

Answer Key

Question 1: What is this patient's Delirium risk assessment score: low, medium or high?

Delirium Risk Assessment: Delirium Risk Screen

Delirium Risk Assessment: Delirium Risk Screen (Marcantonio et al.)	
Age ≥ 70	If YES: 1 point
Alcohol abuse	If YES: 1 point
Cognitive impairment: MMSE < 25/30 or Telephone Interview for Cognitive Status (TICS) score <30	If YES: 1 point
Electrolytes: Abnormal sodium, potassium or glucose <small>* sodium, <130 or >150 mmol/L; potassium, <3.0 or >6.0 mmol/L; and glucose, <60 or >300 mg/dL.</small>	If YES: 1 point
Poor functional status =Specific Activity scale of Class IV. (means <2 mets (light intensity activity e.g Can't dress without stopping because of symptoms.) <small><i>1 MET</i> = the energy (oxygen) used by the body as you sit quietly, perhaps while talking on the phone or reading a book.</small>	If Yes: 1 point
Type of surgery: is it either non-cardiac thoracic surgery or AAA repair?	If Yes: 1 point
Score: 0 = low risk 1-2 = medium risk ≥3 = high risk of delirium	
Delirium Risk: <input type="checkbox"/> Low (2%) <input type="checkbox"/> Medium (11%) <input type="checkbox"/> High (50%)	

Suggested readings:

1. Marcantonio EJ, Goldman L, Mangione CM et al. A clinical prediction rule for delirium after elective noncardiac surgery. JAMA 1994;271:134–139.
2. Fong TG, Tulebaev SR, Inouye SK. Delirium in elderly adults: diagnosis, prevention and treatment. Nature reviews. Neurology. 2009;5(4):210-220.

Question 2: What are some risk factors for delirium in this patient?

Check ones they identified	Pre-existing factors	
	1	Age
	2	Cognitive impairment/dementia
	3	hearing and visual impairment
	4	Impairment in IDLs
	5	Functional impairment
	6	Malnutrition (alb 2.1)
	7	Polypharmacy and high risk medications (glyburide, Prozac, tramadol)
	8	CKD
	9	constipation
	10	Multiple comorbidities
	11	Alcohol use
	12	anemia
	13	Depression
	14.	Male
	Preoperative Risk factors	
	1	Uncontrolled pain
	2	Acute on chronic kidney disease
	3	Emergent/Urgent surgery
	4	Dehydration
	5	anemia
	6	Electrolyte abnormalities
	7	Uncontrolled glucose
	8	Poor vision/hearing
	9	Acute medical condition
	10	Low blood pressure, tachycardia,
	11	Elevated bilirubin/elevated AST/ALT
	12.	Environmental changes
	13.	Medication withdrawal: Betablocker, SSRI.

Suggested Readings:

1. Inouye SK, Zhang Y, Jones RN, Kiely DK, Yang F, Marcantonio ER. Risk factors for delirium at discharge: development and validation of a predictive model. *Archives of internal medicine*. 2007;167(13):1406-1413.
2. Dasgupta M, Dumbrell AC. Preoperative risk assessment for delirium after noncardiac surgery: a systematic review. *J Am Geriatr Soc*. 2006;54(10):1578-1589.

Question 3: You are the upper level resident. Realizing the patient's delirium risk score is high, what adjustments would make to the intern's admission orders to reduce the patient's risk of developing delirium?(i.e what preventive measures would you implement?)

(see next page)

Suggested readings:

1. Schwartz's Principles of Surgery, 10e : Chapter 47: Surgical Considerations in the Elderly.
2. Tan KY. Novel perioperative models make a difference in outcomes of elderly surgical patients.*Annals of Surgery*. 2014;259(4):e62-e63.
3. Shipway D, Harari D, Dhesi J. Peri-operative management of older people undergoing surgery. *Reviews in Clinical Gerontology*. 2014;24(1):78-92.
4. Partridge JS, Harari D, Martin FC, Dhesi JK. The impact of pre-operative comprehensive geriatric assessment on postoperative outcomes in older patients undergoing scheduled surgery: a systematic review. *Anaesthesia*. 2014;69 Suppl 1:8-16.

