



Cases/Questions and Answers

Geriatric Core - PGY 2 Seminar

Cases and Questions with Answers and Preceptor Notes for Discussion

Case 1

72 year-old female is brought to the ED by EMS after being found at a bus stop exhibiting bizarre behavior. In the ED, she is initially calm but is expressing paranoid delusions. She is talking incessantly about her neighbour putting poison in her coffee and cameras in her apartment. She states that he records her every move. In your attempts to obtain further history from the patient, she becomes more paranoid and starts accusing you and the nursing staff of collaborating with her neighbour. You observe her looking around the room while making poor eye contact. She appears very dishevelled with worn clothing and poor hygiene. The nurses are unable to obtain vital signs or IV access as she tries to hit anyone who comes close to approaching her and becomes more agitated. Over 3-5 minutes, she continues to escalate verbally (yelling) and physically (hitting the stretcher and railings). She does not respond to any verbal de-escalation or by a show of force with security presence.

EMS was able to obtain ID for the patient from a wallet found on her, and after a chart review, you do not see any prior visits to the ED or admissions to hospital. Her only medications filled in the last 2 month are hydrochlorothiazide and alendronate. There is no next of kin or emergency contact listed for this patient.

1. What is your differential diagnosis for this patient's presentation?

- Hyperactive delirium with acute underlying medical etiology. Need to always assess for potentially reversible causes first, especially in this case
 - Drugs** – overdose, substance abuse, withdrawal, anticholinergics, sedative hypnotics, opioids, serotonin syndrome, etc.
 - Infection** – pneumonia, UTI, skin and soft tissue, CNS
 - Metabolic** - altered pH, hypo/hyponatremia, severe hypo/hypercalcemia, acute liver or renal failure, diabetic ketoacidosis
 - Environmental/Endocrine** - hypo-/hyper-cortisol, hypoglycemia, thyrotoxicosis, hyper/hypothermia, stress response
 - Structural (CNS)** – brain injury, subdural hematoma, post-ictal, stroke, tumour, brain metastasis
- More general ddx for underlying etiology of delirium:
 - D** – drugs, dehydration, detox, deficiencies, discomfort
 - E** – electrolytes, elimination abnormalities, environment
 - L** – lungs (hypoxia), liver, lack of sleep, long ED stay
 - I** – infection, iatrogenic events, infarction (cardiac, cerebral)

R – restraints, restricted mobility, renal failure

I – injury, impaired sensory inputs, intoxication

U – UTI, unfamiliar environment

M – metabolic abnormalities (glucose, thyroid), metastasis (brain), medications

- Dementia with behavioral and psychological symptoms of dementia
- Acute psychosis, primary psychiatric disorder – diagnosis of exclusion

2. What are your next steps in the management of this patient? (If considering chemical restraints, please provide medications with specific dosing and frequency of administration)

- Always consider non-pharmacological strategies first and look for underlying cause of agitation: calm environment/interactions, offer food/drink, address any pain/discomfort, etc.
- For safety reasons, would need to consider chemical sedation in this case. If patient refusing PO, consider haloperidol 0.25-0.5 mg IM/SC (max dose suggested is 1 mg) **OR** loxapine 2.5-5 mg IM as a starting dose. If willing to take PO, consider an atypical antipsychotic as first line – risperidone 0.25-0.5 mg, quetiapine 6.25-12.5 mg, olanzapine 2.5-5 mg. Better to avoid benzodiazepines as first line for delirium in this case unless suspecting withdrawal syndrome, acute intoxication, presence of seizure activity, etc. Benzodiazepines may worsen confusion, behavioural disinhibition, amnesia, ataxia, with prolonged sedation and increased fall risk. If needing to use, consider midazolam with shorter duration of action. Need to allow time for therapeutic effect of medication before repeat dosing – usually at least 60 mins for PO atypical antipsychotics.
- Antipsychotics are not a treatment for delirium, may worsen delirium and increase mortality risk. Use as a last resort only for severe and dangerous agitation and psychosis; use non-pharmacological strategies as much as possible, consider one time dose; stop as soon as possible. Start low and go slow when dosing.
- Goal is to be able to safely obtain vital signs, perform a physical exam and investigate for underlying medical etiology
- Physical exam should include looking for potential sources of infection including resp, abdomen, sacral/foot ulcers, skin, nuchal rigidity; neuro deficits; evidence of trauma; medical patches; +/- DRE (always consider fecal impaction as potential cause for delirium)

3. What are the different types of restraints available for use in the ED? What are important considerations including indications and potential harms associated with the use of different types of restraints in older adults? What kind of monitoring is required for a patient with restraints?

