

# Office management of gait disorders in the elderly

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## Abstract

**Objective** To provide family physicians with an approach to office management of gait disorders in the elderly.

**Sources of information** Ovid MEDLINE was searched from 1950 to July 2010 using subject headings for gait or neurologic gait disorders combined with *physical examination*. Articles specific to family practice or family physicians were selected. Relevant review articles and original research were used when appropriate and applicable to the elderly.

**Main message** Gait and balance disorders in the elderly are difficult to recognize and diagnose in the family practice setting because they initially present with subtle undifferentiated manifestations, and because causes are usually multifactorial, with multiple diseases developing simultaneously. To further complicate the issue, these manifestations can be camouflaged in elderly patients by the physiologic changes associated with normal aging. A classification of gait disorders based on sensorimotor levels can be useful in the approach to management of this problem. Gait disorders in patients presenting to family physicians in the primary care setting are often related to joint and skeletal problems (lowest-level disturbances), as opposed to patients referred to neurology specialty clinics with sensory ataxia, myelopathy, multiple strokes, and parkinsonism (lowest-, middle-, and highest-level disturbances). The difficulty in diagnosing gait disorders stems from the challenge of addressing early undifferentiated disease caused by multiple disease processes involving all sensorimotor levels. Patients might present with a nonspecific “cautious” gait that is simply an adaptation of the body to disease limitations. This cautious gait has a mildly flexed posture with reduced arm swing and a broadening of the base of support. This article reviews the focused history (including medication review), practical physical examination, investigations, and treatments that are key to office management of gait disorders.

**Conclusion** Family physicians will find it helpful to classify gait disorders based on sensorimotor level as part of their approach to office management of elderly patients. Managing gait disorders at early stages can help prevent further deconditioning and mobility impairment.

## Résumé

**Objectif** Proposer au médecin de famille une méthode pour traiter, au bureau, les troubles de la démarche chez la personne âgée.

**Sources de l'information** On a consulté Ovid MEDLINE entre 1950 et 2010 à l'aide des rubriques *gait* ou *gait disorders* en combinaison avec *physical examination*. On a retenu les articles spécifiquement dédiés à la pratique familiale ou au médecin de famille. On a aussi utilisé des articles de revue et des recherches originales considérés appropriés et applicables aux personnes âgées.

**Principal message** Les troubles de la démarche et de l'équilibre chez la personne âgée sont difficiles à reconnaître et à diagnostiquer parce que leurs manifestations sont généralement subtiles et non spécifiques, et parce que leurs causes sont habituellement multifactorielles, plusieurs maladies

**KEY POINTS** Gait disorders can be difficult to diagnose, as most have multiple contributing causes. Recent clinical practice guidelines recommend asking about or examining for difficulties with gait and balance at least once annually in the elderly. History-taking should focus on searching for predisposing intrinsic causes of gait disorders. Physical examination should include measurement of vital signs, examination of eyesight and hearing, and neurologic and musculoskeletal examination. Romberg testing, heel-to-toe walking, the functional reach and Timed Up and Go tests, and the Dix-Hallpike test can all be useful. An interdisciplinary approach to treatment, including referral for physiotherapy, is likely to be helpful.

## POINTS DE REPÈRE

Les troubles de la démarche sont parfois difficiles à diagnostiquer, puisqu'ils relèvent pour la plupart de causes multiples. Les récentes directives de pratique recommandent de s'informer auprès de la personne âgée ou de rechercher les problèmes de la démarche et de l'équilibre au moins une fois l'an. L'anamnèse devrait porter spécifiquement sur les facteurs intrinsèques prédisposant aux troubles de la démarche. L'examen devrait inclure la mesure des signes vitaux, l'examen de la vision et de l'audition, et l'examen neurologique et musculo-squelettique. Le test de Romberg, la marche sur les talons et sur la pointe des pieds, le Functional Reach, le Timed Up and Go et le test de Dix-Hallpike peuvent tous être utiles. Pour le traitement, une approche interdisciplinaire, incluant une consultation en physiothérapie, devrait être utile.

