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This Medicines Information Leaflet is produced locally to optimise the use of medicines by encouraging prescribing that is safe, clinically appropriate, and cost-effective to the NHS.

Medication and Falls: A guide to Medication Review

The management of older people admitted to hospital with a fall accounts for 2.3% of the entire NHS budget.[1] Roughly a half of all falls are due wholly or partly to the effects of medications.[2]

Medications can increase falls risk by causing:[2,3]

- Hypotension
- **Orthostatic hypotension** (OH)
- Mental obtundation
- Sedation
- **Balance impairment**
- Hyponatraemia (rare)
- Bradycardia (rare)

Commonly, medications are well tolerated until an intercurrent illness causes orthostatic intolerance.[2] Often the medications contributing to falls are long term medications that have been taken for some time, as opposed to recent medication changes.[2,3] This can be due to gradual alterations in the patient's age, weight and renal function, which alter the pharmacokinetics and pharmacodynamics of the medicine. [1-3]

Medication Review in the context of falls means reconsidering the indications, doses and potential benefits and harms of each medicine that has the potential to increase the risk of falls.[3,4] The goal is to stop them where possible and reduce or replace such medications with a safer alternative where treatment is necessary to improve the patient's quality of life.[3,4]

Most elderly people take medications that are no longer indicated and should be stopped.[4] For others, there may be a balance between falls risk and benefit that needs to be established.[3] Some medications, (usually antidepressants or antipsychotics) are obligatory and cannot be stopped or changed easily.[3]

The doses and need for anti-anginal and anti-hypertensive medication need to be reviewed as such treatment tends to be automatically continued when it may no longer be appropriate.[3]

Cardiovascular medications

Cardiovascular medications are associated with falls in older people.[9]

In older people, a lower systolic blood pressure (BP) is associated with an increase in falls.[2] An arbitrary cut-off of 110mmHg is considered desirable. [2]

Any medicine that reduces the blood pressure or slows the heart (or causes fainting, loss of consciousness (syncope) or "legs giving way") can cause falls.[3,4] This may be due to more obvious side effects such as hypotension or orthostatic hypotension.[3,4] Other possible medicine related causes of falls may be syncope or pre-syncope from carotid sinus hypersensitivity or vasovagal syndrome.[3,4] Stopping cardiovascular medication reduces the prevalence of causative syndromes, and ultimately reduces falls risk by 50%.[9,10]

A common cause of falls is treating drug induced oedema (e.g. from calcium antagonists or doxazosin) with diuretics. Both should be stopped (if NT-proBNP is normal) and a switch to other agents considered.[10]

Symptomatic hypotension in heart failure with reduced ejection fraction

Angiotensin-converting-enzyme (ACE) inhibitors, Angiotensin receptor blockers (ARB) and beta blockers have a survival benefit in heart failure with reduced ejection fraction (HFrEF).[4] ACEI/ARB

should be maintained whenever possible, but ARBs should be preferred in the frail, those with CKD and if there is presence of orthostatic hypotension (OH).[4] Most older people, however, have heart failure with preserved ejection fraction (HFpEF). ACEI/ARBs and beta blockers have no survival benefit in diastolic failure but are used for AF and blood pressure control in that setting.[4] The effects of SGLT2 inhibitors on OH and falls has not been assessed (they can cause volume depletion, so an effect is expected).

Nitrates, calcium channel blockers and other vasodilators should be stopped, when possible, as few people taking these have symptomatic angina.[4] For symptomatic angina, the use of ranolazine or ivabradine should be considered and discussed with the cardiac team.[4] The need for, and dosage of, diuretics should be reviewed, and they should be reduced when appropriate.

The frequency of falls determines the balance between risk and benefit in terms of stopping existing medications.

