle strength	***
Reduced muscle power	*
Reduced muscle endurance	*
Slow reaction time	***
Psychological factors	
Fear of falling	***
Reduced selective attention	**
Risk taking	*
Medical factors	
Impaired cognition	***
Depression	**
Abnormal neurological signs	**
Stroke	***
Incontinence	**
Acute illness	**
Parkinson's disease	***
Vestibular disorders	—
Arthritis	**
Foot problems	**
Dizziness	*
Orthostatic hypotension	*
Medication factors	
Psychoactive medication use	***
Antihypertensive use	*
NSAIDs	—
Use of four or more medications	***
Environmental factors	
Poor footwear	*
Inappropriate spectacles	*
Home hazards	—
External hazards	—

Each risk factor is rated according to the strength of the published evidence, using the following rating system:
 *** Strong evidence (consistently found in good studies).
 ** Moderate evidence (usually but not always found).
 * Weak evidence (occasionally but not usually found) and little or no evidence (not found in published studies despite research to examine the issue).

Clinical assessment and management

History

WHEN trying to establish cause, it is important to remember that most falls occur as a result of an interaction between intrinsic and extrinsic factors and that multiple risk factors increase the likelihood of falls.

A detailed history of the events surrounding a fall is essential. Corroborative information should be sought for those with limited recollection of the incident: there is a significant overlap between syncope and falls, with many older people having amnesia for the event. Some points to consider in the history are listed in table 2 (page 29).

Assessing gait and balance in general practice

Gait and balance problems are potentially modifiable with strength and balance training with appropriately trained practitioners. Assessing postural stability is a key area in the management of an older person at risk of falling.

The timed up-and-go test is a simple screening tool to identify people who warrant more detailed assessment of gait and balance (see the AGS/BGS/AAOS Guideline under Suggested resources, page 32). It measures the time taken for a person to rise from a chair, walk three metres at normal pace and with their usual assistive device, turn, return to the chair and sit down.

Taking 15 or more seconds to complete the test has been shown to discriminate fallers from non-fallers in three retrospective studies. However, this screening test provides little information about specific causes for falls or how to target intervention strategies.

QuickScreen

QuickScreen, a risk assessment tool designed specifically for general practice, is based on a sensorimotor functional model for falls prediction. It allows the clinician not only to predict which older patients are likely to fall, but also to determine which sensorimotor systems are impaired. This provides a clear opportunity to link assessment with evidence-based tailored interventions.

The assessment requires minimal equipment: a low-contrast eye chart, an aesthesiometer filament for measuring touch sensation, and a small step. It can be performed in the home, GP surgery, hospital ward or residential care setting and takes less than 10 minutes to complete.

QuickScreen provides information that can be



given to the patient to educate them about their fall risk and to help them reduce or compensate for any identified risk factors. The five simple tests are highlighted in figure 1 (A-E); 1F details the form used in the assessment (page 29).

Vision test

Vision is assessed using a low-contrast visual acuity chart (figure 1A). Acuity is assessed binocularly with the chart at a distance of 3m and the patient wearing their distance glasses (if applicable). The patient is asked to read aloud the letters on the chart and to pass the test must be able to correctly identify all letters on the third line from the top.

Peripheral sensation test

Peripheral sensation is measured by using a tactile sensitivity test at the ankle. A Semmes-Weinstein-type pressure aesthesiometer containing a nylon filament is applied to the centre of the lateral malleolus of the ankle on the patient's dominant side (figure 1B).

The patient must keep their eyes closed and indicate to the tester if they are able to feel the monofilament. A total of three trials is given and the patient must be able to correctly identify the touch of the filament during at least two of the three trials to pass the test.

Near-tandem stand

The near-tandem stand test is a measure of lateral stability. It is a modification of the tandem stand test, which has previously been shown to be too difficult for many older people to carry out.

The subject is asked to

stand for 10 seconds, with their eyes closed, in a near-tandem position, with their bare feet parallel and separated laterally by 2.5cm and the heel of the front foot 2.5cm anterior to the great toe of the back foot (figure 1C).

To pass the test the subject must stand in this position for 10 seconds without moving their feet or opening their eyes. If a score of five seconds or less is obtained, a second trial is allowed.

The alternate-step test

The alternate-step test is a modified version of the stool-stepping task, which is one of the 14 components of the Berg Balance Scale. It is a practical measure of the requirements of walking and stair climbing and is also a measure of mediolateral balance.

This test involves placing the whole foot (shoes removed) onto a step (19cm high and 40cm deep) and alternating right and left feet, four times for each foot, as fast as possible (figure 1D). The time taken (measured in seconds) to complete the eight foot taps is recorded and the patient must complete the task within 15 seconds to pass the test.

The sit-to-stand test

The sit-to-stand test is predominantly a measure of lower-limb strength and involves standing up and sitting down five times from a seated position in a 45cm-high chair, with the arms folded in front of the body (figure 1E).