Four types of Restraint	
Physical • Restraining limbs e.g 4 persons to provide care • Moving a person to another location against their will	Environmental • Seclusion room • Half doors, barricades • WanderGuard • Secure units
Mechanical • Limb, waist and trunk • Back-fastening seat belt • Full bed-side rails • Chair with locking table • Broda/Geri	Pharmacologic • Antipsychotics • Antidepressants • Sedatives • Benzodiazepines • May be scheduled or prn

<https://www.albertahealthservices.ca/assets/info/hp/hpsp/if-hp-hpsp-prov-restraint-acute-notes.pdf>

- Physical restraints should always be a last resort. There is always some degree of harm associated with restraints. The least restrictive restraints should be used for the shortest amount of time possible. Informed or emergent consent required. Document clear reasons for indication and informed consent if obtained from SDM/POA. Consideration of both staff safety as well as patient's well-being/freedom
- Mechanical restraints are often used to protect medical devices such as IV's, lines, dressings, oxygen, etc. Common harms associated include increased risk of delirium, agitation, use of pharmacological restraints, extended use of antipsychotics, increased hospital LOS, PTSD.
- Pharmacologic restraints are given to control behaviors and actions and/or restrict freedom of movement. They are not used to treat a specific medical condition such as a chronic mental health condition. Ideal use of this type of restraint is using the lowest dose that allows for safety, with patient still alert and able to safely mobilize.
- When consider prescribing pharmacological restraints, should always be asking 4 questions: 1) Is there an imminent safety risk to the patient or others? 2) Are the symptoms particularly disturbing, distressing or dangerous? 3) Are the symptoms likely going to respond to your treatment? (Medications are not going to treat wandering, pacing or restless behaviors, etc.) 4) Have you weighed the potential benefits and risks?
- Antipsychotics - NNH 1/100 for stroke, mortality. Side effects include sedation, falls, postural hypotension, QT prolongation, confusion, extrapyramidal symptoms, tardive dyskinesia, thrombosis, metabolic syndrome. Health Canada Warnings for increased risk of heart failure, sudden cardiac death, stroke, infection (mostly pneumonia).

Antipsychotics are *not* effective for:

- Calling out, repetitive questions
- Wandering, exit-seeking
- Inappropriate elimination
- Eating inedibles (soap, dirt, feces)
- Perseveration (clapping, tapping)
- Inappropriate dressing/undressing



- Socially inappropriate
- Hiding/hoarding items
- Insomnia
- Spitting
- Crying
- Nervous or restless

Limited Effectiveness for Aggression:
NNT 5-14 for 3 months

<https://www.albertahealthservices.ca/assets/info/hp/hpsp/if-hp-hpsp-prov-restraint-acute-notes.pdf>

- Other types of restraints that we don't often think about when we order them – BP cuff, indwelling foley catheter, IV line, HR monitors, O2 sat monitor, height of bed, railings, absence of typical mobility aid. Ensure you are minimizing these if not clinically indicated.
- Restraints are associated with deconditioning, functional decline (ADLs, walking), increased falls risk, increased severity of injury in patients that do fall, decline in cognition, incontinence, muscle weakness, poor circulation, psychological trauma, infections, skin breakdown, behavioral changes, social isolation, depression, mortality from falls/strangulation, damages therapeutic relationship
- Monitoring should include documentation of type of restraint used, behavior status of patient, respiratory status (RR, work of breathing), sedation scale, limb status at least Q1H with regular consideration for removal or modification of restraint. At minimum Q2H the patient requires consideration of opportunity to void, eat/drink, turn/reposition, with vital signs documented at minimum Q4H. *See Island Health Acute Care Restraint Assessment & Monitoring Documentation Form as an example.*

