DELIRIUM PREVENTION: A PATIENT SAFETY OPPORTUNITY

- Joshua Swan, PharmD, MPH, BCPS
- Michael Liebl, PharmD, BCPS
Disclosure & Acknowledgment

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- Mobolaji Adeola, PharmD, BCPS and Rejena Azad, PharmD, BCPS were instrumental in developing the slides for this presentation.
Learning Objectives

1. Joshua Swan, PharmD, MPH, BCPS
   • Evaluate risk factors and outcomes associated with delirium among hospitalized geriatric patients
   • Describe an interventional strategy that reduced delirium among hospitalized geriatric patients

2. Michael Liebl, PharmD, BCPS
   • Apply quality improvement methodology to delirium prevention
   • Compare interventional components for generalizability
OVERVIEW OF DELIRIUM AND A PATIENT SAFETY PROGRAM TO PROMOTE PREVENTION

- Joshua Swan, PharmD, MPH, BCPS
Delirium

“a disturbance of consciousness that is accompanied by a change in cognition that cannot be better accounted for by a preexisting or evolving dementia”

- American Psychiatric Association
Quality and Quantity of Cognition

Background

- Delirium is an acute disruption of attention and cognition
  - Hypoactive subtype is often unrecognized

- Incidence of delirium
  - Emergency department: 8% – 19%
  - At hospital admission: 14% – 24%
  - Postoperatively: 15% – 53%
  - Intensive care unit (ICU): 70% – 87%
  - Acute care: 6% – 56%
  - Post-acute care settings: up to 60%

Fong, GT et al. Nat Rev Neurol. 2009 Apr; 5(4): 210–220
Ryan DJ. BMJ Open. 2013 e001772
Why Does Delirium Matter?

- Increased mortality (up to 2 years after discharge)
- Loss of dependence (nursing home placement)
- Hospital complications and LOS
- Costs – Medicare $100 billion annually
- Most cases of delirium are missed!
- Long-term cognitive impairment and dementia

Fong, GT et al. Nat Rev Neurol. 2009 Apr; 5(4): 210–220
Ryan DJ. BMY Open. 2013 e001772
Long-term brain dysfunction

Adjusted RBANS Global Cognition Score at 12 Mo

N = 382
P = 0.04

Days of Delirium

Mild cognitive impairment
Traumatic brain injury
Alzheimer’s disease

Pandharipande PP, et al. NEJM. 2013;369:1306-1316
Delirium and Increased Risk of Mortality

### Risk Factors

<table>
<thead>
<tr>
<th>Predisposing (baseline vulnerability)</th>
<th>Precipitating (iatrogenic insults)</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Older age</td>
<td>▪ Psychoactive medications</td>
</tr>
<tr>
<td>▪ Preexisting dementia</td>
<td>▪ Withdrawal from benzodiazepines or ethanol</td>
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<tr>
<td>▪ Hypertension</td>
<td>▪ Metabolic abnormalities</td>
</tr>
<tr>
<td>▪ Alcoholism</td>
<td>▪ Infection</td>
</tr>
<tr>
<td>▪ Sensory impairment</td>
<td>▪ Untreated pain</td>
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<td></td>
<td>▪ Hypoxia</td>
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</table>

High baseline vulnerability confers an increased likelihood of delirium from iatrogenic insults

Etiologies of delirium

Possible etiology of delirium in elderly acute care patients (n = 50)

- Fluid/electrolyte imbalance
- Infection
- Drug toxicity
- Metabolic
- Sensory
- Low perfusion
- Withdrawal
- Intracranial

Francis J, et al. JAMA. 1990;263:1097-1101
Medications and Delirium

- May account for up to 40% of all delirium cases
  - Evidence with sedative hypnotics, anticholinergics, & benzodiazepines

- Why are elderly patients vulnerable to adverse drug events?
  - Diminished physiologic reserve
  - Higher chronic disease burden
  - Polypharmacy
  - Pharmacokinetic and pharmacodynamic age-related changes

Delirium Management

• No FDA approved medication for prevention or treatment
Prevention: Non-Pharmacologic Approach

HOSPITAL ELDER LIFE PROGRAM (HELP)

- Included 852 general medicine patients ≥ 70 years of age
- Intervention bundle: cognitive re-orientation, non-pharmacologic sleep protocol, vision & hearing aids, early mobilization, and dehydration protocol
- Results favored intervention group
  - ↓ delirium occurrence by ~ 40% (OR 0.60, 95% CI 0.39 - 0.92)
  - ↓ delirium days (105 days vs. 161 days, p=0.02)
  - No effect on delirium severity or recurrence rate

Inouye SK, et al. NEJM 1999;340(9):669-676
Detecting Delirium

- When a standardized screening tool is not used, clinicians fail to recognize most cases of delirium during routine care.