The bare-footed subject is asked to perform the five repetitions as quickly as possible, finishing in the seated

Table 2: Points to consider in the history of the patient who has had a fall

Questions to ask about the fall	Possible related cause or reason for fall
Does the individual have amnesia for the event?	Syncopal, cardiac or neurological problem
Where and at what time did the fall happen?	Postural hypotension in proximity to change in posture; falls occurring in relation to medication ingestion; falls at night due to poor lighting, etc
What was the individual doing at the time of the fall — getting up from a chair or bed, turning their head, reaching up or bending down?	Certain conditions are related to specific actions, such as postural hypotension on standing, or carotid sinus syndrome related to turning of the head
Was the fall preceded by dizziness or palpitations?	Consider neurocardiogenic syncope, cardiac arrhythmia, a vestibular problem
Was the individual able to get off the floor after the fall?	Inability to do this is a predictor of further falls, as well as a flag for additional interventions, ie, training in how to get up from the floor, use of personal alarms, increased care levels
Does the pattern of injury described and/or visualised fit with the details of the fall — did the individual manage to break their fall or were there facial/head injuries?	In syncopal episodes, the individual is rarely able to break the fall and more likely to sustain central injuries including facial injuries
What injuries were sustained as a result of the fall?	Low-trauma fractures should trigger an assessment of bone health
How often has the person fallen in the past year?	One of the strongest predictors of falling again

position. To pass the test, the subject must complete the task within 15 seconds.

Falls risk score

Two additional questions are asked about history of falls and number of prescribed medications. A score from the test can be translated into an overall falls risk score, with individual measurements serving to tailor any planned interventions (figure 1F).

Unexplained falls, dizziness and syncope

Not all falls are caused directly by gait and balance problems: individuals presenting with recurrent falls and no obvious cause require further detailed specialist assessment and access to specific investigative and diagnostic facilities.

Recent studies have started to unravel the ragbag diagnostic label of a 'drop attack' into a variety of individual diseases associated with distinct pathologies, including carotid sinus syndrome, neurocardiogenic (vasovagal) syncope, sick sinus syndrome, micturition or cough syncope, and orthostatic hypotension.

Neurocardiogenic syncope

Neurocardiogenic, or vasovagal, syncope is the most common form of neurally mediated syncope and is characterised by a failure of the autonomic nervous system to maintain a pulse and blood pressure sufficient to ensure adequate cerebral perfusion.

The underlying pathophysiological mechanism is thought to include:

- Excessive peripheral venous pooling, leading to reduced

peripheral venous return.

- A hypercontractile cardiac state.
- Paradoxical reflex bradycardia and a further decrease in vascular resistance.

Tilt-table testing is the recommended investigation to make the diagnosis of neurocardiogenic syncope.

A positive test entails a significant change in haemodynamic status in the presence of symptoms comparable to those previously experienced by the individual at the time of an episode of collapse.

Treatment usually involves avoiding precipitating factors, such as dehydration, extreme heat and prolonged standing. However, some individuals with neurocardiogenic syncope have recurrent episodes of collapse with no associated warning symptoms.

Treatment options include beta blockers, midodrine (an alpha₁-agonist [vasoconstrictor] available in Australia after application to the Therapeutic Goods Administration on a case-by-case basis) or SSRIs, for which there have been case reports but no large clinical series. Cardiac pacing has also been considered, although the evidence for this is inconsistent.

Orthostatic hypotension

Although orthostatic hypotension has not been found in large population studies to be a strong risk factor for falls, and the intermittent nature of the problem makes it difficult to establish a direct causal link, few clinicians would doubt that symptomatic postural hypotension can lead to falls.

Orthostatic hypotension is

triggered by peripheral venous pooling leading to reduced venous return and reduced cardiac filling pressures.

To maintain normal cardiac output the healthy response to reduced filling pressures is peripheral vasoconstriction and increased heart rate.

Failure to mount an appropriate response can be caused by vasodilator medications and/or autonomic failure associated with conditions often seen in advancing years, including diabetes and chronic renal failure. Orthostatic hypotension is also observed in people taking diuretics causing volume depletion.

Formal testing involves the patient lying in the supine position for a minimum of five minutes before lying blood pressure is recorded. Subsequent readings are taken on assuming the upright position at one, three and five minutes using a standard sphygmomanometer, although continuous beat-to-beat monitoring is more accurate.

