

# Medicines and Falls in Hospital: Guidance Sheet

All patients should have their drug burden reviewed with respect to its propensity to cause falls.

The history should establish the reason the drug was given, when it started, whether it is effective and what its side effects have been.

An attempt should be made to reduce the number and dosage of medications, and ensure they are appropriate and not causing undue side effects.

Falls can be caused by almost any drug that acts on the brain or on the circulation. Usually the mechanism leading to a fall is one or more of:

- **sedation**, with slowing of reaction times and impaired balance
- **hypotension**, including the 3 syndromes of paroxysmal hypotension – orthostatic hypotension, vasovagal syndrome and vasodepressor carotid sinus hypersensitivity
- **bradycardia, tachycardia or periods of asystole**

Falls may be the consequence of recent medication changes, but are usually caused by medicines that have been given for some time.

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This guidance has been approved by the British Geriatrics Society.

## Key to tables overleaf:



Red High risk: can commonly cause falls alone or in combination

Amber Moderate risk: can cause falls, especially in combination

Yellow Possibly causes falls, particularly in combination







Green National Institute for Health and Clinical Excellence (NICE) guidelines

## DRUGS ACTING ON THE BRAIN (PSYCHOTROPIC DRUGS)

There is good evidence that stopping these drugs can reduce falls (1).

Taking such a medicine roughly doubles the risk of falling. There is no data on the effect of taking two or more such tablets at the same time (2).

Sedatives, antipsychotics and sedating antidepressants cause drowsiness and slow reaction times. Some antidepressants and antipsychotics also cause orthostatic hypotension.

MEDICATION GROUP	COMMONLY USED MEDICATIONS WITHIN THE GROUP	EFFECTS ON FALLS RISK
Sedatives: Benzodiazepines	 Temazepam, Nitrazepam Diazepam, Lorazepam Chlordiazepoxide, Flurazepam, Lorazepam, Oxazepam, Clonazepam	Drowsiness, slow reactions, impaired balance. Caution in patients who have been taking them long term.
Sedatives: "Zs"	 Zopiclone, Zolpidem	Drowsiness, slow reactions, impaired balance.
Sedating antidepressants (tricyclics and related drugs)	 Amitriptyline, Dosulepin Imipramine, Doxepin Clomipramine, Lofepramine, Nortriptyline, Trimipramine  Mirtazapine, Mianserin Trazodone	All have some alpha blocking activity and can cause orthostatic hypotension. All are antihistamines and cause drowsiness, impaired balance and slow reaction times. Double the rate of falling.
Monoamine oxidase inhibitors (MAOIs)	 Phenelzine, Isocarboxazid, Tranylcypromine	MAOIs are little now used; all (except moclobemide) cause severe orthostatic hypotension.
Drugs for psychosis and agitation	 Chlorpromazine, Haloperidol, Fluphenazine, Risperidone Quetiapine, Olanzapine	All have some alpha receptor blocking activity and can cause orthostatic hypotension. Sedation, slow reflexes, loss of balance.
Selective serotonin reuptake inhibitor (SSRI) antidepressants	 Sertraline, Citalopram, Paroxetine, Fluoxetine	Cause falls as much as other antidepressants in population studies. Several population studies have shown that SSRIs are consistently associated with an increased rate of falls and fractures, but there are no prospective trials. The mechanism of such an effect is unknown. They cause orthostatic hypotension and bradycardia only rarely as an idiosyncratic side effect. They do not normally sedate. They impair sleep quality.