4. What are first-line non-pharmacological management strategies for patients with delirium?

- Treat any reversible acute medical causes, optimize chronic medical illness
- Offer food/drink, provide warm blanket
- Ask about pain and offer regular analgesia
- Address bowel/bladder function, patient may need prompting or assistance to bedside commode/washroom
- Optimize function – glasses, hearing aids, mobility aids at bedside, lighting
- Orient regularly – at the beginning of every new interaction, have clock in room, whiteboard with staff names and date
- Allow/encourage regular mobilization
- Be mindful of patient interactions - ask permission to come into their space, calm approach, attempt to maintain a routine, use short simple words and phrases, don't

rush, wait for their answers. Distract by engaging in individualized activities, go along with their delusions if not distressing to them

- Education of caregivers/family - ask them to bring in familiar objects from home, encourage their presence with patient as much as possible, "familiar faces"
- During daytime, give cognitively stimulating activities
- Normalize sleep patterns and discourage daytime sleep – overnight minimize unnecessary interruptions, consider timing of labs/meds/vitals, offer eye masks/ear plugs, be mindful of patient's location in department (hallway vs. room with door, etc.)
- Avoid/remove restraints including catheters and non-essential monitor leads
- Order their regular meds from home unless likely contributing to delirium or other contraindication during acute hospital visit (e.g. antihypertensives and the patient is hypotensive)

5. What investigations would you order for this patient?

- Labs – CBC, electrolytes, creatinine, glucose (POC check early on), urea, extended electrolytes, liver enzymes, TSH, tox panel (EtOH, ASA, APAP)
- ECG +/- troponin
- CXR
- CT head – will need to consider sedation plan for this if patient continues to be agitated. More strongly indicated if history of trauma, if significantly altered level of consciousness, if new focal neurologic findings, if history is incomplete, or if there is no clear alternative cause
- Urine R&M, C&S - especially if hypo/hyperthermia, leukocytosis, urinary complaints. Otherwise should consider potential for asymptomatic bacteriuria and continue to look for other potentially reversible causes of delirium even if positive urine.
- Urine tox – consider false positive/negatives
- PVR bladder scan – important to assess for urinary retention

As part of your medical work-up for this patient, you believe a CT head is indicated. How might you safely arrange for this test? (Be specific)

- Call radiology/tech ahead of time to discuss more challenging case and need to have time window for scan
- Go down with patient and nursing staff to CT if you think you will need to use procedural sedation
- RT presence if using sedation
- Appropriate monitoring
- For sedation, consider antipsychotics - haloperidol or loxapine or PO quetiapine (most sedating atypical). If more urgent CT head required, consider your approach to procedural sedation with lower starting doses of medications used – e.g. small dose of midazolam 0.02 mg/kg (max 2.5 mg), ketamine 0.5-0.75 mg/kg.
- Consider factors surrounding consent if requiring procedural sedation for emergent CT – ultimately that it is necessary to provide health care without delay in order to preserve the patient's life, to prevent serious physical or mental harm or to alleviate severe pain

6. How would you assess for capacity in this patient? If the patient is deemed to be incapable of making decisions surrounding her medical care and treatment, what are your options to keep her in the ED involuntarily?

- Patient must have: 1) *understanding* of the disorder and its treatment, including associated benefits/risks of treatment options; 2) *appreciation* of the diagnosis and its treatment (requires insight into how these will affect the patient individually); 3) *reasoning*, which examines why and how a health care decision was made and the potential to compare consequences; and 4) ability to *express a choice*
- This is specifically to assess capacity for medical care/treatment, does not refer to other areas such as financial or global capacity
- Can still assess for capacity in patients with underlying cognitive impairment, acute medical illness, etc. All emergency physicians have the skills to perform an assessment for capacity for medical treatment.
- If deemed to not have capacity and patient is expressing clear wish to leave hospital AMA, would certify under the mental health act which permits legal detention for the purpose of a psychiatric assessment. This then also allows time for consideration of suitability to detain patient under the mental health act vs. the health care consent act.

How could you potentially apply the Health Care Consent Act (HCCA) to this clinical scenario?