Check ones they identified	Pre-existing factors	Prevention/Treatment orders	Nursing orders/Care orders
	1 Age \geq 70	n/a	n/a
	2 Cognitive impairment/dementia	n/a	Get family involved with patient's care. Do environmental adaptations: (e.g., Use care boards, a large clock, calendars to aid in reorientation, enhanced lighting by opening shades and keep lights on during the day, and implement noise reduction.)
	3 Hearing and visual impairment	n/a	Make sure the patient has his glasses, hearing aids, dentures ect. -oral mouth care.
	4 Impairment in IDLs	n/a	n/a.
	5 Functional impairment	Order PT/OT consulted, early mobilization. Order appropriate anticoagulation to prevent DVT/PE.	Order to have patient OOB for each meal Order Skin care by nurse to prevent skin breakdown.
	6 Malnutrition with alb 2.1	Make sure nutrition is consult and optimize nutrition.	Have the nurse encourage PO intake, possibly 1:1 Feeds.
	7 Polypharmacy and high risk medications (glyburide, Prozac, tramadol, Benadryl)	-Eliminate unnecessary medications -Treat pain initially with Tylenol, if still uncontrolled pain, use a low dose opiate (i.e. oxycodone 2.5mg) -Avoid glyburide in older adults with renal impairment (use insulin while in the hospital) -Avoid use of Tramadol and Benadryl in older patients is possible.	n/a
	8 CKD	Consult pharmacy to review medications and adjust medications for renal impairment and avoid nephrotoxic medications.	Monitor I/Os.
	9 constipation	Implement a good bowel regimen to prevent constipation. (goal is one BM a day or at least every other day) Recommendations are. 1 st : started with docusate/senna 2 tabs QHS 2 nd : if still constipated add Miralax daily 3 rd : if still no BM, do bisacodyl sup.	Monitor for daily bowel movements.
	10. Multiple comorbidities	n/a	n/a

Check ones they identified	Pre-existing factors	Prevention/Treatment orders	Nursing orders/Care orders
	11 Alcohol use	Many physicians forget to ask older adults about their drinking history. If patient had drinking history, recommend order CIWA to monitor for withdrawal.	Have the nurse perform CIWA.
	12 anemia	If elective surgery, try to correct/work up prior to surgery. Since this was not elective, then try and avoid intraoperative blood transfusion if possible. Recommend to only transfuse if Hb <7.0.	N/a
	13 Depression	n/a.	n/a
	14. Male	N/a.	n/a
Preoperative Risk factors			
	1 Uncontrolled pain	Evaluate and treat pain or discomfort Treat pain initially with Tylenol (po or IV), if still uncontrolled pain, use a low dose opiate (i.e. oxycodone 2.5mg liq). -Morphine 2-4mg IV would not be a good initial treatment option in this patient especially given his AKI/CKD. -So if the patient is NPO and rec'd low dose dilaudid 0.2mg IV if IV Tylenol is not controlling the patient's pain in a patients with renal impairment.	Order to have the nurse assess for pain and let you know if the patient is having uncontrolled pain.
	2 Acute on chronic kidney disease	Try and correct AKI if possible. Make sure you renally dose all your medications and avoid nephrotoxic medications.	Order to monitor urine output.
	3 Foley catheter	Preventing UTI will reduce the incidence of delirium, -try and avoid foley's or remove as soon as possible. So would rec'd not placing foley but if they are placed then to remove as soon as possible and do PVR to make sure the patient is not retaining. (want a PVR<200).	Order to have the nurse do Post-void residuals after foley is removed and call physician if PVR>250. Monitor I/Os
	4 Emergent/urgent surgery	n/a	n/a
	5 Dehydration	Correct dehydration,	Monitor I/Os.
	6 anemia	If elective surgery, try to correct/work up prior to surgery. Try and avoid intraoperative blood transfusion if possible.	n/a
	7 Electrolyte abnormalities	Correct and monitor electrolyte abnormalities.	n/a
	8 Uncontrolled glucose	Monitor glucose closely and control with insulin is needed. Consider ISS. Recommend to hold oral hypoglycemic whiles acutely in the hospital. -Since this patient is NPO, rec'd FBG Q6 with ISS. Don't need to schedule standing insulin since pt was only on oral hypoglycemic at home. don't rec'd continuing oral hypoglycemic acutely while in the hospital.	If Diabetic order AC/HS FBG unless NPO then do Q6hr FBG.