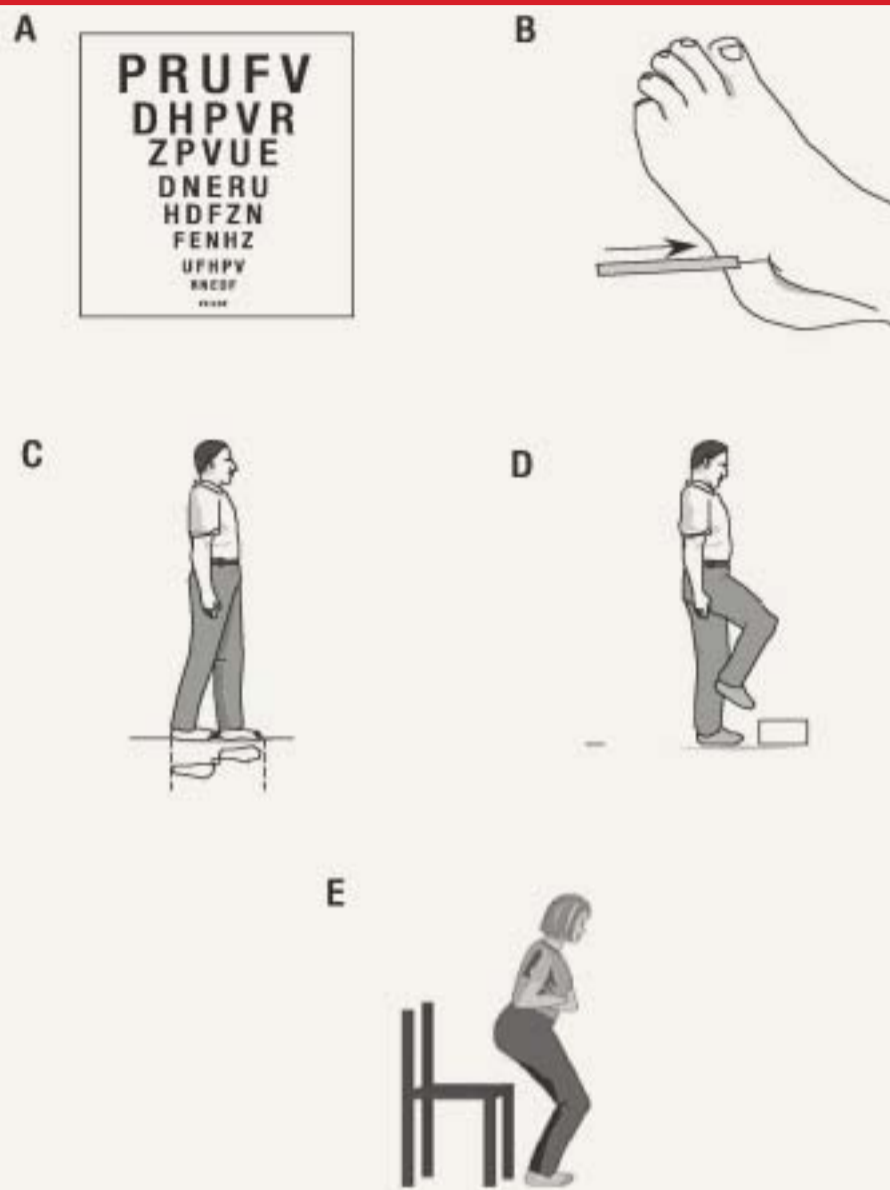
Treatment of symptomatic orthostatic hypotension involves review of any potential suspect medication and may also include increasing fluid and salt intake, use of compression hosiery and medication such as midodrine.

Carotid sinus syndrome

Carotid sinus syndrome, defined as an abnormal haemodynamic response to massage of the carotid sinus, is seen more often in old age and is characterised clinically by unexplained dizziness and/or syncope — often, but

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Figure 1: Components of QuickScreen. A. Vision test; B. Peripheral sensation test; C. Near-tandem stand; D. The alternate-step test; E. The sit-to-stand test; F. QuickScreen assessment form.



QuickScreen Falls Risk Assessment

Patient: Date:

MEASURE	RISK FACTOR PRESENT? (please circle)	ACTION				
Previous falls						
One/more in previous year	Yes/No					
Medications						
Four or more, excluding vitamins	Yes/No					
Any psychotropic?	Yes/No					
Recommendation: Review current medications.						
Vision						
Low contrast visual acuity test — unable to see all of line 16	Yes/No					
Recommendation: Give vision information sheet. Examine for glaucoma, cataracts and suitability of spectacles. Refer if necessary.						
Peripheral sensation						
Tactile sensitivity test — unable to feel 2 out of the 3 trials	Yes/No					
Recommendation: Give sensation loss information sheet. Check for diabetes.						
Strength/reaction time/balance						
Near-tandem stand test — unable to stand for 10 seconds	Yes/No					
Alternate-step test — unable to complete in 15 seconds	Yes/No					
Sit-to-stand test — unable to complete in 15 seconds	Yes/No					
Recommendation: Give strength / balance information sheet. Refer to community exercise class or home exercise program if appropriate to individual level of functioning.						
Number of risk factors	0	1	2	3	4	5+
Total risk increase	1	1.4	2.1	4.7	8.7	12

The patient has times the risk of falling as someone with no risk factors.

from previous page

not exclusively, in relation to turning of the head or the wearing of tight-fitting collars.

The pathophysiology of the syndrome is not well described.

Subtypes. There are three subtypes: cardio-inhibitory, vasodepressor and mixed.