- Would not be able to utilize HCCA to detain patient in this case. It can only be utilized if the patient is deemed incapable of making decisions about medical care/treatment. There is no requirement for a specific detention form. Patient is neither voluntary or involuntary. Documentation of capacity assessment is important in patient's medical record. In this case, we do not have a substitute decision-maker (SDM), but normally the highest ranking SDM should be consulted for treatment decisions. Patient should be advised of this and the right to appeal. Patient is then considered to be *informally admitted to hospital via the HCCA*.
- Even if admission was technically supported by a SDM, an informal hospital admission per the HCCA cannot generally be invoked against a patient's will/with patient actively objecting/requiring restraint to maintain hospitalization especially if there is a primary psychiatric or combined psychiatric focus of admission unless such powers expressly directed via legal documents/guardianship.

How could you potentially apply a Mental Health Certification (Form 4) under the Mental Health Act to this clinical scenario?

- This would be the more appropriate course of action for this patient's case. Need for mental health disorder to be present which includes cognitive disorders such as delirium and for disorder to be contributing to safety risk requiring psychiatric admission/hospitalization for safety. However, this does not allow you to treat medical issues against the patient's will if capably refusing. In this patient's case, the patient would have suspected concurrent medical and psychiatric causes for admission and safety/mental health certification criteria would be met. A staff physician would need to clearly fill out a Form 4 or Medical Certificate for Involuntary Admission. By filling out

this form, it allows a person to be apprehended, transported, admitted, treated, and detained as an involuntary patient for up to 48 hours. A second Form 4 can be completed by a 2nd physician to extend the involuntary hospitalization for up to 1 month starting from the date of involuntary admission.

- Involuntary admission criteria: 1) patient is suffering from an apparent mental disorder that seriously impairs their ability to react appropriately to his or her environment or to associate with others; 2) requires psychiatric treatment in or through a designated facility; 3) requires care, supervision, and control in (or through) a designated facility to prevent the person's substantial mental or physical deterioration, or for the person's own protection, or for the protection of others; and 4) is not suitable as a voluntary patient
- Need to give patient a Form 13 – notification of rights

7. You are unable to contact any substitute decision-maker for this patient. What are your next steps when it comes to making non-emergent recommendations surrounding medical treatment for this patient?

- If no designated power of attorney, no advanced directive and no temporary SDMs (family members or close friends), need to involve social work and make contact with public guardian and trustee of BC. “SDM of last resort”.

Case 2

87 year-old male presents to the ED with his wife with a triage complaint of “confusion”. On your initial assessment, the wife informs you that the patient has been noted to have worsening confusion over the past 1-2 months and is refusing care at home. He has also become very agitated over the past several weeks. Home care is maxed at 14 hours/week which he receives to help with some ADLs in the morning and evening, medication administration, along with bathing twice per week. He has been displaying both physical and verbal aggression to personal support workers and some of them have refused to return to provide care. You note significant caregiver burnout when speaking with the patient’s wife.

PMHx: dementia, hypertension, atrial fibrillation, previous L3 compression fracture

Medications: donepezil, apixaban, bisoprolol, hydrochlorothiazide, quetiapine, lorazepam prn, tramadol, vitamin D

Vitals - HR 62, BP 154/95, RR 20, O2 97% on RA, T 36.6

1. What further information on history would you want to ask?

- Always obtain collateral history. In this case, you are fortunate that the wife is present to provide this but need to seek out if caregiver is not present – think EMS report, community homecare notes, calling staff from LTC, etc. Even review of previous notes from specialists can give some indication of the patient’s baseline cognition.