Check ones they identified	Pre-existing factors		Prevention/Treatment orders	Nursing orders/Care orders
9	Poor vision/hearing			<ul style="list-style-type: none"> -Make sure the patient has his glasses, hearing aids, dentures etc. -Speak clearly and directly to the patient so they can read lips -Arrange for earwax disimpaction if needed
11	Low blood pressure, tachycardia		<ul style="list-style-type: none"> Monitor for dehydration and hydrate as needed. Monitor for Beta blocker withdrawal. 	<ul style="list-style-type: none"> -Check orthostatic blood pressures.
12	<p>Medications:</p> <p>morphine (esp. given AKI/CKD) and Benadryl</p> <p>And Medication withdrawal: Betablocker, SSRI</p>		<ul style="list-style-type: none"> -Eliminate unnecessary medications -Treat pain initially with Tylenol if necessary start with low dose opiate. -Limit morphine use in older adults with renal impairment -Avoid Benadryl in older patients. <p>Treatment of itching:</p> <ul style="list-style-type: none"> -1st line: Barrier repair creams/moisturizers/emollients -can try Topical corticosteroids if there is skin inflammation. - Menthol 1-3% cream: Useful in patients who report cooling as an alleviating factor - Pramoxine 1 to 2.5%: Useful for pruritus on face and that associated with CKD -If those don't work can try non-sedating anti-histamines like loratadine. - Monitor for medication withdrawal. 	n/a.
13	Elevated bilirubin/elevated AST/ALT		n/a	n/a
14	Environmental changes		<ul style="list-style-type: none"> -order sitter if needed to help provide patient safety,. 	<ul style="list-style-type: none"> -Minimize noise, Minimize staff and room changes. -Provide visual clocks and calendars. -Appropriate lighting, blinds open during day, bed by window. Lower bed. Move room near nurse station. -Encourage family to stay with patient. -Make sure call bell, personal items, glasses, hearing aids within reach at all times.

Question 4: What are some factors intra-operatively that can cause postoperative delirium?

Intraoperative risk factors		
1		Blood loss >1000ml
2		Intraoperative blood transfusion.
3		Intraoperative hypotension/fluctuations in blood pressure
4	General Anesthesia (not monitored with EEG) and American Society of Anesthesiologists (ASA) Physical Status score of 3	
	ASA PS 3 Patients with severe systemic disease	Some functional limitation; has a controlled disease of more than one body system or one major system; no immediate danger of death; controlled congestive heart failure (CHF), stable angina, old heart attack, poorly controlled hypertension, morbid obesity, chronic renal failure; bronchospastic disease with intermittent symptoms
5		Urgent Surgery
6.		Longer duration surgery

Suggested Readings:

1. Strom C, Rasmussen LS, Sieber FE. Should general anaesthesia be avoided in the elderly? *Anaesthesia*. 2014;69 Suppl 1:35-44
2. Turrentine FE, Wang H, Simpson VB, Jones RS. Surgical risk factors, morbidity, and mortality in elderly patients. *J Am Coll Surg*. 2006;203(6):865-877.
3. *Scientific American Surgery* :Chapter 103: Perioperative Considerations for Anesthesia.
4. Hirsch J, DePalma G, Tsai TT, Sands LP, Leung JM. Impact of intraoperative hypotension and blood pressure fluctuations on early postoperative delirium after non-cardiac surgery. *British journal of anaesthesia*. 2015.

Question 5: Using the 4AT that we taught you, does this patient have delirium or just lethargy from surgery?

So answer is yes he is delirious.

	CIRCLE
[1] ALERTNESS	
<i>This includes patients who may be markedly drowsy (eg. difficult to rouse and/or obviously sleepy during assessment) or agitated/hyperactive. Observe the patient. If asleep, attempt to wake with speech or gentle touch on shoulder. Ask the patient to state their name and address to assist rating.</i>	
Normal (fully alert, but not agitated, throughout assessment)	0
Mild sleepiness for <10 seconds after waking, then normal	0
Clearly abnormal	4
[2] AMT4	
<i>Age, date of birth, place (name of the hospital or building), current year.</i>	
No mistakes	0
1 mistake	1
2 or more mistakes/untestable	2
[3] ATTENTION	
<i>Ask the patient: "Please tell me the months of the year in backwards order, starting at December." To assist initial understanding one prompt of "what is the month before December?" is permitted.</i>	
Months of the year backwards	0
Achieves 7 months or more correctly	0
Starts but scores <7 months / refuses to start	1
Untestable (cannot start because unwell, drowsy, inattentive)	2
[4] ACUTE CHANGE OR FLUCTUATING COURSE	
<i>Evidence of significant change or fluctuation in: alertness, cognition, other mental function (eg. paranoia, hallucinations) arising over the last 2 weeks and still evident in last 24hrs</i>	
No	0
Yes	4
<hr/> 4AT SCORE _____ 10 _____	
4 or above: possible delirium +/- cognitive impairment	
1-3: possible cognitive impairment	
0: delirium or severe cognitive impairment unlikely (but delirium still possible if [4] information incomplete)	

Suggested Reading:

1. [Bellelli G, Morandi A, Davis DH, Mazzola P, Turco R, Gentile S, Ryan T, Cash H, Guerini F, Torpilliesi T, Del Santo F, Trabucchi M, Annoni G, Maclullich AM. Validation of the 4AT, a new instrument for rapid delirium screening: a study in 234 hospitalised older people. Age Ageing. 2014 Mar 14.](#)

Question 6: What are some treatment options non-pharmacological that you can implement to help treat this patient's delirium?

