

Cases

Case A

A 71-year-old, female presents to your ED following a fall. Prior to the fall, she was feeling very unsteady with her gait as well as feeling off-balance. She states that she lost her balance while washing in the bathroom, fell and knocked her head and back against her bathtub. She denies any headache, loss of consciousness or amnesia. On your assessment, the patient is complaining of significant back pain. You obtain a CT lumbar spine and note three acute-appearing compression fractures. Vital signs are normal other than her BP which is 172/105.

PMHx: HTN, type 2 diabetes, asthma, hypothyroidism, depression, osteoarthritis, Ménière's disease, previous stroke

You suspect the etiology of the fall with the patient's associated gait and balance problems was multi-factorial – likely due to a combination of osteoarthritis, deconditioning, medications and recent stroke.

You are aware that completing a medication reconciliation has been shown to reduce adverse drug events for patients being admitted to hospital and you decide to proceed with a detailed medication review as your ED pharmacist has gone home for the day.

- The patient informs you that there have been a number of changes to her medications over the past few months.
- Four months prior to this event, the patient's family physician had prescribed amlodipine 2.5 mg twice daily to control her blood pressure.
- Three weeks later, her cardiologist prescribed 2 diuretics: furosemide 20 mg and spironolactone 25 mg, to be taken once daily. The drugs were intended to treat edema of the lower limbs, which she had recently developed.
- Three more weeks passed and she was prescribed an antimuscarinic, oxybutynin 5 mg twice daily, by her urologist, to treat her overactive bladder symptoms.
- One month after this, she complained of dry mouth to her family physician, who prescribed Pilocarpine 5 mg 3 times a day.

In addition to above, her usual medications include metformin, fenofibrate, clopidogrel, rabeprazole, levothyroxine, aripiprazole, citalopram, bupropion, hydroxyzine, ibuprofen and montelukast.

1. What is this sequence of prescribing events called?
 - Prescribing cascade - refers to the sequence of events in which an adverse drug event is misinterpreted as a new medical condition, leading to the addition of another, potentially avoidable, medication. Higher potential for this in older patients with multiple medications, involvement of many prescribers and a suboptimal review of medication history.
2. What medications is the patient on that could contribute to her risk of having a fall and why?

- Aripiprazole (antipsychotic), citalopram (SSRI), hydroxyzine (Antihistamine) (bupropion removed from Beers list in 2015)
 - Common medications associated with falls risk include: psychoactive medications - anticonvulsants, antidepressants (TCAs, SSRIs/SNRIs most common), antipsychotics, benzodiazepines, opioids, and sedatives/hypnotics; prescription and over-the-counter antihistamines; muscle relaxants; antihypertensives; anticholinergics
 - Psychoactive medications may cause ataxia and loss of balance, slowed reflexes, sedation, impaired psychomotor function, and syncope
 - SSRIs may cause hyponatremia, changes in gait and attention, ataxia, impaired psychomotor function, syncope
 - Anticholinergics cause sedation, dizziness
- Ibuprofen – could cause AKI, leading to general weakness and falls
- Amlodipine, furosemide, spironolactone – could all lower BP leading to falls, increased nocturia leading to falls at night
- Oxybutynin – anticholinergic – fall risk (sedation, dizziness)

3. What are common medications prescribed in the ED that are cleared by the renal system? What is a more accurate measure of renal clearance in older adult patients?

- Specific meds that require renal dosage adjustment: allopurinol, digoxin, gabapentin, lithium, metformin, metoclopramide, procainamide, ranitidine
 - Antibiotics – carbapenems, cephalosporins, clarithromycin, fluoroquinolones (ciprofloxacin and levofloxacin), nitrofurantoin, penicillins (pip-tazo, amoxicillin) septr
 - Antifungals – “azoles”
 - Antivirals – acyclovir, valacyclovir, paxlovid
 - Anticoagulants – rivaroxaban, apixaban
 - Antihypertensives – ACEi, hydrophilic BBs (atenolol, bisoprolol, nadolol)
 - Opioids – morphine, codeine, tramadol
- *Not an exhaustive list*
- Nephrotoxic drugs include NSAIDs, ACEi, aminoglycosides
- Cockcroft-Gault Equation: Creatinine Clearance = $(140 - \text{age}) \times \text{Weight} \times (0.85 \text{ if female}) / \text{Serum Creatinine}$
- Need to use ideal body weight (IBW):
 - Male = $50 + [2.3 \times (\text{height in inches} - 60)]$
 - Female = $45.5 + [2.3 \times (\text{height in inches} - 60)]$
- If patient obese, use adjusted body weight:
 - $\text{IBW} + [0.3 \times (\text{actual weight} - \text{IBW})]$
- [Modification of Diet and Renal Disease equation (MDRD): $\text{GFR} = 175 \times \text{serum creat} \times \text{age}$]