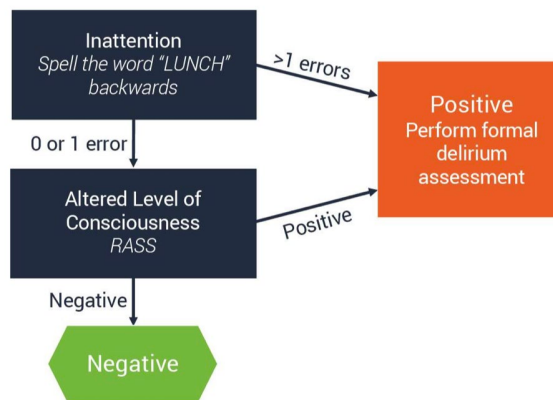
- What are specific examples of confusion? Agitation?
- Is there any pattern to confusion or agitation? Time of day? In response to certain activities such as giving meds or trying to help bathe?
- Helpful to know timing of onset. Sudden change? More gradual? Over what time period exactly.
- Have there been changes in LOC (think agitated or sleeping more) compared to baseline?
- Has the patient had new difficulties in communicating or expressing themselves?
- Any hallucinations or perceptual disturbances?
- What is their baseline cognitive and functional abilities especially in the context of their history of dementia? Has there been a sudden change to this in the past days to weeks?
- Is there any other family or friends that are supports to the patient and his wife? Consider probing re: caregiver burnout as this may be the underlying reason for patient presenting to the ED today.
- ROS for acute medical concerns
- New medication changes, new environments

2. What is your differential diagnosis of this patient's presentation? What are potential etiologies that could be contributing to this patient's "agitation"?

- Behavioral and psychological symptoms of dementia (BPSD)
- Think "all behavior communicates" or has meaning. Reframe agitation as "responsive behaviors".
- Delirium (see *Case 1* for underlying causes)
- Disease - Chronic wounds/pressure ulcers, angina, sleep apnea, etc. Essentially any poorly managed or undiagnosed chronic disease
- Drugs – anticholinergics, steroids, antipsychotics, benzodiazepines, beta blockers
- Discomfort – pain, constipation, fecal impaction, urinary retention, hunger, thirst
- Disability – sensory, functional
- Environment - over/under stimulation, relocation, change in routine, noise, lighting
- Capabilities – capability too low to meet demands of environment (catastrophic reactions) or not utilized enough (boredom).
- Social isolation, loss of culture (eg. moved cities to be closer to family for support but loss of social network)

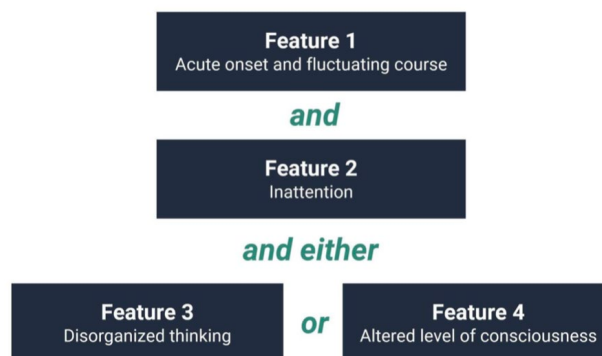
3. How might you formally screen for delirium in this patient?

- Delirium triage screen (DTS), if positive, need for further delirium screening to confirm diagnosis (low specificity ~50%). If negative, high sensitivity (~98%) and can rule out.



The DTS or delirium triage screen algorithm

- bCAM (brief Confusion Assessment Method) – acute onset and fluctuating course, inattention (test formally by asking days of week or months of year backwards) plus either disorganized thinking or altered level of consciousness (anything that is not calm and alert)



The Confusion Assessment Method algorithm.

- 4AT – alertness (RASS 0 or 1), abbreviated mental test (age, date of birth, place of birth and current year), attention (months of the year backwards), acute change in mental status/fluctuating course. Score of 4 or more is suggestive of delirium, but not diagnostic.

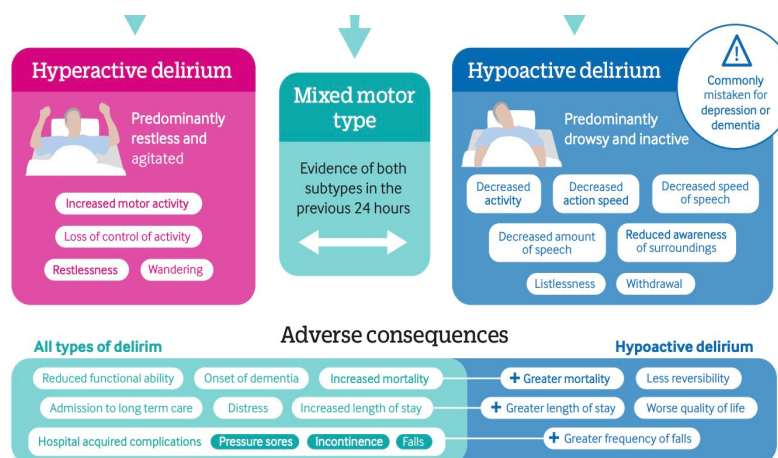
If the patient did not have a formal diagnosis of dementia, how might you formally screen for cognitive impairment in the ED?