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se développant simultanément. Et ce qui complique davantage le problème, c'est que ces manifestations peuvent être masquées par les changements physiologiques qui accompagnent le vieillissement. Une classification des troubles de la démarche en fonction de niveaux sensori-moteurs peut s'avérer utile dans la méthode choisie pour traiter ce problème. Les troubles de la démarche des patients qui consultent un médecin de famille dans un contexte de première ligne sont souvent associés à des problèmes de nature articulaire ou osseuse (niveau d'inconvénient minimal), par opposition aux patients dirigés à des cliniques neurologiques spécialisées pour de l'ataxie sensorielle, une myélopathie, de multiples accidents vasculaires cérébraux et du parkinsonisme (niveaux d'inconvénient bas, modéré et maximal). Ce qui rend difficile le diagnostic des troubles de la démarche, c'est qu'il faut tenir compte de maladies indifférenciées débutantes relevant de plusieurs processus pathologiques qui touchent tous les niveaux sensori-moteurs. Le patient peut se présenter avec une démarche « prudente » non spécifique qui n'est qu'une adaptation du corps aux limitations imposées par la maladie. Ce type de démarche se caractérise par une posture légèrement fléchie avec diminution du balancement des bras et élargissement du polygone de base. Cet article passe en revue l'histoire type (incluant une revue de la médication), l'examen physique pratique, les investigations appropriées et les traitements qui constituent la clé du traitement, au bureau, des troubles de la démarche.

**Conclusion** Une classification des troubles de la démarche en fonction du niveau sensori-moteur aidera le médecin de famille à traiter adéquatement les personnes âgées qui le consultent. Une prise en charge précoce des troubles de la démarche peut aider à prévenir une perte de mobilité et un déconditionnement plus sévères.

## Case

Mr J.S. is an 84-year-old man who was recently discharged from hospital after being treated for a sudden episode of expressive aphasia and a small non-ST-segment elevation myocardial infarction with elevated troponins. The possible transient ischemic event, which lasted about 30 minutes, has now completely resolved, and Mr J.S. tells you that he never actually had any specific chest pain or cardiac symptoms despite being told he had had a heart attack. He looks a bit pale and deconditioned from his hospital stay, but you also notice that he is using a single-point cane, which is new.

## Sources of information

Ovid MEDLINE was searched from 1950 to July 2010 using subject headings for gait or neurologic gait disorders

combined with *physical examination*. Articles specific to family practice or family physicians were selected. Relevant review articles and original research were used when appropriate and applicable to the elderly.

## Background

Gait and balance disorders in the elderly are difficult to recognize and diagnose in the family practice setting. Like many other geriatric syndromes, gait problems initially present with subtle undifferentiated manifestations, and causes are usually multifactorial, with multiple diseases developing simultaneously.<sup>1</sup> To further complicate the issue, these manifestations can be camouflaged in elderly patients by the physiologic changes associated with normal aging. It is normal for postural responses to slow in the elderly, resulting in a slower, shorter, broader-based stride.<sup>2</sup> Nevertheless, these normal physiologic changes should not disturb overall function and participation in usual activities.

A "senile" gait disorder has been described in the past to account for gait disturbances that progress beyond what can be attributed to physiologic changes of aging, but for which an underlying disease to explain the disturbance cannot be found; however, it is becoming clearer that these disturbances are really early presentations of subclinical disease.<sup>3</sup> Gait abnormality has been found to be a predictor of dementia.<sup>4</sup> What often presents in the family doctor's office is a nonspecific adaptation or compensation of the body for disease limitations in the form of a "cautious" walk (similar to how anyone would walk on a slippery surface). This cautious gait has a mildly flexed posture with reduced arm swing and a broadening of the base of support.

A normal gait requires proper functioning and communication of the frontal lobe cortical motor areas (primary motor, premotor, and supplementary motor) and the subcortical motor areas (cerebellum and basal ganglia). Walking might seem like an automatic activity, but research has suggested that a small amount of frontal lobe executive functioning is required. Lundin-Olsson et al<sup>5</sup> demonstrated that patients with limited cognitive reserve stopped walking when they started talking. These same patients were also at risk of future falls.