The cardio-inhibitory response is characterised by a period of more than three seconds of asystole after carotid sinus massage. This usually occurs within a few seconds of onset of massage and tends to be self-limiting, although atropine and full resuscitation facilities should be readily accessible during testing.

The vasodepressor response is identified by a fall in systolic blood pressure (>50mmHg) in the absence of a significant bradycardia. The drop in blood pressure is seen within seconds of massage and is difficult to detect without the use of continuous non-invasive blood pressure monitoring.

The mixed type is a combination of both responses.

Method of testing. Patients are initially tested in the supine position with the neck slightly extended. Surface ECG monitoring, non-invasive beat-to-beat monitoring of blood pressure and immediate access to resuscitation facilities should be available.

Massage is applied over the point of maximal carotid pulse, medial to the sternomastoid muscle at the level of the upper border of the thyroid cartilage. Firm longitudinal massage is applied for five seconds on the right and, after a 60-second inter-

Figure 2: A Reveal implant.



val, repeated on the left. The procedure is repeated with the patient tilted upright to 70°.

Carotid sinus massage is contraindicated in patients with a history of a stroke, TIA or MI in the past three months.

Patients with carotid artery bruits should have carotid dopplers before the study to exclude significant carotid artery disease (>50% stenosis is generally accepted as significant) and the risks and benefits of the test should be discussed with affected individuals.

Carotid sinus studies carry the risk of transient and permanent neurological damage. The highest reported rate of any neurological complication is 0.9%, with 0.1% of all cases having persistent neurological deficits.

Treatment. Symptomatic carotid sinus hypersensitivity of the cardio-inhibitory subtype should be treated

with dual-chamber pacing. Treatment of the vasodepressor response type has proved less successful, and this almost certainly reflects a limited understanding of the underlying mechanisms producing the response. A review of prescribed medications is the first step, particularly looking for drugs with vasodilator and/or vagal activity.

Cardiac arrhythmias

Bradyarrhythmias and tachyarrhythmias have the potential to cause falls in older people, so a 12-lead ECG is essential in investigating any potential arrhythmic syncope.

An entirely normal ECG in someone with syncopal attacks makes an ischaemic arrhythmia an unlikely cause of symptoms.

Although a 24-hour ECG has been the major clinical investigation for patients with intermittent palpitations,

dizziness and syncope, it has a very low diagnostic yield.

Patient-activated recorders and implantable loop recorders are becoming the preferred investigative mechanisms for this group.

Implantable loop recorders are small devices (figure 2) inserted subcutaneously under local anaesthetic that can store up to 45 minutes of retrospective ECG recording when triggered by the individual.

The device can remain in situ for up to 18 months, with reported diagnostic yields of up to 40%.

Medication review

As sound evidence emerges supporting pharmacological interventions for more and more diseases, so the number of prescribed drugs increases. Polypharmacy could therefore be considered a redundant term and the focus should be on appropriate prescribing.

Centrally acting medications

Centrally acting medications have been consistently shown to be a predictor of falls risk, with some studies demonstrating a 2-3-fold increased risk. There is also evidence of the beneficial effects on subsequent risk of falls of withdrawing these agents.

There is little justification for the regular prescription of benzodiazepines as a hypnotic agent unless there is a clear pattern of addiction and/or a failure to successfully complete a withdrawal program.

Non-pharmacological approaches to the management of sleep disorders, depression and anxiety should be considered,

particularly in populations at high risk of medication side effects such as falls and fractures.

Calcium and vitamin D supplementation

Calcium and vitamin D are essential components of bone health and over the past 13 years studies have been published showing the benefits of supplementation in preventing fractures in high-risk populations.

The role of calcium in preventing fractures seems to be largely through bone effects, but vitamin D is different: there are vitamin D receptors in muscle and nervous tissue, and studies have shown vitamin D replacement can lead to improvements in composite measures of postural stability and psychomotor function.

Older people are at an increased risk of vitamin D deficiency because of reduced ability of ageing skin to synthesise it, often compounded by a reduced exposure to sunlight.

Vitamin D deficiency, as measured by serum 25-hydroxycholecalciferol, is indicated by levels <12µg/L, and insufficiency by levels between 12 and 20µg/L. There is also an increasing body of evidence that vitamin D supplementation can prevent falls.

Questions about prescribing include:

- Who requires supplementation?
- In whom do we need to check levels?
- Which doses and formulations of calcium and vitamin D should we be using?

There are no hard and fast answers to any of these ques-

tions but evidence supports routine supplementation of the diet in older people living in aged-care facilities, those who are largely housebound, or older adults taking bone-strengthening agents for osteoporosis.

For younger postmenopausal women with or without fracture who do not have a diagnosis of osteoporosis, the question of supplementation becomes less clear, and checking vitamin D levels before prescribing any form of supplementation might be considered.

The optimal dosage of both calcium and vitamin D generates debate, but most experts agree that 800mg calcium and 800 IU cholecalciferol daily constitute adequate doses for replacement, and toxicity at this dose is extremely unlikely.

