Preventing Perioperative Delirium

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Objectives
- Identify patients at risk for post-operative delirium using simple screening tools.
- Be able to implement elements of an evidence based prevention protocol for delirium.
- Understand the state of the evidence, and its limits, for treatment of post-operative delirium.

Clinical Case
Gertrude’s Tragic Tale
- 88 y/o woman with fall stepping off a curb outside her assisted living on a Saturday.
- X-ray demonstrates hip fx.
- Admit for operative repair scheduled for Monday.
- PMH
  - Mild Alzheimer’s Dementia
  - Insomnia
  - HTN
  - Chronic renal insufficiency
  - Depression
- Medications
  - Lisinopril 10mg daily
  - Aspirin 81 mg daily
  - Amitriptyline 50mg qhs
  - Oxybutynin 5mg bid.
Gertrude's Tragic Tale

- Gertrude is confused
- Does not remember her home medications
- When asked what year it is she replies: "Honey, I don't have to know that at my age" – Can spell "WORLD" backwards with effort
- Tells you a bright and animated story about her dog and how funny it was when he ate peanut butter

Is Gertrude Delirious?

Delirium

"Acute onset of disturbance in consciousness in which cognition or perception is altered"

Disturbance in Cognition

- Acute/Fluctuating
- Inattention
- Altered Level of Consciousness
- Disorganized Thinking

Since Gertrude is attentive you know she is not currently delirious

Quantifying Delirium Risk

Elective Non-cardiac Surgery

1. Age > 70 = 1 pt
2. Hx alcohol abuse = 1 pt
3. Cognitive impairment = 1 pt
4. Severe physical impairment = 1 point
5. Abnormal glucose or electrolytes = 1 pt
6. Noncardiac thoracic surgery = 1 point
7. AAA surgery = 2 points

Delirium Incidence
- 0 points = 2%
- 1-2 points = 11%
- ≥3 points = 50%

Cardiac Surgery

1. MMSE
   - ≤23 = 2 pts
   - 24-27 = 1 pt
2. Geriatic Depression Scale > 4 = 1 pt
3. Hx CVA/TIA = 1 pt
4. Albumin ≤3.5 or ≥4.5 = 1 pt

Delirium Incidence
- 0 points = 16%
- 1 point = 43%
- 2 points = 60%
- ≥3 points = 87%


Delirium Rates Were 4X higher in Hip Fracture Patients Compared to Elective Hip Surgery Patients

Quantifying Delirium Risk
Hip Surgery Patients

1. Cognitive impairment (MMSE < 24) = 1 pt
2. Severe Illness (APACHE II >16) = 1 pt
3. High BUN/Cr (>18/1) = 1 pt
4. Vision impairment (>20/70) = 1 pt

<table>
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<tr>
<th>Delirium Incidence</th>
<th>Low Risk (0)</th>
<th>Int. Risk (1-2)</th>
<th>High Risk (3-4)</th>
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<tbody>
<tr>
<td></td>
<td>4% risk</td>
<td>11% risk</td>
<td>37% risk</td>
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Mechanism of Delirium
- Imbalance of Neurotransmitters
  - Acetylcholine
  - Dopamine
  - Others
- Hypothalamic-pituitary-adrenal axis
- Inflammation
  - Cytokines (TNF, Interleukins)
- Occult diffuse brain injury
  - Especially following sepsis (ischemic insult)

Prevention of Delirium
- Anesthesia
  - Regional versus general anesthesia may have less post-operative cognitive dysfunction but impact on delirium is debated
  - Depth of sedation (light associated with % the delirium as deep)
  - Choice of ICU sedative agent (Dexmedetomidine better than lorazepam)

- Risperidone caused delirium in CABG pts
  - Another trial of prophylactic haloperidol in hip surgery did not reduce delirium development

- Multifactorial Geriatric Consultation - 40% reduction
Problematic Medications

- Sedative/Hypnotics
  - Diazepam, Lorazepam, Zolpidem
- Narcotics
  - Meperidine worse than all other narcotics
  - Morphine not a good choice in renal impairment
- Antihistamines
  - Diphenhydramine, hydroxyzine, H2 blockers
- Anticholinergic medications
  - Promethazine, Cylodibenzapine, Oxybutynin, Amlodipine
  - Combinations of medications with partial anticholinergic activity
    - Priscoline
    - Theophylline
    - Digezine
    - Pilocarpine

Delirium Prevention

<table>
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<tr>
<th>Modifiable risk factor</th>
<th>Prospective Intervention</th>
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<tbody>
<tr>
<td>Visual Impairment</td>
<td>Visual Aides, Adaptive Equip</td>
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<tr>
<td>Hearing Impairment</td>
<td>Amplifiers, Adaptive Equip</td>
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<td>Cognitive Impairment</td>
<td>Orienting Communication</td>
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<tr>
<td>Immobility</td>
<td>Early Mobilization, Reduce Restraints</td>
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<tr>
<td>Dehydration</td>
<td>Oral Hydration</td>
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<tr>
<td>Sleep deprivation</td>
<td>Uninterrupted Sleep, Non-pharmacologic Aides</td>
</tr>
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40% Relative Risk Reduction

One of Hebb's sensory deprivation subjects at McGill.
Declassified 1983 CIA Training Manual

- Deprivation of sensory stimuli induces stress and anxiety.
- Some subjects progressively lose touch with reality, focus inwardly, and produce hallucinations, delusions, and other pathological effects.