Along with a history of previous falls, balance and gait impairment are considerable risk factors for future falls in the elderly.<sup>6</sup> Falls among elderly Ontarians resulted in more than 850 hospital admissions in 2008, and most falls occurred at home from slipping, tripping, or stumbling.<sup>7</sup> Recently published clinical practice guidelines based on expert opinion and consensus recommend asking about or examining for difficulties with gait and balance at least once annually in the elderly.<sup>8</sup>

This paper will provide a practical family practice office approach to the management of gait disorders in the elderly.

## Causes of gait disorders

The causes of gait disorders differ depending on the cohort studied. While neurology specialty clinics have shown sensory ataxia (18%), myelopathy (17%), multiple strokes (15%), and parkinsonism (12%) to be the most common causes,<sup>9</sup> in most community studies, joint and skeletal disorders are more common than neurologic causes.<sup>10,11</sup> This was also highlighted in a family practice study, which showed 43% of gait disturbances were due to arthritis (Table 1).<sup>1</sup>

**Table 1. Primary diagnoses in 35 patients evaluated for gait disorders in primary care**

DIAGNOSIS	NO. OF PATIENTS
Degenerative joint disease	13
Orthostatic hypotension	3
Parkinson disease	3
Postcerebrovascular accident	2
Intermittent claudication	2
Congenital deformity	2
Gouty arthritis	2
Postorthopedic surgery	1
Vertebrobasilar insufficiency	1
Idiopathic gait disorder (fear of falling)	1
Atherosclerotic heart disease	1
Charcot-Marie-Tooth disease	1
Peripheral neuropathy	1
Benign positional vertigo	1

Data from Hough et al.<sup>1</sup>

## Approach to management

**History.** History-taking should focus on searching for predisposing intrinsic causes of gait disorders. There are many extrinsic environmental factors that can precipitate falls in patients with gait disorders, but these are well described in the literature pertaining to falls and will not be discussed in this article.

As most gait disorders have multiple concurrent causes, a history of having a cautious gait might be the only thing to surface. It would be important to clarify that this cautious gait is not associated with light-headedness or vertigo so much as a feeling of being unconfident or unbalanced while walking. These patients are at risk of “accidentally” falling owing to a disturbance of their postural reflexes. These patients are also described as having “mechanical” falls, with some being able to attribute their gait disturbance to pain or dysfunction in a particular joint. Others might describe more generalized or distal extremity pain, suggesting a neuropathic cause.

Gait disorders occur along a continuum from slowing of gait speed to balance and stability problems causing complete mobility failure. An overall picture of the patient’s mobility will help discover those who might

limit their activity as a result of their physical limitations, thereby causing a vicious cycle of further deconditioning of muscular strength and cardiopulmonary reserve.

Patients with gait disorders should have their medications reviewed, especially those medications that might cause hypotension (eg, antihypertensive medications, especially  $\alpha$ -adrenergic blockers) or oversedation (eg, benzodiazepines, opioids, and antihistamines). Impaired postural reflexes can result from suprathreshold anti-convulsant therapy (eg, phenytoin) causing neurotoxicity or statin therapy causing myopathy. Dopamine blockade by antipsychotics, antidepressants (especially selective serotonin reuptake inhibitors), some antiemetics (specifically metoclopramide or prochlorperazine), calcium channel blockers (especially flunarizine), or methyldopa might cause drug-induced parkinsonism.<sup>12</sup> Drug-induced cognitive impairment and blurred vision can be caused by any drug with anticholinergic activity (eg, tricyclic antidepressants).

A review of systems should include discussion of any memory problems, eyesight and hearing deficits, chest pain or dyspnea, constipation, urinary incontinence, or joint or foot pain.