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- Interdisciplinary team approach involving nursing, geriatrics and surgery should be used for at-risk older adults to prevent delirium.
 - Non-pharmacological treatment involves recognizing and treating precipitating factors as (refer to the mnemonic "Delirium").
 - It also involves reviewing medications to eliminate unnecessary medication, renally dosing medications if patient has renal failure, and avoiding high risk medications.
 - Thus in this patient we would want to stop the Ativan, not use dilaudid first line for pain but Tylenol instead and then low dose opiates as 2nd line (e.g. 0.2mg IV dilaudid Q4 prn or 2.5mg oxycodone Q4 prn pain). Correct any deficits, adapt environmental factors (lighting, etc.), remove any tethers like foley and implement a bowel regiment so the patient has a bowel movement.

Things to Think About in Terms of Risk Factor (RF), Prevention (P), and Management (M) of Delirium

Deficits that can be corrected or accommodated: e.g. hearing, vision, dentures, oxygen, hydration, nutrition, metabolic imbalances, electrolytes, constipation, UA retention (RF,P,M)

Environmental factors: e.g. rest/sleep deprivation, stimulation control (avoid over and under stimulation), lighting, familiarity of surroundings, orientation (e.g. clock, pictures, reminders), implement non-pharmacological sleep protocol by the nurse instead of sleep aids.(RF,P,M)

Longevity/age>70 (RF)

Impaired functional status, general health status: early mobilization, PT/OT consults (RF,M);

Restraints, avoid, along with other tethers (foley, IV, ect) (RF,P,M)

Intellect/CNS function: e.g. dementia, stroke, depression (RF)

Uncomfortable; manage pain pain control with scheduled tylenol (limit 3g/day), if needed use low dose opioid (e.g. 2.5mg oxycodone Q4 PRN, So if the patient is NPO and rec'd low dose dilaudid 0.2mg IV if IV Tylenol is not controlling the patient's pain in a patients with renal impairment.)

(RF,P,M)

Medications / anesthetic agents Avoid high risk medications in the elderly (see list below), especially benzodiazepines and monitor for drug withdrawal. (RF,P,M)

Acute stressors: surgery, infection, metabolic disorders, other acute illness (RF, M)

Some Top High Risk Medications:

Drug	Concern	Potential Alternatives
<p><i>Carisoprodol</i></p> <p><i>Chlorzoxazone</i></p> <p><i>Cyclobenzaprine</i></p> <p><i>Metaxalone</i></p> <p><i>Methocarbamol</i></p> <p><i>Orphenadrine</i></p>	<p>Skeletal Muscle Relaxants:</p> <p><i>Anticholinergic side effects: worsened cognition & behavioral problems (especially in dementia); urinary retention OR incontinence; confusion; sedation; weakness; questionable efficacy (at lower doses)</i></p>	<p>Non-pharmacologic treatment:</p> <p>Baclofen, tizanidine</p>
<p>Diphenhydramine,</p> <p>hydroxyzine</p>	<p>Older Antihistamines:</p> <p><i>Anticholinergic side effects: worsened cognition & behavioral problems (especially in dementia); urinary retention OR incontinence; confusion; enhanced sedation</i></p>	<p>For itching</p> <p>triamcinolone cream 0.025% or OTC emollients</p> <p>For allergic rhinitis:</p> <p>nasal steroid sprays, or low-sedating antihistamines such as levocetirizine or OTC loratadine or cetirizine</p>
<p>Zolpidem,zaleplon, Lunesta</p>	<p>Non-benzodiazepine hypnotics</p> <p><i>Avoid chronic use >90 days</i></p> <p><i>Associates with sleep walking,delirium and falls</i></p>	<p>Non-pharmacologic treatment :</p> <p>Sleep hygiene; cognitive behavior therapy;</p> <p>non-pharm sleep protocol.</p>

		Pharm Treatment: Trazodone
Promethazine Reglan	Anti-Nausea medications <i>Strong anticholinergic and sedation properties</i> <i>Associated with extrapyramidal adverse events.</i>	Prochlorperazine Ondasetron
Diazepam	Benzodiazepines <i>Accumulation in elderly due to altered metabolism and active metabolites leads to daytime sedations, increase fall risk.</i>	Buspirone Fuloxetine Sleep hygiene Melatonin (OTC) Mirtazapine Trazadone

Suggested Readings:

1. Inouye, Sharon K. et al. Postoperative Delirium in Older Adults: Best Practice Statement from the American Geriatrics Society, Journal of the American College of Surgeons , Volume 220 , Issue 2 , 136 - 148.e1 2015.
2. Fong TG, Tulebaev SR, Inouye SK. Delirium in elderly adults: diagnosis, prevention and treatment. Nature reviews. Neurology. 2009;5(4):210-220.