Acute and Chronic Kidney Injury

All commonly used ACEI are renally excreted and accumulate in kidney injury, and in dehydration (especially with diarrhoea).[4] They should be held whilst the patient is unwell.[4,5]
Most beta blockers have dual excretion including bisoprolol. [6] However, for both atenolol and sotalol the primary route of elimination is through renal excretion.[7,8]

CNS agents

Antidepressants and antipsychotics are strongly associated with falls.[3] Only for fluoxetine is there audit data showing it might cause less orthostatic hypotension (see data in appendix 1).

All sedating medication can cause falls, and there is good evidence that stopping them reduces the chances of falling.[3]

Sedatives, antipsychotics, and sedating antidepressants cause mental obtundation, unsteadiness, drowsiness, and slow reaction times.[3] Antidepressants and antipsychotics also cause orthostatic hypotension.[3]

The MIL provides **guidance on page 3** for each class of medication that may contribute to increasing falls risk and gives advice of how to approach medication review where deprescribing is appropriate.

Resources and tool available to help with medication reviews:

- **Anticholinergic burden** can cause adverse effects such as confusion and dizziness which can contribute to a fall. The ACB calculator can be used as part of medication reviews. Please click here to launch the calculator.
- **STOPPFALL** deprescribing guidance was developed to support clinicians and optmise medication reviews. Please see table 2 in the document and use the interactive tool as appropriate.

Shared decision making with the patient when stopping or switching medications is essential to ensure compliance.[3] Communicating medication changes to the GP through clear documentation in the clinical narrative of the discharge summary letter is important. Ensure any monitoring requirements are also communicated.

How medicines may contribute to falls & guidance

Postural hypotension							
Medication Class	**Angiotensin converting enzyme inhibitors (ACEIs)**	**Antianginals**	**Alpha-blockers**	**Thiazide and thiazide-like diuretics**	**Loop diuretics**	**Calcium channel blocker**	**Parkinson's disease medications**
Examples	Lisinopril Ramipril Enalpril Perinodopril	Isosorbide- mononitrate Nicorandil GTN	Tamsulosin Doxazosin Prazosin Indoramin	Bendroflumethiazide Indapamide (Metolazone for end stage heart failure)	Furosemide Bumetanide Torasemide	Amlodipine Felodipine Diltiazem Lercandipine	Selegiline Rasagiline MAO-B inhibitors
Guidance	Replace with losartan (Ramipril 10mg equivalent to Losartan 100mg)	Stop unless there is a clear history of angina currently; use ranolazine or ivabradine	In prostatism, change to tamsulosin. Ask if they work – if not then stop. Consider finasteride to shrink prostate .	In hypertension, replace with losartan or calcium channel blocker	Are they indicated? (Check NT-proBNP) Reduce dose if not overloaded as appropriate	If there is OH consider losartan for BP	Complex issue in PD as OH may not be drug related. **Do not make** any changes without neuro/PD consult.

Mental obtundation					
Medication Class	**Sedating Antihistamines**	**Drugs for urinary incontinenance**	**Benzodiazepines**	**Z drugs**	**Opioids**
Examples	Chlorphenamine Promethazine Diphenhydramine	Oxybutynin Tolterodine Solifenacin	Temazepam Lorazepam Diazepam	Zopiclone Zolpidem	Codeine Morphine Tramadol Oxycodone
Guidance	Fexofenadine is the only drug that is not anticholinergic. Loratadine and cetirizine might be less sedating.	Risk of adverse cognitive effects. Mirabegron can be an alternative medication that could be used.	Stop whenever possible however note that weaning may be required in patients taking them longterm.	Discourage use/ for short term use **only**	Review indication and check if on more than one opioid.