**Classification of gait disorders.** A classification of gait disorders in the elderly has been developed based on sensorimotor levels (Box 1).<sup>13</sup> Most disorders in family practice affect the lowest sensorimotor level.<sup>1</sup> This includes patients favouring osteoarthritic joints, leading to an antalgic gait. The antalgic gait is highlighted by the patient preferring to spend less time bearing weight on the painful extremity. Patients with visual and proprioceptive problems due to peripheral neuropathy might have difficulty finding the ground, leading to a high-stepping or slapping gait as the foot forcefully meets the ground. Middle-level disturbances include spasticity from strokes and cerebellar ataxia with an uncoordinated gait. This level also includes the shuffling gait related to Parkinson disease, which might present with a resting tremor or increased rigidity alone. The highest-level disturbances are the least understood, and patients might simply adopt a nonspecific, undifferentiated cautious gait from subcortical disequilibrium. A *frontal gait disorder* is also described at this level as the *marche à petit pas*, in which the lower body takes small shuffling steps but the upper limbs have preserved function.

## Case

When questioned, Mr J.S. reveals that he purchased his cane about 1 year ago and he believes that it helps his confidence while walking. Although he has never fallen, he has had some “close calls.” He lives alone and manages all his activities of daily living, including his finances and driving a car, but he was

**Box 1. Classification of gait disorders in the elderly**

**Lowest-level gait disturbances**

- Skeletomotor problems (eg, arthralgia with weight bearing) -----> antalgic gait
- Peripheral sensory problems (eg, visual, proprioceptive) -----> high-stepping or slapping gait
- Vestibular problems -----> deviation to one side or "drunken" gait

**Middle-level gait disturbances**

- Spastic or hemiplegic -----> possibly scissoring
- Cerebellar ataxia -----> uncoordinated gait
- Parkinsonism -----> shuffling gait

**Highest-level gait disturbances**

- Frontal gait disorder -----> *marche à petit pas* with lower-half parkinsonism (normal upper-limb function)
- Drug or metabolic causes -----> diffuse impairment of postural reflexes
- Subcortical disequilibrium -----> "cautious" gait

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told to wait for at least 1 month before thinking about returning to driving.

Past medical history includes hypertension, insomnia, asthma, gastroesophageal reflux disease, generalized osteoarthritis, lower extremity peripheral neuropathy with neuropathic pain, a not-yet-diagnosed right lung nodule, and benign prostatic hypertrophy. Medications include the following:

- enteric-coated acetylsalicylic acid, 81 mg orally once daily;
- clopidogrel, 75 mg orally once daily;
- atorvastatin, 40 mg orally at bedtime;
- amlodipine, 5 mg orally once daily;
- perindopril, 4 mg orally once daily;
- indapamide, 1.25 mg orally once daily;
- nitroglycerin, 0.4 mg spray sublingually as needed for chest pain;
- ipratropium bromide (20 µg), 2 puffs 3 times daily;
- terbutaline (0.5 mg), 2 puffs 3 times daily;
- salbutamol (100 µg), 2 puffs every 4 hours as needed for dyspnea;
- budesonide-formoterol (200 and 6 µg), 2 puffs 3 times daily;
- enteric-coated pantoprazole, 40 mg orally once daily;
- pregabalin, 25 mg orally twice daily;
- sustained-release tamsulosin, 0.4 mg orally at bedtime;
- finasteride, 5 mg orally once daily;
- vitamin D, 1000 IU orally once daily;
- zopiclone, 3.75 mg orally at bedtime as needed for insomnia;
- acetaminophen, 650 mg orally 3 times daily;
- docusate sodium, 100 mg orally twice daily;
- senokot, 17.2 mg orally at bedtime as needed for constipation.

**Physical examination.** Ideally you would want to surreptitiously watch your patient walk into the office, examining for posture, arm swing, placement of feet, and overall gait symmetry.