Common Standardized Screening Tools for Acute Care:
  - Confusion Assessment Method (CAM)
  - The 4 “A”s Test (4AT)
  - Nursing Delirium Screening Scale (Nu-DESC)
  - NEECHAM Confusion Scale
  - Delirium Observation Screening Scale/Delirium Observation Scale (DOS)

Why Does Delirium Matter?

Nate Hiber is an independent 85YOM who presents to the ER with a fall while at home. He is diagnosed with a hip fracture and is admitted for surgical repair. His home medications are reordered in the hospital including amiodipine, glyburide, tamsulosin, and diphenhydramine as needed for sleep.

- Day 2
  - Patient continued on home medications.
  - Repeated doses of diphenhydramine given for sleep.

- Day 5
  - Post-op increased agitation
  - Increased sedatives & diphenhydramine
  - Pain not fully addressed

- Day 8
  - Discharged to Skilled Nursing Facility
  - Diphenhydramine restarted with medication reconciliation
  - Limited Recovery

- Day 30
  - Patient unable to return home – wheelchair dependent
  - Persistent Cognitive Impairment
  - Transfer to Nursing Home
Houston Methodist Delirium Prevention Program

- Houston Methodist West Hospital: 146 Beds
- Houston Methodist Texas Medical Center: 851 Beds
- Houston Methodist Sugar Land Hospital: 235 Beds
- Houston Methodist Willowbrook Hospital: 241 Beds
- Houston Methodist San Jacinto Hospital: 375 Beds
Program Goals

Target population: acute care patients ≥ 70 years old

- ↓ Hospital-acquired delirium
- ↑ Detection and safety measures
- ↓ High-risk medication exposure
- ↓ Hospital costs and length of stay by avoiding hospital-acquired delirium, falls, and mortality
Interdisciplinary Collaboration

- Assess for delirium
- Delirium awareness and treat underlying causes
- Decrease use of high-risk medications
- Help orient patients
- Visit patients at home
- Provide follow-up phone calls

Bedside Nurses

Team CLARITY Home Health

Care Navigator Nurses

Physicians

Pharmacists

Volunteers

CLARITY Home Health

Care Navigator Nurses

Physicians

Pharmacists

Volunteers

PATIENT SAFETY

HOUSTON Methodist
LEADING MEDICINE
### Implementation Process

<table>
<thead>
<tr>
<th>Project Milestones</th>
<th>†Q4-2012</th>
<th>Q1-2013</th>
<th>Q2-2013</th>
<th>Q3-2013</th>
<th>Q4-2013</th>
<th>Q1-2014</th>
<th>Q2-2014</th>
<th>Q3-2014</th>
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†Delirium grant launched, October – December 2012

**Screening & Interdisciplinary Education**

**Pharmacy Interventions**

**Volunteer visits**

**Care Navigators**

**Home Health Visits**

**Houston Methodist**

**Leading Medicine**
Pharmacy Interventions

- **Formulary**
  - Cetirizine added as alternative to itching
  - Ramelteon and Doxepin 3mg added as alternative to sleep

- **Prescribing**
  - Standard order sets modified to offer lower dose options and safer alternatives
  - Implementation of the “Delirium Elderly Initial Management” order set

- **Verification**
  - Automatic substitution of zolpidem 10mg doses to 5mg doses
  - Therapeutic interchange (diphenhydramine to cetirizine) for itching

- **Dispensing**
  - Dissemination of poster indicating medications to avoid and safer alternatives on nursing units

- **Monitoring**
  - Real time electronic surveillance of high-risk medication orders

- **Discharge**
  - Electronic alerts during discharge medication reconciliation
Formulary and Prescribing Changes

<table>
<thead>
<tr>
<th>Pt &gt; 70 yrs old - 3 item(s)</th>
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<tbody>
<tr>
<td>Ramelteon</td>
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<tr>
<td>Cetirizine</td>
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<tr>
<td>Diphendrydilamine Injection</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Pt &lt; 70 yrs old - 3 item(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydroxyzine</td>
</tr>
<tr>
<td>Diphendrydilamine Tablet</td>
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<tr>
<td>Zolpidem</td>
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</table>
Verification: Automatic Interchange