4. What commonly prescribed medications have a narrow therapeutic window and may easily be affected by reduced renal clearance with age?

- Aminoglycosides (gentamycin, tobramycin)
- Carbamazepine
- Digoxin
- Flecainide
- Lithium
- Phenytoin
- Phenobarbital
- warfarin
- Drugs having a small difference between plasma concentration range resulting in efficacy and toxicity

5. How might normal changes in pharmacodynamics in older adults make us consider differences in how we prescribe medications in this patient population?

- What the drug does to the body or changes that affect the patient's response to the drug
- Cardiovascular system – stiff pump/pipes and decreased beta adrenergic response. More difficult to increase cardiac output and orthostatic effects will be more dramatic. Meds like digoxin, diuretics, antihypertensives or beta blocks will commonly cause “weakness, dizziness, falls” as presenting complaints
- CNS - fewer neurons and neurotransmitters, especially dopaminergic, cholinergic and GABA. This means the CNS is more sensitive to subtle changes in its pharmacologic environment. Any medication that has a psychotropic effect - antipsychotics, benzodiazepines, antiepileptics, opioids, propofol – as well as anticholinergics, antihistamines, etc can cause greater potential for side effects including delirium

6. What are general safe principles when prescribing medications for older adults?

- Establish clear treatment goals to avoid potentially inappropriate medications
- Ensure clear indication for medication you are prescribing
- Review potential common and high risk side effects and ensure you communicate these with your patients
- Review resources such as Lexicomp to avoid potentially harmful drug interactions
- Start with a low dose of medication and titrate slowly
- Use simple regimens as much as possible
- Consider time of day that you are prescribing medications (e.g. laxatives, diuretics, steroids, etc.)
- Ensure while patient is in the ED that they have continuation of time/dose-sensitive medications (e.g. think meds for Parkinson's, chronic opioids, etc.)
- Provide clear instructions, this often needs to include written instructions in some form
- Consider alternative modes of delivery for patients going home – fax Rx to pharmacy so that patient may have medication delivered; blister pack;

automated dispensers

7. What changes would you consider making to this patient's medication list on admission orders? What new medications will you consider ordering?

As ED physicians we should be doing the following changes:

- Discontinue hydroxyzine (first generation antihistamine, anticholinergic). Likely using for symptoms associated with Meniere's but should clarify the reason patient is taking this medication. Address underlying precipitant. If absolutely necessary consider 2nd generation antihistamine such as cetirizine. High risk medication generally with low benefit.
- Discontinue oxybutynin – high risk medication with low benefit. Anticholinergic.
- Discontinue pilocarpine. By stopping the oxybutynin, you will likely improve the side effect that was being treated with this medication.
- Important to start regular analgesia with the patient's new diagnosis of compression fractures. Acetaminophen 1 g po Q6H. Regular PRNs for low dose opioids – hydromorphone 0.5-1 mg PO/SC Q4H prn.
- Discontinue ibuprofen. High risk of GI bleeding when also taking clopidogrel but also impact on BP, renal function. Patient is likely taking for arthritis but again, important to consider indication for this and prescribe alternatives such as acetaminophen, etc.

Other drug change considerations – consider initiating this process or flagging for your ED pharmacist, admitting physicians

- Consider how long the patient has been on rabeprazole for and the indication. This patient is potentially taking in the context of also being on clopidogrel. Suggest discontinuing if PPI duration >8 weeks (choosing wisely).
- Review indications for aripiprazole and citalopram for this patient – aripiprazole in particular does not seem clearly indicated from the patient's PMHx. Check for hyponatremia secondary to SSRI. Suggest geriatric psychiatry consult for review if available.
- Discontinue amlodipine and consider alternative antihypertensive such as ACEI (check renal function).
- Review with cardiology ongoing need for furosemide, spironolactone after assessment for volume status, signs of CHF, etc.