Question 7: what are some pharmacological treatments that you could use if patient continues to have hyperactive delirium and risk at hurting self or others? List drug name, appropriate starting dose for an elderly patient and adverse reactions to monitor for.

A systematic review of acute drug treatments for delirium indicated that few high-quality, randomized, controlled trials have been performed to date, and current clinical practice is, therefore, based largely on case series and retrospective reports medications are usually reserved for patients in whom the symptoms of delirium might compromise safety or prevent necessary medical treatment (that is, those with hyperactive delirium who may be a harm to themselves or others).

-----Increasing sedative effects----->
Haloperidol(0.5-1mg) risperidone(0.5-1mg) olanzapine(2.5-5mg) quetiapine(12.5-25mg)
 <-----Worsening EPS-----

Drug	Dose	Adverse effects
Typical antipsychotics		
Haloperidol	0.5–1 mg PO or IM; can repeat every 4h (PO) or every 60 min (IM)	Extrapyramidal syndrome, prolonged QT interval

Drug	Dose	Adverse Effects
Atypical antipsychotics		
Risperidone	0.5 mg BID	Extrapyramidal syndrome, prolonged QT interval
Olanzapine	2.5–5 mg daily	
Quetiapine	25 mg BID	

Extrapyramidal symptoms:

- **Acute dystonic reactions:** muscular spasms of neck, jaw, back, extremities, eyes, throat, and tongue; highest risk in young men.
- **Akathisia:** A feeling of internal motor restlessness that can present as tension, nervousness, or anxiety
- **Pseudoparkinsonism:** drug-induced [parkinsonism](#) (rigidity, bradykinesia, tremor, masked facies, shuffling gait, stooped posture, sialorrhoea, and seborrhoea; greater risk in the elderly).
- **Tardive dyskinesia:** involuntary muscle movements in the lower face and distal extremities; this is a chronic condition associated with long term use of antipsychotics

Suggested Reading:

1. Hshieh TT, Yue J, Oh E, et al. Effectiveness of multicomponent nonpharmacological delirium interventions: a meta-analysis. *JAMA Intern Med.* Published online February 2,2015.

2. Inouye, Sharon K. et al. Postoperative Delirium in Older Adults: Best Practice Statement from the American Geriatrics Society, *Journal of the American College of Surgeons* , Volume 220 , Issue 2 , 136 - 148.e1 2015.
3. Fong TG, Tulebaev SR, Inouye SK. Delirium in elderly adults: diagnosis, prevention and treatment. *Nature reviews. Neurology*. 2009;5(4):210-220

Question 8: What are some ramifications that can occur since this patient developed postoperative delirium?

Adverse outcomes of delirium (there are many ☺)	
1	mortality
2	Increased institutionalization esp since his delirium may not allow him to be able to participate in PT/OT.
3	Cognitive impairment (if they didn't have any prior then can last up to 1 year and be similar to a patient with TBI- In a pt with dementia who develops delirium can lead to further cognitive decline which can last up to 5 years if not longer).
4	Increased length of stay
5	Functional impairment
6.	Increase postoperative complication rates: infections, ect.
7.	Increase readmission rates
8.	Decreased patient satisfaction
9.	Increased caregiver burden.
10.	Falls
11.	Death

Suggested readings:

1. Bellelli G, Mazzola P, Morandi A, et al. Duration of postoperative delirium is an independent predictor of 6-month mortality in older adults after hip fracture. *J Am Geriatr Soc*. 2014;62(7):1335-1340
2. McAvay GJ, Van Ness PH, Bogardus ST, Jr., et al. Older adults discharged from the hospital with delirium: 1-year outcomes. *J Am Geriatr Soc*. 2006;54(8):1245-1250.
3. Hopkins RO, Jackson JC. Assessing neurocognitive outcomes after critical illness: are delirium and long-term cognitive impairments related? *Curr Opin Crit Care*.2006;12:388–94
4. Fong TG, Tulebaev SR, Inouye SK. Delirium in elderly adults: diagnosis, prevention and treatment.*Nature reviews. Neurology*. 2009;5(4):210-220