Occasionally calcium supplementation may lead to the unmasking of an underlying myeloma or hyperparathyroidism, but this is not considered sufficient justification for not treating with calcium and, given the relatively small numbers of cases, would not be sufficient to justify routine checking of calcium and vitamin D levels in everyone prescribed supplementation.

Failure to ensure older adults are vitamin D replete has wider-reaching consequences than just the effects on the musculoskeletal system, with evidence showing increased vascular risk in those with low levels of vitamin D, as well as the positive effects of vitamin D on the immune system and as a protective agent for certain cancers, including cancer of the colon.

Successful approaches to preventing falls

THERE have been about 25 published randomised controlled trials showing benefit in interventions to prevent falls in older people (table 3). Most of the evidence relates to community-dwelling populations, where both single and multifaceted interventions have been shown to be effective.

Exercise in the form of balance training with a strength component is the most effective single approach to preventing falls. Exercises need to be weight bearing, tailored to the individual, progressed over time and preferably focused on functional tasks.

A short-term program can result in improvements in physical functioning but ongoing exercise participation is necessary for preventing falls.

In published trials, physiotherapists have largely delivered exercise programs, although one trial has shown benefit in training nurses to deliver exercise programs.

Other successful approaches to prevention in community-based populations include expedited cataract extraction, occupational therapy home assessment in people

Table 3: Randomised controlled clinical trials that have shown the benefit of interventions to prevent falls

Population	Single interventions	Multifaceted interventions
Community-dwelling populations	Wolf 1996, Campbell 1997, Campbell 1999, Barnett 2003, Lord 2003, Robertson 2001, Harwood 2005, Li 2005, Skelton 2005	Tinetti 1994, Hornbrook 1994, Day 2002, Clemson 2002, Nikolaus 2003, Wagner 1994
Emergency department attendees	Kenny 2001	Close 1999, Davison 2005
Hospital inpatients	—	Haines 2004, Healey 2004
Care-home residents	—	Ray 1997, Jensen 2002, Becker 2003

with severe visual impairment or those recently discharged from hospital, and withdrawal of centrally acting medications.

Multifactorial interventions in the community involving a variable combination of doctors, nurses, physiotherapists and occupational therapists have been consistently shown to be effective.

The emergency department is an ideal place to identify people at high risk of falls. Three trials have

shown the benefits of intervening in this group outside the ED, which serves as an important mechanism to identify those at high risk.

Residents in hospitals and aged-care facilities tend to represent the frailer end of the older population and it is interesting that single approaches to intervention have not been shown to be effective in this group.

Subgroup analysis of people living in aged-care facilities has

failed to show benefit in intervening in people with significant cognitive impairment (crudely defined as a Mini-Mental State Examination score <18).

Hip protectors

Hip protectors are designed to reduce the chance of hip fracture in the event of impact on the greater trochanter (figure 3). Energy absorption and inflatable airbags

Figure 3: Hip protectors.



cont'd page 32

from page 30

have been considered, but the energy-shunting pad used in hip protectors has undergone the most extensive development and currently appears to offer the most in terms of fracture reduction.

Energy-shunting hip protectors consist of a polymer cup surrounded by polymer foam that is moulded to fit the anatomical shape of the greater trochanter and fixed in an undergarment. Energy-shunting systems function by increasing impact area, reducing peak forces and leading energy away from the greater trochanter. They also have an energy-absorption capacity.

There is some evidence from randomised controlled trials that hip protectors are effective in reducing hip fractures in nursing homes. From a purely biomechanical aspect, hip protectors have the requisite properties to reduce fracture risk. The limiting factor in the success of hip protectors is whether people will wear them. Problems influencing compliance include poor fitting, weight of the protectors and difficulty using the toilet.

Given the issues with compliance it is necessary to target this intervention to those most likely to benefit from it or those in whom other interven-

tions are unlikely to work. Such groups include those with Parkinson's disease and dementia, particularly those with a tendency to wander.

Gaps in our knowledge

Preventing falls in cognitively impaired older adults is a major challenge. Although we do not know how to reliably prevent falls in this population, we do know how to prevent fractures through diagnosis and treatment of osteoporosis and use of hip protectors.

At present, cognitively impaired patients are not routinely assessed for fracture risk, and some argue

that drug compliance would be an issue for this group. However, with the emergence of bone-strengthening agents that can be prescribed monthly and even yearly, this trend in clinical practice may change.

The question remains as to whether specific disease processes require disease-specific approaches to prevent both falls and fractures or whether, by taking a physiological approach to prevention, we can devise programs tailored to physiological deficits as opposed to specific pathologies.

This is of particular relevance to those with multiple

chronic diseases who may be directed to attend several different generic exercise programs, each believed to be disease specific (as opposed to individually tailored programs) and based on objective measures of assessment.

Cost-effectiveness models are lacking in falls prevention, and more research is required to help define and refine models of care that offer long-term clinical efficacy and cost-effectiveness. Integral to this will be improved understanding of the barriers and motivators that determine the uptake of programs known to prevent or reduce falls.