**Sitting:** If your patient is already seated, a practical approach would include the following:

- measurement of vital signs, with particular attention to postural drops in blood pressure (especially if history is suggestive of syncope), and cardiac examination, including heart rhythm;
- examination of eyesight and hearing (in patients with severe balance problems, limitation of vertical gaze should be checked for as a sign of progressive supranuclear palsy);
- neurologic examination looking for
  - signs of parkinsonism (masklike facies, stooped posture, resting tremor, rigidity or bradykinesia),
  - cerebellar abnormalities (difficulty with rapid alternating movements of the hands or dysdiadochokinesia), and
  - focal neurologic deficits; and
- musculoskeletal examination looking for
  - weakness, especially in hip flexors and ankle dorsiflexors (patients unable to stand without using their arms, likely have proximal muscle weakness) and
  - restriction in the range of motion of any joint.

**Standing and walking with reasonable stability:** If they can stand with reasonable stability, attempt Rhomberg testing with the patient's eyes closed (checking cerebellar, dorsal column, and proprioception function). Later, it would be important to check sensation—light touch (with a standard 10-g pressure monofilament) and vibration (with a 128 Hz tuning fork)—and proprioception in the feet, but it is important to note that even healthy

70-year-old patients without known disease might have lost vibration sense in their toes and ankle-jerk responses.<sup>14</sup>

In your office, patients might appear to have a surprisingly stable gait, as you are inevitably observing them under ideal environmental circumstances. Although the Berg Balance Scale,<sup>15</sup> which includes 14 balance items, is validated, it can take up to 30 minutes to complete and that might be difficult within the time constraints of a busy family practice setting. I prefer to focus on 2 particular items. Standing or walking tandem (heel-to-toe) is a sensitive screening test and should be tried in those patients with apparently normal gait and balance. Among the noninstitutionalized oldest old (older than 88 years of age), about 20% can do this task without difficulty.<sup>11</sup> Alternatively, testing if patients can stand on one foot is another simple balance screen.

The functional reach<sup>16</sup> and Timed Up and Go (TUG)<sup>17</sup> tests are easier to incorporate into a usual family practice visit. The reach test measures how far patients can lean forward and extend their hands while standing, without losing their balance (healthy patients can reach 10 or more inches), and the TUG test consists of timing patients while they stand from a seated position, walk 3 m, turn around, walk back, and sit back down. Although a healthy patient takes 10 or fewer seconds to complete this task, the clinician will need to budget about 5 to 10 minutes to conduct the TUG test.

*Standing and walking with balance difficulties:* For those with apparent balance or gait difficulties, it is helpful to note whether assistance with one or both hands helps their gait substantially, intuitively justifying a cane or walker respectively for stability.<sup>18</sup> A patient's cane or walker should be the right height, with the handle at the level of the patient's wrist crease when his or her arm is hanging freely at the side. A cane should usually be used in the hand opposite the impaired side.

If the patient experiences vertigo triggered by sudden movement, the Dix-Hallpike test should be attempted. While seated, the patient's head is rotated 45° to one side, then the patient lies down so that his or her head is extended over a pillow or the edge of the examination table. In about half of cases of benign paroxysmal positional vertigo, this test will result in 10 to 30 seconds of horizontal nystagmus after a few seconds of latency.<sup>19</sup>

## Case

Unfortunately you were unable to see Mr J.S. walk from the waiting room into your office. He does have cerebellar coordination abnormalities and some rigidity in the upper extremities but no resting tremor. He cannot stand from a seated position without using his arms for support. Certainly a Romberg test with his eyes closed cannot be completed safely today. Without his cane, he has a mildly flexed posture with

a slow, slightly wide-based but symmetric gait. He has reduced arm swing but no obvious shuffling. Tandem stance and gait could not be attempted safely, but he certainly benefits from you lending a hand to help stabilize his gait around the examination room. His gait is also remarkably improved with the use of his single-point cane.