- Mini-Cog screen – 3 word repetition (repeat words immediately), clock drawing (patient is given piece of paper with circle on it and asked to draw numbers on face of clock with hands pointing to “ten past eleven”), followed by 3 word recall (delayed)
 - o Score of 0-2 = higher likelihood of clinically important cognitive impairment
 - o Score of 3-5 = lower likelihood of cognitive impairment (although does not definitively exclude)
 - o 1 point for each word correctly recalled without prompt
 - o 2 points for normal clock, 0 points for abnormal clock

- Short blessed test – orientation to year and month; repeat made up name and address x 3; time without looking at clock or watch (accept answer within 1 hr of actual time); count backwards from 20 to 1; months of the year in reverse; repeat name and address that initially was repeated
 - o Better sensitivity
 - o Complex scoring system
- Ottawa 3DY, and other screening tools also options. Important to pick one that is easy for you to remember how to administer and score

4. What are key differences in the presentation of patients with delirium and dementia? What are the different types of delirium and how might they present differently?

	Delirium	Dementia
Onset	Acute	Slowly progressive
Awareness	Reduced	Clear
Alertness	Fluctuates	Normal
Orientation	Impaired	Impaired
Memory	Impaired	Impaired
Perception	Hallucinations	Intact
Thinking	Disorganized	Vague
Language	Slow	Word finding difficulty



5. What are behavioral and psychological symptoms of dementia (BPSD)? What are some common examples?

- Generally defined as signs and symptoms of disturbed perception, thought content, mood, or behavior. Important to realize that the behavior that we are seeing can be this person's NORMAL behavior. They don't necessarily have delirium.
- Symptom clusters include psychosis or perceptual disturbances, aggression or agitation, depression, anxiety, apathy, sleep problems, wandering, disinhibition/hypersexuality, personality changes, etc

- One or more symptoms will affect nearly all people with dementia over the course of their illness.
- These symptoms are among the most complex, stressful, and costly aspects of care, and they lead to poor patient health outcomes, including excess morbidity, mortality, hospital stays, and early placement in a nursing home.
- Many examples: the patient who is frightened and fighting staff (because they are delusional); the patient who is constantly attempting to get out of the stretcher and wanting to pace in the hall (restless); the person who won't let you examine them (amotivation/withdrawn), etc.

6. What strategies might you use in the assessment and management of a patient with BPSD? (Consider both non-pharmacological and pharmacological strategies)

- Ensure patient and staff safety
- Need to obtain collateral history, need to obtain consent for certain investigations or procedures from SDM
- Always consider delirium with appropriate work-up for reversible causes
- Orient regularly, speak clearly and slowly, ask permission, optimize their hearing, provide clear choices
- Address basic needs – hunger/thirst, mobility
- Address discomfort
- Ask about engaging a volunteer, sitter or a family member to help with activities - play music, provide puzzles, "fidget or activity blanket", give them something to fold
- ABC behavior log – antecedent (what happened immediately before), behavior (described in detail), consequence (what was reaction and outcome). Important for observing and documenting responsive behaviors. This tool is best practice for evaluating challenging or difficult responsive behaviors in patients with dementia.
- We need to characterize the behavior of these patients if they are in our ED for any prolonged period of time. Goal is to identify factors that can trigger or reinforce acute behavioural incidents and to modify them.
- TADA approach – tolerate, anticipate, don't agitate
- Consider antipsychotics only if safety concern, symptoms particularly disturbing, distressing or dangerous and likely to respond to treatment.
- During disposition planning, need to assess for high risk factors that may make discharge unsafe: roaming/wandering, imminent danger (falls, fire setting, etc.), suicidal ideation, elder abuse or inadequate social support, driving, substance use, self-neglect
- <https://www.acep.org/patient-care/adept/> - reference tool for elderly patient agitation and confusion in the ED

7. Which of the patient's medications could potentially cause delirium and why? What changes or suggestions to his medications could you make to decrease this risk?