Drugs acting on the brain (psychotropic drugs) - *continued*

MEDICATION GROUP		COMMONLY USED MEDICATIONS WITHIN THE GROUP	EFFECTS ON FALLS RISK
Serotonin and norepinephrine reuptake inhibitor (SNRI) antidepressants A combination of an SSRI and a noradrenaline re-uptake inhibitor		Venlafaxine, Duloxetine	As for SSRIs but also commonly cause orthostatic hypotension (through noradrenaline re-uptake blockade).
Opiate analgesics		All opiate and related analgesics – Codeine, Morphine, Tramadol	Sedate, slow reactions, impair balance, cause delirium.
Anti-epileptics		Phenytoin	Phenytoin may cause permanent cerebellar damage and unsteadiness in long term use at therapeutic dose. Excess blood levels cause unsteadiness and ataxia.
		Carbamazepine, Phenobarbitone	Sedation, slow reactions. Excess blood levels cause unsteadiness and ataxia.
		Sodium valproate, Gabapentin	Some data on falls association.
		Lamotrigine, Pregabalin Levetiracetam, Topiramate	Insufficient data to know if these newer agents cause falls.
Parkinson's disease (PD): Dopamine agonists		Ropinirole, Pramipexole	May cause delirium and orthostatic hypotension.
Parkinson's disease (PD): MAOI-B inhibitors		Selegiline	Causes orthostatic hypotension. The subject of drugs and falls in PD is difficult, as falls are so common, and orthostatic hypotension is part of the disease. In general only definite drug related orthostatic hypotension would lead to a change in medication.
Muscle relaxants		Baclofen, Dantrolene	Sedative. Reduced muscle tone. No falls data on muscle relaxants. Tend to be used in conditions associated with falls.











Drugs acting on the brain (psychotropic drugs) - *continued*

MEDICATION GROUP	COMMONLY USED MEDICATIONS WITHIN THE GROUP	EFFECTS ON FALLS RISK
Vestibular sedatives Phenothiazines	 Prochlorperazine	Dopamine antagonist – may cause movement disorder in long term use. Alpha receptor blocker and antihistamine.
Vestibular sedatives Antihistamines	 Cinnarazine, Betahistine	Sedating. No evidence of benefit in long term use.
Sedating antihistamines for allergy	 Chlorphenamine, Hydroxyzine, Promethazine, Trimeprazine	No data, but sedation likely to contribute to falls. Long half lives.
Anticholinergics acting on the bladder	 Oxybutinin, Tolterodine, Solifenacin	No data, but have known Central Nervous System (CNS) effects.

## DRUGS ACTING ON THE HEART AND CIRCULATION

Maintaining consciousness and an upright posture requires adequate blood flow to the brain. This requires an adequate pulse and blood pressure. In older people a systolic blood pressure of 110mmHg or below is associated with an increased risk of falls.

Any drug that reduces the blood pressure or slows the heart can cause falls (or feeling faint or loss of consciousness or “legs giving way”) (3). In some patients the cause is clear – they may be hypotensive, or have a systolic drop on standing. Others may have a normal blood pressure lying and standing, but have syncope or pre-syncope from carotid sinus hypersensitivity or vasovagal syndrome. Stopping cardiovascular medication reduces syncope and falls by 50%, and reduces the prevalence of these four syndromes (4, 5).

MEDICATION GROUP		COMMONLY USED MEDICATIONS WITHIN THE GROUP	EFFECTS ON FALLS RISK
Alpha receptor blockers		Doxazosin, Indoramin, Prazosin, Tamsulosin, Terazocin, Alfluzosin	Used for hypertension or for prostatism in men. They commonly cause severe orthostatic hypotension. Stopping them may precipitate urinary retention in men.
		Sedating antidepressants	See ‘sedating antidepressants’ in the ‘drugs acting on the brain’ table. Orthostatic hypotension.
		Drugs for psychosis and agitation	See ‘drugs for psychosis and agitation’ in the ‘drugs acting on the brain’ table. Orthostatic hypotension.
Centrally acting alpha 2 receptor agonists		Clonidine, Moxonidine	May cause severe orthostatic hypotension. Sedating.
Thiazide diuretics		Bendroflumethiazide, Chlorthalidone, Metolazone	Cause orthostatic hypotension, weakness due to low potassium. Hyponatraemia.
Loop diuretics		Furosemide, Bumetanide	Dehydration causes hypotension. Low potassium and sodium
Angiotensin converting enzyme inhibitors (ACEIs)		Lisinopril, Ramipril, Enalapril, Captopril, Perindopril	These drugs rely almost entirely on the kidney for their elimination and can accumulate in dehydration or renal failure.
		Fosinopril, Trandolapril, Quinapril	Excreted by liver and kidney.