Orthostatic hypotension & Mental obtundation				
Medication Class	**Anti-psychotics**	**Serotonin Reuptake inhibitors (SSRIs) + SNRIs**	**Tricyclic antidepressants**	**Parkinson's disease medications**
Examples	Olanzapine Quetiapine Haloperidol Risperidone Amisupiride Aripiprazole	Sertraline Citalopram Paroxetine Fluoxetine Duloxetine Venlafaxine	Amitriptyline Nortriptyline Mirtazapine Trazodone	Rotigotine Amantadine Ropinirole Pramipexole
Guidance	Cannot be stopped in schizophrenia or other significant psychosis, d/w with psych.	Ask why taken; take psych history. If deprescribing, consider discussing weaning plan with psych. Consider using fluoxetine that may be safer. No data for escitalopram.		Discuss with PD team

Patient assessment for medication review

The **indication** for each culprit medication may need to be established (eg is antidepressant for depression, anxiety, pain or sleep). Why was an antipsychotic started? Is an ACEI indicated (commonly in HFpEF, when there is no benefit other than for high BP).

Check **lying and standing blood pressure** with a manual cuff – *(never sitting and standing).* Automatic sphygs are less accurate for this task. Any drop in blood pressure on standing is abnormal, the definiton of OH being a drop of 20mmHg systolic is a random cut-off determined by a committee with no evidence base. The diagnosis is almost never based on a diastolic drop. Remember a standing BP <90mmHG also counts as OH. The greatest benefit is when we find a drug is not required.

Stop the following drugs if possible

Amitriptyline (and other tricyclics) if for:

- Sleep - always stop and consider alternatives to encourage sleep.
- Pain- consider switch to gabapentin or pregabalin. No good options.
- Depression- look into psychiatric history and discuss history with GP if needed. Request Psych review where approrpaite.

Note: For patients taking high doses for long duration its best to wean the medication gradually and monitor patient response rather than stopping it abruptly .

Venlafaxine/Duloxetine: OH is very common with these drugs. Review psych history. If for pain consider gabapentin. Stopping is often difficult and weaning must be gradual.

Sertraline/Citalopram/Paroxetine: cause OH (but sertraline also commonly causes diarrhoea). Consider if it is needed. If for anxiety consider pregabalin or short term use of lorazepam. For depression consider fluoxetine. Paroxetine causes more severe discontinuation symptoms than the others and must be weaned slowly.

Fluoxetine: is the best tolerated of the common antidepressants and may be the safest of the SSRIs in this respect. First choice in older people who fa

ACE inbibitors all commonly cause OH and vasovagal syndrome. They are superfluous and ARBs are as effective with a better side effect profile for all indications. Losartan is the best tolerated medication in this setting.

Orthostatic hypotension

Causes

- Medications *(see table on page 3)*
- Dementia
- B12 less than 250 ng/L
- Neurological disease: PD/MSA, neuropathy, MS, ataxia/choreas
- History of excessive alchohol
- Stomas may lead to impaired ability to control fluid balance

Management of OH

There is no effective treatment for orthostatic hypotension other than removing provoking medications and supplementing low B12. Education and environmental modification, walking aids for support are mainstays of management.

Drugs used are **fludrocortisone** and **midodrine**. There is no evidence of sustained effects from either despite being widely used in the absence of any other effective treatment. If used, the prescriber must ensure they follow the patient up regularly. Side effects occur in most cases. Fludrocortisone causes hypokalaemia as a physiological effect. It causes fluid retention and can precipitate heart failure (check NT-proBNP before starting, C/I in heart failure). Both can cause severe hypertension, and supine hypertension, which need regular monitoring. There is no role for slow sodium.

Check **B12** and supplement if below 250ng/L (which is within the normal range for prevention of macrocytosis); the range for prevention of neurodegeneration has not been determined.[11]

Ask about **alcohol** and suggest stopping if significant intake (might stop it getting worse; would not improve with abstinence).

There is no role for **support stockings** (harmful skin damage more likely than any benefit) or abdominal binders (difficult to put on, uncomfortable, minimal effect).

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Appendix I

Local audit data from Ox Falls Service looking at postural drop in patients who have fallen, and have no obvious cause for OH other than the one medication of interest. Audits of patients presenting to the Oxfordshire falls service who have no clear cause of orthostatic hypotension except the single drug of interest.