- Lorazepam - age-related pharmacodynamic changes result in increased sensitivity and decreased clearance of benzodiazepines, which leads to both cognitive impairment and delirium. Can also cause significant sedation and occasional paradoxical agitation even at low doses. Exposes users to risks of abuse, misuse, addiction and withdrawal.

- Determine how often patient is taking this. Make sure to order for patient in ED if taking regularly to reduce risk of withdrawal. If taking regularly, consider recommendation in your documentation for safe/slow taper by specialist or primary care. If patient is not taking regularly, consider indication patient is taking this for and other safer alternatives.
- Tramadol – opioids associated with higher rates of delirium, but tramadol associated with highest risk (after meperidine). Can also cause constipation, hyponatremia which can precipitate delirium
 - Discontinue tramadol. Order regular dosing of extra strength Tylenol. PRN low dose opioid such as hydromorphone 0.5-1 mg PO Q4H PRN
- Hydrochlorothiazide – hyponatremia
 - Check electrolytes, if normal, safe to continue if no hypotension

8. What are examples of potentially harmful medications in older patients that are commonly prescribed/ordered in the ED? What resources could you reference to determine which medications may be higher risk for older adults?

- Gravol/Dimenhydrinate – anticholinergic, sedating, risk of delirium, falls
- Benadryl/diphenhydramine – anticholinergic, sedating, urinary retention, confusion, delirium and falls risk
- Benzodiazepines – sedative. Increased risk of cognitive impairment, delirium, falls, fractures, and motor vehicle crashes
- Cyclobenzaprine - 5-HT₂ receptor antagonist, anticholinergic. Centrally acting. Causes sedation, dizziness, falls, delirium, cognitive impairment.
- Zopiclone – sedative. Similar side effect profile to benzodiazepines and minimal improvement in sleep.
- Nitrofurantoin - potential for pulmonary toxicity, hepatotoxicity, and peripheral neuropathy, especially with long-term use; safer alternatives available. Not appropriate for complex UTIs which many older people have.
- NSAIDs - Increased risk of gastrointestinal bleeding or peptic ulcer disease in high-risk groups, including those >75 years or taking oral or parenteral corticosteroids, anticoagulants, or antiplatelet agents; use of proton-pump inhibitors reduces but does not eliminate risk. Upper gastrointestinal ulcers, gross bleeding, or perforation caused by NSAIDs occur in ~1% of patients treated for 3-6 months and in ~2%-4% of patients treated for 1 year; these trends continue with longer duration of use. Also can increase blood pressure and induce kidney injury. Risks are dose related.
- Antipsychotics – *see above*
- Metoclopramide - Can cause extrapyramidal effects, including tardive dyskinesia; risk may be greater in frail older adults and with prolonged exposure
- PPIs - risk of *Clostridium difficile* infection, osteoporosis and fractures with long-term use
- Resources include ED pharmacist**, Beers list, STOPP/START criteria, choosing wisely, anticholinergic burden calculator

9. What are some examples of safer alternatives or different methods of administration that are lower risk?

- Nausea – ondansetron, isopropyl alcohol
- Sleep – promote sleep hygiene, ear plugs, eye mask
- Analgesia – tylenol, low dose hydromorphone PO/SC prn
- UTI – cefixime
- Allergy - calamine lotion; cetirizine or loratadine - second-generation H1-antihistamines are newer drugs that are much more selective for peripheral H1 receptors as opposed to the central nervous system H1 receptors and cholinergic receptors. This selectivity significantly reduces the occurrence of adverse drug reactions, such as sedation.

Case 3

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 anethole trithione 25 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, citalopram, hydroxyzine (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

3. Why are older adult patients at higher risk of adverse drug events (ADEs)?

- Changes in pharmacokinetics and pharmacodynamics
- Polypharmacy – extent is directly linked to the risk of adverse drug events
 - o 5-7 medications increases risk of ADEs by 4-fold
 - o 8-10 medications increase risk of ADEs by 8-fold
- Polymorbidity
- Disability – e.g. arthritis causing difficulty opening pill bottles
- Changes in medication adherence
- Cognitive impairment
- Sensory impairment

4. What are normal pharmacokinetic changes that occur in older adults that can impact medication effect and risk of adverse drug reactions?