Case B

88 yo male presents to the ED with acute onset chest pain, palpitations and SOB that started 4 hours ago. He denied any preceding symptoms. There was no falls or syncope. He states he has had palpitations before but only lasted seconds to minutes and he is awaiting an outpatient holter monitor from his family physician.

He lives independent at home. Uses a cane occasionally when he is walking outside of the house for prolonged periods. He is independent with ADLs, he doesn't drive and gets some assistance with running errands from his adult children.

Past Medical History

Osteoarthritis
CKD – baseline Cr 150s, GFR 30s
Dyslipidemia
HTN
CHF – preserved EF
Ex-smoker

Medications

Naproxen BID PRN
Atorvastatin
Perindopril

Exam

Wt 70kg

VS: HR 135-165, RR 18, SpO2 96% RA, BP 142/78.

CV: irregular HR, no pitting edema.

Resp: Good air entry bilaterally. No adventitia. No increased WOB.

Abdo: Soft, non-tender. BS present.

Investigations: ECG shows Afib with rapid ventricular rate, blood work unremarkable.

1. You and your team decide to proceed with electrical cardioversion. The patient is consented. What would be some considerations for his procedural sedation?
 - Consider that due to physiological changes with age, and PK/PD, this patient is at increased risk of adverse events
 - Consider options: propofol and fentanyl, benzos, opioids only, ketamine. For this patient I would choose propofol and fentanyl
 - What dose?
 - <0.5mg/kg initial bolus. Studies have shown that older patients for ED sedation needed less total dose and weight-based doses of propofol
 - Be prepared for side effects
 - Considerations with propofol:
 - Lipophilic – drug will take longer to clear. Is it also renally cleared, thus with dec renal function with age, and this patient has CKD, you see higher plasma concentrations and prolonged clearance of propofol
 - Inc sensitivity to CNS depression with propofol
 2. You successfully cardiovert him to normal sinus rhythm. His symptoms have resolved. What, if any, medications would you consider starting in this patient? Does this affect his current medications, if so, which ones?
 - Anticoagulation:
 - Cons: HAS-BLED score, bleeding, falls risk etc.
 - Pros:
 - CHADS2
 - Loire Valley Atrial fibrillation project - oldest patients had the greatest benefit from AC
 - registry of Canadian stroke network - older age more strongly associated with ischemic stroke than hemorrhagic stroke
 - man-son-hing, JAMA 1999: caveat this was looking at warfarin (before DOACs mainstream)...and so we can expect even better bleed risks with DOACs
- “It is possible to calculate the number of falls that persons must have for warfarin to not be the optimal choice of therapy. Elderly persons who fall have a mean of 1.81 falls per year.⁴⁶ Given that the risk of SDH must be 535-fold or greater for the risks of

warfarin therapy to outweigh the benefits, **persons taking warfarin must fall about 295 (535/1.81) times in 1 year for warfarin to not be the optimal therapy."**

- Will need to stop NSAIDs due to GIB risk. Counsel patient on this, write it down. Advise alternatives – Tylenol, topical etc.
- Rate control :
 - a. Consider starting very small dose of beta-blocker. See what HR and BP is post sedation. Inquire what his baseline HR and BP is
 - b. Bisoprolol 1.25mg/2.5mg daily? Metoprolol 12.5mg PO BID?
- 3. If you decide to initiate anticoagulation for this patient, what medication would you choose and at what dose?
- Reduced dosing with apixaban – when to consider this?
 - If patient has 2 or more of the following:
 - Age 80 years or older
 - Weight 60kg or less
 - Serum creatinine >133umol/L
 - Reduced dose: 2.5mg PO BID (regular dosing 5mg PO BID)
- 4. What discharge planning would you try to arrange for this patient? What instructions do you provide the patient at time of discharge?
- Written patient instructions about Afib – thrombosis Canada has a page for patient education you can print out
- Write letter to GP about new dx, new medications
- Inform patient +/- family about side effects
- Get cardiology and GP follow-up
- Advise stopping NSAIDs – can use topical diclofenac for OA, and Tylenol scheduled or PRN
- For BBlocker – counsel on side effects, risk of postural hypotension. Get GP to followup on BP and HR to see if dose needs to be changed.