1984 revision states: “Deliberately causing these symptoms is a serious impropriety.”


Sensory Deprivation

One of Hebb’s sensory deprivation subjects at McGill.

Cognitive Impairment

- Mini-Cog
  - 3 item recall (ball, justice, tree) (up to 3 pts)
  - Clock Draw (10 minutes after 11)
    - All or nothing: 0 or 2 pts
  - Pre-existing cognitive vulnerability is the strongest predictor of development of peri-operative delirium.

0 points
Mobility

- Gertrude's pre-op activity order reads: 
  - "bed rest"

- Gertrude's post-op activity order reads: 
  - "Ad lib, WBAT"

Translate this…..

Immobility

- One study reveals 30% of elderly patients had initial order for "bed-rest"
- Another study found the median amount of time standing or walking…..
  - 43 minutes
- Translation: 
  - "Ad lib" means 97% of the time immobile

Sleep Deprivation

- Consequences of lack of sleep in healthy volunteers include impaired attention and irritability
- Record for sleep deprivation is approximately 11 days
- No longer accepts submissions in this category due to deleterious health effects

Could you sleep?
Gertrude's Tragic Tale

- Gertrude's surgery went well
  - Indwelling catheter present since admission
  - Her personal possessions were sent home from PACU
    - Glasses
    - Dentures
    - Hearing aids.
- Post-op she has a morphine PCA for pain.
- Complains of insomnia overnight
  - Diphenhydramine pm in order set given

Clinical Case
Gertrude's Tragic Tale

- The following morning Gertrude is still sleepy when:
  - The intern assesses her at 6:00 am
  - The nurse assesses her at 5:30 am
  - The attending assesses her at 10:00 am
- She sleeps through lunch
- Disoriented and inattentive-- not following instructions
- She becomes confused
  - Trying to get out of bed
  - Pulling at her IV

Is she delirious?

DELIRIUM IS OFTEN MISSED

- 17%-74% cases unrecognized by nurses
- Physicians may be worse
- Over reliance on disorientation/inappropriate behavior
DIAGNOSING DELIRIUM: The Confusion Assessment Method (CAM)

Patient must demonstrate the following:

- Disturbance in Cognition
- Acute/Fluctuating Inattention
- Altered Level of Consciousness
- Disorganized Thinking

Sensitivity 94-100%, Specificity 90-95%


TESTING

- Chem7, CBC, UA
- Troponin, EKG
- CXR and/or ABG driven by other clinical cues

LOW YIELD STUDIES:
- CT/MRI brain
- If focal neurologic signs or head trauma
- LP
- Reserve for fever or neck stiffness
- EEG
  - If clinical evidence of seizures

Extensive testing of limited value unless driven by a specific clinical suspicion

Practical Approach

1. Remove Problem Medications, particularly anticholinergics, H2RAs, and nonsteroidal anti-inflammatories
2. Treat Withdrawal
   - Alcohol or benzodiazepines
3. Correct Metabolic Disturbances
   - Electrolytes, glucose, hydration
4. Reduce Level of Invasiveness
   - Indwelling urinary catheters and lines
5. Assess and Treat Infection
   - Particularly new UTIs or pneumonias
6. Adequately Treat Pain
   - Uncontrolled pain is more potent delirium trigger than narcotics
   - Scheduled may be better than prn. Non-narcotic if possible
7. Improve Environment and Mobility

Medical Therapy for Delirium

- No good evidence that cholinesterase inhibitors (donepezil, rivastigmine) are effective
- No good evidence that Benzodiazepines are effective EXCEPT in alcohol withdrawal
- Antipsychotics decrease the degree and duration of delirium (typical just as good as atypical)

When All Else Fails.....

ANTIPSYCHOTICS

Typical Antipsychotics (Haloperidol)
- Extra-pyramidal side effects with high doses
- Haloperidol 0.25 – 0.5mg PO/IM BID or q.m. q.4h.
- IV formulation has FDA black box warning

Atypical Antipsychotics (Risperidone, Olanzapine, Quetiapine)
- Less QTc prolongation compared to haloperidol

Antipsychotics associated with increased mortality in dementia
- Lowers seizure threshold
- Prolonged QTc
- Our research suggests unsafe use of IV haloperidol in patients with QTc > 500