Drugs acting on the heart and circulation - *continued*

MEDICATION GROUP	COMMONLY USED MEDICATIONS WITHIN THE GROUP	EFFECTS ON FALLS RISK
<p><b>Symptomatic hypotension in systolic cardiac failure</b></p> <ul style="list-style-type: none"> <li>• ACEIs and beta blocker have a survival benefit in systolic cardiac failure and should be maintained whenever possible.</li> <li>• NICE recommends: stop nitrates, calcium channel blockers and other vasodilators. If no evidence of congestion, reduce diuretics. If problem persists, seek specialist advice.</li> <li>• The mortality risk from a fall at age 85 is about 1% per fall. The frequency of falls determines the balance between risk and benefit.</li> </ul> <p>Most cardiac failure in older people is diastolic (preserved left ventricular function). ACEIs and beta blockers have little survival benefit in diastolic failure.</p>		
Angiotensin receptor blockers (ARBs)	Losartan, Candesartan, Valsartan, Irbesartan, Olmesartan, Telmesartan, Eprosartan	May cause less orthostatic hypotension than ACEIs. Excreted by liver and kidney.
Beta blockers	Atenolol, Sotalol - Renally excreted. May accumulate.	Can cause bradycardia, hypotension, carotid sinus hypersensitivity, orthostatic hypotension and vasovagal syndrome.
	Bisoprolol, Metoprolol, Propranolol, Carvedilol, Timolol eye drops	Can cause bradycardia, hypotension, carotid sinus hypersensitivity, orthostatic hypotension and vasovagal syndrome.
Antianginals	Glyceryl trinitrate (GTN)	A common cause of syncope due to sudden drop in blood pressure.
	Isosorbide mononitrate, Nicorandil	Cause hypotension and paroxysmal hypotension.
Calcium channel blockers that only reduce blood pressure	Amlodipine, Felodipine, Nifedipine, Lercanidipine	Cause hypotension and paroxysmal hypotension.
Calcium channel blockers which slow the pulse and reduce blood pressure	Diltiazem, Verapamil	May cause hypotension or bradycardia.
Other antidysrhythmics	Digoxin, Amiodarone, Flecainide	May cause bradycardia and other arrhythmias. Data on digoxin and falls probably spurious due to confounding by indication.



Drugs acting on the heart and circulation - *continued*

MEDICATION GROUP	COMMONLY USED MEDICATIONS WITHIN THE GROUP	EFFECTS ON FALLS RISK
Acetylcholinesterase inhibitors (for dementia)	 Donepezil, Rivastigmine, Galantamine	Cause symptomatic bradycardia and syncope.

**References**

1. Campbell AJ, Robertson MC, Gardner MM, Norton RN, Buchner DM. Psychotropic medication withdrawal and a home-based exercise program to prevent falls: a randomized, controlled trial. *J Am Geriatr Soc* 1999;47:850–3.
2. Darowski A, Chambers SCF and Chambers DJ. Antidepressants and falls. *Drugs and Aging* 2009 26 (5) 381-394
3. Darowski A and Whiting R. Cardiovascular drugs and falls. *Reviews in Clinical Gerontology* 2011, 21 (2) 170-179
4. Van der Velde N, van den Meiracker AH, Pols HA, Stricker BH, van der Cammen TJ. Withdrawal of fall-risk-increasing drugs in older persons: effect on tilt-table test outcomes. *J Am Geriatr Soc* 2007;55:734–739.
5. Alsop K, MacMahon M. Withdrawing cardiovascular medications at a syncope clinic. *Postgrad MJ* 2001;77:403-5.