Example: Diphenhydramine to cetirizine interchange for itching

<table>
<thead>
<tr>
<th>Discontinue</th>
<th>Start</th>
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<tbody>
<tr>
<td>□ Diphenhydramine 12.5 mg by mouth as needed for itching</td>
<td>Cetirizine 5 mg daily by mouth as needed for itching</td>
</tr>
<tr>
<td>□ Diphenhydramine 25 mg by mouth as needed for itching</td>
<td>Cetirizine 5 mg daily by mouth as needed for itching</td>
</tr>
<tr>
<td>□ Diphenhydramine 50 mg by mouth as needed for itching</td>
<td>Cetirizine 10 mg daily by mouth as needed for itching; use 5 mg if CrCl is less than 30 ml/min</td>
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Conversion from intravenous to oral therapy:
Intravenous diphenhydramine therapy for itching will be converted to oral cetirizine therapy if the patient tolerates oral therapy. The interchange will not be applied in patients with anaphylactic indications.

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Monitoring: Real-time Electronic Medication Surveillance Program

- Customizable
  - 9 medications monitored to date including diphenhydramine and zolpidem
- Alerts pharmacists
- Outcome of recommendations documented by pharmacists
Sample handout with common high-risk medications and alternatives that are displayed in prescriber charting areas.
Interventions in Practice

Nate Hiber is an independent 85YOM who presents to the ER with a fall while at home. He is diagnosed with a hip fracture and is admitted for surgical repair. His home medications are reordered in the hospital including amlodipine, glyburide, tamsulosin, and diphenhydramine as needed for sleep.

Day 2
- Negative delirium screen
- High risk medication alert triggers for diphenhydramine

Day 3
- Delirium risk assigned (Intermediate risk)
- Volunteer visit

Day 4
- Positive delirium screen s/p surgery
- RN increases safety measures
- MD initiates workup with orders
- May request PharmD med review
- Team CLARITY consent obtained

Day 5
- Delirium risk assigned (High risk)
- Team CLARITY home visits introduced to family
- MD reconciled diphenhydramine on discharge which triggered a warning alert
- Team CLARITY visit within 72 hours

Day 6 - discharge
- MD reconciled diphenhydramine
- Electronic medication monitoring
- Nurse delirium screening
Key Takeaways

- Delirium is a common in hospitalized patients and is associated with length of stay, cost, and mortality
- High-risk medications are a major cause of delirium
- Houston Methodist multicomponent delirium program helped reduced use of high-risk medications
BEST PRACTICES FOR IMPLEMENTING A DELIRIUM PREVENTION PROGRAM

- Michael Liebl, PharmD, BCPS
Delirium Prevention

“An ounce of prevention is worth a pound of cure”
Benjamin Franklin
Building a Quality Delirium Prevention Program

DEFINE

MOBILIZE

IMPLEMENT

EVALUATE

Gather Information
• What is the problem?
• Who is affected?
• Is it worth solving?
• Has it been solved before?
Building a Quality Delirium Prevention Program

**DEFINE**

**MOBILIZE**
- Mobilize a multidisciplinary core team
  - Outline attainable goals
  - Develop a strategic operational plan

**IMPLEMENT**
- Engage key stakeholders
  - Know what motivates them
  - Shared ownership = shared success

**EVALUATE**
# Houston Methodist Core Team

<table>
<thead>
<tr>
<th>Resource</th>
<th>Role</th>
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<tbody>
<tr>
<td>Chief Quality Officer</td>
<td>Overall governance of the quality improvement initiative</td>
</tr>
<tr>
<td>Program Director</td>
<td>Supervise completion of milestones outlined in the operational plan</td>
</tr>
<tr>
<td>Physician Subject Matter Experts</td>
<td>Provide education on early detection, appropriate documentation, and evidence-based interventions. Serve as liaisons to physician groups</td>
</tr>
<tr>
<td>Pharmacy Leads</td>
<td>Develop and implement initiatives to limit high-risk medication use</td>
</tr>
<tr>
<td>Nursing Educators</td>
<td>Assist with bedside nurse training and compliance audits</td>
</tr>
<tr>
<td>Care Navigators</td>
<td>Post-discharge calls to connect patients with healthcare/social needs</td>
</tr>
<tr>
<td>Project Specialists</td>
<td>Recruit, onboard, and <strong>train volunteers</strong>. Collaborate with <strong>case management</strong> to increase patient consents for home health visits</td>
</tr>
<tr>
<td>Technical Support</td>
<td>Maintain reporting for grant purposes</td>
</tr>
</tbody>
</table>
Houston Methodist Pharmacy Leadership