- What the body does to the drug, changes that can affect drug concentration in the body
- Absorption – decreased gastric pH, slower gastric emptying, decreased splanchnic blood flow, decreased bowel motility and decreased absorptive capacity
 - o In general, this has a very small effect in general
 - o Example: antacids containing calcium or magnesium will impair the absorption of antibiotics, aspirin, and digoxin; may need increased dose of B12, calcium, iron to achieve same therapeutic effect
- Distribution – increased adipose tissue and decreased total body water.
 - o If drug is water soluble, the volume of distribution in the older body is much less and therefore the serum concentration will be greater than expected for a given dose (e.g. digoxin, HCTZ, penicillins, most cephalosporins, sotalol, lithium)

- If drug is fat soluble, the volume of distribution in the older body is greater and therefore the serum concentration will be less than expected for a given dose (e.g. midazolam, diazepam, quetiapine, amiodarone, propranolol). Lipophilic drugs will also accumulate with repeated dosing, increasing duration of effect
- Serum albumin decreases and other proteins increases with age, but the clinical effect of these changes on serum drug binding varies with different drugs. In patients with an acute disorders such as sepsis or malnutrition, rapid reductions in serum albumin may enhance drug effects because serum concentrations of unbound (free) drug may increase. Phenytoin and warfarin are examples of highly protein-bound drugs with a higher risk of toxic effects when the serum albumin level decreases acutely.
- Metabolism – phase 1 metabolism in the liver is decreased with age. For example, CYP 450 enzymes decrease by about 30% in older adults. Medications with phase 1 metabolism are more likely to accumulate. Phase 2 metabolism is largely unchanged.
- Elimination – significant decrease in renal function with age. There is decreased renal mass, decreased number of nephrons, and decreased blood flow to the kidneys.

5. What are common medications prescribed or ordered in the ED that are hepatically metabolized (specifically by Phase 1 metabolism)? How might their metabolism be affected in normal aging changes in physiology?

- Analgesics – acetaminophen, NSAIDs (celecoxib, diclofenac, indomethacin)
- Antiarrhythmics – lidocaine, amiodarone
- Antibiotics – macrolides (e.g. azithromycin), fluoroquinolones, septr, metronidazole
- Antidepressants - TCAs, SSRIs, SNRIs
- Antipsychotics – haloperidol, olanzapine, risperidone
- Antiepileptics – phenytoin, carbamazepine, phenobarbital
- Opioids – methadone, morphine, fentanyl, tramadol
- Sedatives – benzodiazepines (midazolam), trazodone
- Steroids – prednisone, dexamethasone
- Misc – warfarin, beta blockers, calcium channel blockers, nitrates, PPIs, metoclopramide
- These medications are more likely to accumulate due to decreased phase 1 metabolism – improves drug bioavailability and efficacy and increases potential toxicity
- Technically more complex as some drugs are CYP inducers or inhibitors rather than simple substrates
- Meds to be cautious of in this patient are aripiprazole, citalopram, ibuprofen
- In the ED, more clinically relevant when multiple doses of meds are administered, higher risk of drug toxicity

6. 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, fluroquinolones (ciprofloxacin and levofloxacin), nitrofurantoin, penicillins (pip-tazo, amoxicillin) sepra
- 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): $\text{GFR} = 175 \times \text{serum creat} \times \text{age}$]

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, and warfarin
- Drugs having a small difference between plasma concentration range resulting in efficacy and toxicity

7. 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

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

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

- **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.
- 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 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.
- **Discontinue oxybutynin – high risk medication with low benefit. Anticholinergic.
- Discontinue anethole trithione. By stopping the oxybutynin, you will likely improve the side effect that was being treated with this medication.
- *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.
- **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.
 - o ** - we as emergency physicians should be doing this
 - o * - depending on your level of comfort, consider initiating this process or flagging for your ED pharmacist, admitting physicians