Authors' case studies

Forearm fracture after repeated falls

MRS A, 75, presents to the emergency department with a left distal forearm fracture after a fall down some steps — her third fall in the past year. The two earlier falls were trips that occurred outdoors, and she has significantly reduced the frequency of outings.

Immediate management

Her fractured forearm is reduced and placed in a back slab pending review by the orthopaedic surgeon in a fracture clinic the next morning. She is discharged home, with temporary support arranged to help with domestic and personal care.

Longer-term management

A distal forearm fracture is a risk factor for further fracture, including hip fracture. To minimise this risk, both bone health and falls risk must be considered.

Bone health

Adequate calcium and vitamin D are a basic requirement for bone health. Mrs A has limited exposure to the sun and, even when outdoors, is largely covered by clothing or sunscreen. Her diet is low in calcium, as she drinks very little milk, although she does consume green vegetables. She should be offered calcium and vitamin D supplementation.

A dual-energy X-ray absorptiometry (DEXA) scan will provide data on whether Mrs A has osteoporosis and a bisphosphonate is warranted. Mrs A has a T score of -2.8 at her hip and -2.4 at her spine. Her hip T score confirms a diagnosis of osteoporosis and she is offered a weekly bisphosphonate preparation, with clear instructions on how to take the drug.

The discrepancy in T scores between the hip and spine is not uncommon and a falsely elevated T score at the spine can be seen in people with significant degenerative changes and osteophyte formation or vertebral collapse from osteoporosis.

Falls risk

Mrs A is also assessed for her risk of future falls using QuickScreen and is found to have deficits in strength and balance. An exercise program tailored to her deficits is needed but she resists the idea of exercising in a



group setting.

A physiotherapist prescribes her exercises for the home environment and visits her four times to make sure she is exercising safely and to progress the exercises. She is also given advice on home safety and environmental hazards.

Mrs A changed her spectacles one year ago, moving to bifocals to avoid using two pairs of spectacles. She acknowledges that when walking — particularly during stair descent — edges can be blurred and that this may have contributed to her falls. She is advised to consider resuming use of two separate pairs of spectacles.

Unexplained episodes of collapse

MR B, 78, presents with a history of four syncopal events over the past six months. He denies blacking out but his wife has witnessed two of the events and is sure he suffers a momentary loss in consciousness then recovers immediately.

There is some suggestion that the syncopal events occur with turning of the head. No epileptiform features are associated with the collapses. Mr B has not sustained any fractures or serious injury but does not manage to break the fall and so has had several black eyes.

Clinical examination does not reveal any obvious cardiac arrhythmia, murmur or bruit. Mr B's ECG shows him to be in sinus rhythm, with no ischaemic changes.

Management

In view of the nature and frequency of these events, Mr B is referred to

the cardiology department of his local hospital for further investigation. There is understandably some debate as to which test(s) to perform — Holter monitoring, prolonged Holter monitoring, electrophysiological studies, Reveal implant or carotid sinus studies.

In the absence of any local guidelines, the cardiologist elects to follow the recommendations of the European Society of Cardiology (see Suggested resources, right) and performs tilt-table testing and carotid sinus massage.

Right carotid sinus massage with 70° head-up tilt produces a three-second period of asystole and associated pre-syncope symptoms. In view of the documented cardio-inhibitory form of the carotid sinus syndrome, a dual-chamber pacemaker is inserted and Mr B's syncopal events stop.

A swollen painful knee after a fall

MRS C, 82, presents with a painful left knee after a fall a few days earlier. Over the past four months she has had an increasing number of falls, mostly related to pain in the left knee and the knee giving way.

This is her third visit to the surgery in as many months and on each occasion she has been seen by a different doctor.

Mrs C is too scared to go out alone and her level of physical activity has been declining. Her mood has lowered and her sleep pattern has been altered by her change in activity level: she tends to sleep for prolonged periods in the afternoon.

On her most recent visit to the surgery she was prescribed a benzodiazepine for night sedation.

Mrs C also recently developed bilateral leg oedema. Two weeks ago she was prescribed a diuretic for the oedema but has since developed urinary incontinence because she can't get to the toilet quickly enough.

Clinical examination shows Mrs C to have a small effusion of the left knee, with associated swelling and bruising. There is also evidence of some mediolateral instability, almost certainly secondary to degenerative joint disease.

However, the joint is not hot and Mrs C is not systemically unwell. A recent X-ray of her knee confirms severe degenerative changes.

Management

A referral is made to the orthopaedic surgeon for consideration of joint replacement. However, in the interim it is essential to minimise Mrs C's chances of further falls and functional decline.

Her knee pain is managed with oral analgesic agents, starting with simple paracetamol, and a physiotherapist reviews the unstable knee and recommends a knee brace. However, Mrs C is unable to manage the brace and the physiotherapist provides her with a temporary four-wheel walker until her knee is replaced.