## Investigations

While there is no established diagnostic laboratory workup that is indicated for balance and gait disorders, consider measuring complete blood count and levels of electrolytes, fasting glucose, thyroid function, creatinine, blood urea nitrogen, and vitamin B12.<sup>20</sup> If peripheral neuropathy or a motor neuron disease such as amyotrophic lateral sclerosis is suspected, nerve conduction studies can be diagnostically useful. Also, cervical and lumbar spinal stenosis are common causes of myelopathy in neurology cohorts.<sup>2</sup> Bone mineral density testing with dual-energy x-ray absorptiometry is recommended for all patients older than 65 years of age to identify potential osteoporosis.<sup>21</sup>

If there are no focal neurologic deficits despite the fact that there are balance problems, results of computed tomography or magnetic resonance imaging will not likely change management. Rarely, normal-pressure hydrocephalus, subdural hematoma, or space-occupying lesions are found. Nonspecific gait disturbances are correlated with periventricular white-matter changes called *leukoaraiosis*.<sup>22</sup> These white-matter changes likely represent diffuse cerebrovascular disease, including multiple lacunar infarcts (Binswanger disease).

## Treatment

Cochrane reviews have found evidence that multifactorial risk assessment and targeted interventions by interdisciplinary teams are helpful in reducing falls, but similar evidence has not been clearly demonstrated for treatment of gait disorders.<sup>23</sup> Intuitively, however, you might approach gait disorders, especially cases displaying cautious gaits, in the same way. Gait disturbances in these patients likely have multifactorial causes, and these patients would likely benefit from an interdisciplinary approach.

Treatment of osteoarthritic pain with scheduled acetaminophen is preferred to use of nonsteroidal anti-inflammatory drugs, which have established gastrointestinal and renal toxicity.<sup>19</sup>

Vitamin D supplementation in doses higher than 700 IU/d can improve muscle strength and postural balance, which has been shown to reduce risk of falling by almost 20%.<sup>24,25</sup> Treating nutritional deficiencies in B12 and thiamine might also help peripheral sensory deficits.<sup>26</sup>

Gait aids can be useful even as a temporary measure to provide stability while patients are rehabilitating.

Referral to a physiotherapist for exercise prescription to treat deconditioning and provide gait and balance therapy is recommended.<sup>27,28</sup> Balance exercises address postural sway, weight shifting, strength, and speed components.

Depression and fear of falling need to be addressed, and although fear of falling can independently predict future falls, it remains to be proven whether treatment of this fear can prevent future falling.<sup>29</sup> In fact, selective serotonin reuptake inhibitors have been associated with falls,<sup>30</sup> likely by causing extrapyramidal side effects through dopaminergic blockade. Keep in mind that potential biases in the cohorts studied have been raised,<sup>31</sup> and alternative treatments of depression and insomnia can be challenging. The bottom line is that the risks and benefits of all medications need to be considered carefully.

### Case resolution

Mr J.S. has a gait disorder due to multiple disease processes spanning all 3 sensorimotor levels. He has subcortical disequilibrium with cerebellar dysfunction, parkinsonism, and deconditioning, and presents with an overall cautious gait. As he is taking several antihypertensive medications, sustained-release tamulosin is discontinued and he is monitored for signs of worsening prostatism. Amlodipine is continued, although it could be contributing to his parkinsonism. A trial of 1 tablet of levodopa-carbidopa (100/25) orally twice daily is associated with some improvement within a week. A neurology consultation will be considered if he is not responding to treatment over the next few weeks. Vitamin D is continued at a dose of 1000 IU daily, 1200 mg of calcium daily (from diet and supplements)<sup>21</sup> is recommended, and a bone mineral density scan is ordered to screen for osteoporosis. He is referred for physiotherapy for strengthening exercises and balance and gait therapy, as well as to learn to optimize use of his cane. Although no report to the Ministry of Transportation is sent, Mr J.S. agrees to continue to abstain from driving pending further evaluation, which might require future road testing. Depression is also addressed with the initiation of 7.5 mg of mirtazapine at bedtime, which improves his sleep; his occasional zopiclone is no longer required. Mr J.S. completes the Mini-Mental State Examination and the Montreal Cognitive Assessment and scores 26 out of 30 and 17 out of 30, respectively, so he might also have mild cognitive impairment, which will require ongoing follow-up. 🌿

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### Competing interests

None declared

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