The physiotherapist also practises indoor and outdoor mobility exercises with Mrs C and she is given specific knee-strengthening exercises.

The need for a benzodiazepine is reviewed, particularly given the association of benzodiazepines with falls and fractures. The drug is discontinued and Mrs C agrees to try to avoid prolonged naps in the afternoon.

The leg oedema is dependent (secondary to Mrs C's reduced mobility) and, with advice on elevation of the legs while sitting, plus leg exercises and improved mobility with the four-wheel walker, it is possible to stop the diuretic and therefore the urinary incontinence.

A home assessment by an occupational therapist leads to provision of a raised toilet seat, a bath board for bathing and a perching stool for the kitchen.

Mrs C's falls risk has been minimised and her functional status maximised while she awaits knee surgery.

Tips for GPs

- Advanced age and a history of one or more falls in the previous year are two easily identifiable and strong predictors of future falls risk. They can be used as routine questions during consultations to help identify patients at high risk.
- The most common risk factors identified in people who have falls are problems with gait and balance. These problems can often be modified and should therefore be core to any assessment of falls risk. Only a small proportion of people who have falls have a discrete cardiological or neurological cause.
- The timed up-and-go test is a useful screening tool to identify patients who need more detailed assessment of gait and balance.
- QuickScreen is a 10-minute assessment that gives information on level of risk and potential intervention strategies.
- Centrally acting medications are associated with falls and fracture. Any medication review should include attempts to withdraw such medications unless there is a clear clinical indication for ongoing therapy.
- Bone health should be considered in conjunction with falls prevention. This includes prescription of calcium and vitamin D for patients at high risk, as well as anti-resorptive therapies for those with a diagnosis of osteoporosis.

Suggested resources

- American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls Prevention. Guideline for the prevention of falls in older persons. *Journal of the American Geriatrics Society* 2001; 49(5):664-672.
- Brignole M, et al. Guidelines on management (diagnosis and treatment) of syncope. *European Heart Journal* 2001; 22:1256-1306.
- Lord SR et al. *Falls in Older People: Risk Factors and Strategies for Prevention*. Cambridge University Press, Cambridge, UK, 2001.

GP's contribution



DR ROSS WHITE
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Case study

MR S, 86 and a widower, is a former prisoner of war who moved into a hostel a year ago after living in a self-care unit in a retirement complex for a decade.

He has a five-year history of diabetes mellitus that is well controlled with metformin 500mg bd; longstanding hypertension controlled with ramipril (Ramace, Tritace) 5mg daily; and glaucoma treated with timolol (Timoptol) 0.5% drops.

Mr S had intraocular lens replacements for bilateral cataracts seven years ago. He had a spontaneous vertebral crush fracture a year ago and is taking 70mg alendronate (Alendro, Fosamax) weekly and calcium daily.

Four days ago Mr S had a fall when he tripped on the hostel cat that was sleeping on the verandah. X-rays

taken that day at hospital were reported as showing no hip or pelvic fractures. Mr S was sent back to the hostel with codeine/paracetamol for analgesia, as there were no beds available at the hospital.

He now has ongoing severe low back pain, which is worse on weight bearing, and is constipated from the codeine and dehydrated from being unable to get drinks for himself.

Mr S mentions that he had felt unsteady before the fall. He was readmitted to hospital for analgesia and rehydration, where a bone scan showed an 'H' fracture of the sacrum.

Questions for the authors
Would telemetry ECG monitoring while Mr S is in hospital be of any benefit in the diagnosis of an arrhythmia that may have caused the fall?

The above history suggests the fall was caused directly by tripping on the cat, so telemetry would not be justified. Even for people in whom the cause of a fall is unclear, inpatient telemetry is rarely warranted or undertaken.

Should the timolol eye drops



be changed to a prostaglandin agonist and is there any value in doing formal visual field testing?

There have been isolated case reports of topical beta blockers precipitating a bradycardia. In this case, given the mechanical nature of the fall, a change in the timolol prescription would not be warranted.

Visual field deficits are not strongly associated with falls. Visual acuity and contrast sensitivity are better predictors and easier to formally assess in the general practice setting.

Should Mr S have had a CT or MRI on the first presentation to hospital when the plain films showed no acute fracture? Do those modalities show this type of sacral fracture reliably?

Most significant pelvic fractures will show up on a plain X-ray. On occasion there will be a fracture not picked up on plain radiograph and this would warrant a CT.

People with such fractures tend to have persistent pain and difficulty mobilising after a fall, so it is the clinical picture that tends to guide one to undertake further radiological examination. Some people will opt to undertake a bone scan first, but in an area where there is often associated degenerative joint disease, a bone scan can be inconclusive.

A CT tends to be a more useful investigation. However, given the associated dose of radiation, it should be reserved for patients in whom there is a high index of clinical suspicion that there is a fracture.

General questions for the authors

Do tilt-table testing and carotid sinus studies have Medicare and/or Department of Veterans Affairs item numbers and are they available in private cardiology practices, or only in hospitals?

Tilt-table testing has a Medicare item number.

Does the DVA fund private physiotherapists to provide balance training with a strength component, and do the private physiotherapists

have to be accredited to carry out this treatment?

Veterans holding Gold Cards have access to physiotherapists who should be able to deliver a strength- and balance-training program. The DVA has to accept responsibility for treatment of a condition before a White Card holder may access the same treatment. We are not aware of any formal accreditation required to deliver a strength- and balance-training program.

Do ex-POWs have a higher risk of oestoporosis related to their prolonged starvation as young men, and should they all undergo bone density studies?

Prolonged starvation is a risk factor for osteoporosis and will have an impact on peak bone mineral density attained in one's 20s. Low bone mineral density is associated with an increased risk of fracture.

We are not aware of any recommendations for routine screening of bone mineral density in ex-POWs. If someone presents with a fall or fracture, bone mineral density would be part of a comprehensive assessment.



How to Treat Quiz

Falls in the elderly —
3 March 2006

INSTRUCTIONS

Complete this quiz to earn 2 CPD points and/or 1 PDP points by marking the correct answer(s) with an X on this form. Fill in your contact details and return to us by fax or free post.

FAX BACK	FREE POST	ONLINE
Photocopy form and fax to (02) 9422 2844	Australian Doctor Education Reply Paid 60416 Chatswood DC NSW 2067	www.australiandoctor.com.au/cpd/ for immediate feedback

1. Which TWO descriptions best apply to falls in the elderly?

- a) A common cause of hip fracture
- b) An uncommon cause of death in those aged >65
- c) A rare contributing factor to institutionalisation
- d) More common in women

2. Connie, 74, lives alone and has had two falls in the past three months. Which THREE factors are most likely to increase her risk of falling?

- a) Alcohol consumption
- b) Living alone
- c) Fear of falling
- d) Impaired balance

3. Connie takes medications for arthritis, hypertension, diabetes and reflux. Which TWO medications are most likely to be implicated in her falls?

- a) NSAIDs
- b) Diuretics
- c) Benzodiazepines
- d) PPIs

4. Connie attends with her daughter after another fall. Which THREE questions about the circumstances of her fall are most likely to help determine a specific cause?

- a) Was Connie getting up from a sitting or lying position?
- b) Was the fall preceded by dizziness or palpitations?
- c) Is her home cluttered?
- d) Where and at what time did the fall occur?

5. Connie asks if exercise would help prevent further falls. What advice are you most likely to give her (choose TWO)?

- a) A short-term (10-week) exercise program will provide long-term protection against falls
- b) Exercise is particularly important for Connie because of her sex
- c) Swimming is the ideal form of exercise to prevent falls
- d) Connie should take part in an exercise program designed for older people that is specifically targeted at improving balance and strength

6. Connie deteriorates over the next 12 months and develops new neurological symptoms. Which THREE conditions would put her at greater risk of falling?

- a) Sensorineural deafness
- b) Parkinson's disease
- c) Dementia
- d) Depression

7. Li, 82, is brought in by his son after falling at their home during the night when going to the toilet. You suspect postural (orthostatic) hypotension. Which TWO conditions, if present in Li's personal history, would increase his risk of postural hypotension?

- a) Diabetes
- b) Asthma
- c) Chronic renal failure
- d) Spinal stenosis

8. Li's examination and investigations do not show postural hypotension and Li has had a second fall during the day. Which THREE questions about his falls are most important in finding the cause?

- a) Do they occur when turning his head?
- b) Does he have time to break his fall?
- c) Does he feel nauseated after the fall?
- d) Did he have palpitations before the fall?

9. Which TWO actions are you most likely to take next?

- a) Perform carotid sinus massage
- b) Perform an ECG
- c) Review all medications, including over-the-counter preparations
- d) Recommend a change of footwear

10. Which TWO statements about the QuickScreen assessment are correct?

- a) Specialist training and laboratory equipment are required to administer the QuickScreen assessment
- b) It provides assessment of risk of falls and indicates which sensorimotor systems are impaired
- c) It does not take into account the number of prescribed medications
- d) To pass the sit-to-stand test the patient must complete the action in 15 seconds

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The mark required to obtain points is 80%. Please note that some questions have more than one correct answer. Your CPD activity will be updated on your RACGP records every January, April, July and October.

NEXT WEEK Smoking and alcohol abuse are associated with many of the leading causes of mortality and morbidity in Australia, with adolescence the most significant risk period for adopting these behaviours. Next week's How to Treat, Cigarettes and alcohol — youth at risk, will help you address these behaviours in your young patients. The authors are **Associate Professor Alison Yung**, consultant psychiatrist and associate professor at ORYGEN Youth Health, ORYGEN Research Centre and the University of Melbourne department of psychiatry, Parkville, Victoria; and **Dr Elizabeth Cosgrave**, clinical psychologist and research fellow at ORYGEN Youth Health, ORYGEN Research Centre and The University of Melbourne department of psychiatry.