- Delirium prevention program aligned with department goals
- Two residency trained pharmacists on delirium core team to:
  - Develop sustainable medication safety initiatives
  - Spearhead system-wide implementation and integration
  - Perform plan-do-check-act cycles to sustain quality of initiatives
  - Collaborate on educational strategies
  - Support grant reporting requirements
- Cultivated pharmacy program champions at the facility level
Pharmacy Personnel Budgeting Under Grant

- Percent effort allocation for two full-time pharmacists:
  - 50% Grant-specific outcomes reporting requirements
  - 25% Hospital-level change program initiatives and quality assurance reporting
  - 10% Innovation/leadership and research program development
  - 15% Department of pharmacy service responsibilities
Building a Quality Delirium Prevention Program

1. DEFINE
2. MOBILIZE
3. IMPLEMENT
4. EVALUATE

- Cultivate program champions
  - Disseminate innovative educational support tools
Workforce Development

- Customized educational programs for all frontline staff

  **Nurses**
  - Interactive virtual case module and bedside simulation scenarios
  - Educational video and brochures (screening tool, high-risk meds)

  **Physicians**
  - Presentations, newsletters, and brochures
  - Email-prompted self-study education program (Q-stream®)
  - Peer-peer feedback (physician champions)
  - Delirium management order set
Workforce Development

- **Pharmacists**: education programs approved for CE credit
  - Live PowerPoint presentation and interactive virtual case module
  - Q-stream© self study program
Patient and Family Education

Educational Videos & Brochures

Tips for a Successful Hospital Stay
Focus on what MATTERS!

M Mobility Matters. Lying in bed all day is NOT beneficial. The best way to maintain muscle strength and keep your joints flexible is to move around whenever possible. Always ask for help — “Can you help me to sit in a chair?” “Can you help me to walk?” Progressive mobilization (a little more activity each day) has been shown to decrease how long people stay in the hospital.

A Awake in Day & Avoid Sleep Aids. Taking medication to sleep is not recommended in older adults. Maintain healthy sleep habits by staying awake during the day, being as active as possible, and keeping lights on and curtains open. To facilitate sleep at night, try light reading, dimming lights, warm milk and wearing earplugs.

T Thinking Matters. Delirium (confusion associated with illness) is one of the most common complications of hospitalization for older adults. Keep your brain active in the daytime: read, do puzzles, play games, and engage in conversation. Tell your doctor if you feel “mixed up,” or if you see or hear anything unusual. Caregivers should report any unusual behavior to a member of the medical team.

T Take in Liquids. Older patients typically have a decreased sense of thirst, which can lead to dehydration. Dehydration increases the risks of falls, fainting and confusion. Make sure fluids are within reach, and drink as much as you are allowed.

E Eat Nutritious Foods. It is not uncommon for hospitalized individuals to become malnourished. If you don’t feel like eating, ask about taking a supplement drink or visit with a nutritionist. Wear dentures if you have them. Make sure to eat protein and healthy foods, not just snacks and sweets. You may also ask to bring your favorite foods from home.

R Report all Medications. Be sure the medical team knows ALL the medications you are taking including prescriptions, over-the-counter medications and herbal/vitamin supplements. Make sure to report ANY adverse reaction from a previous medication. Never assume that your medications and exact doses are known.

S Sensory. It is extremely important that you hear and see as well as possible. Bring glasses and assistive hearing devices to the hospital with you. It is best to have a well-labeled container to store your glasses, hearing aids, and dentures.
**Patient and Family Education**

**DELI RiUM PREVEN TiON**

**Understanding Diphenhydramine (Benadryl®)**

Medications are common and preventable causes of delirium in the elderly.

**DIPHENHYDRAMINE**

Diphenhydramine (Benadryl®) is used for many things including itching and sleep.

This medication can cause DROWSINESS, DIZZINESS, and CONFUSION. It is especially important to avoid in older adults.

To help limit exposure to the drug, we:
- Limit the maximum dose to 25mg per dose
- Substitute cetirizine (Zyrtec®) if used for itching
- Use topical creams for itching when possible

Houston Methodist wants you to stay clear and avoid confusion during your hospital stay.

Please talk to your doctor or pharmacist if you have any questions about your medications and/or side effects.

**OLDER ADULTS SHOULD TRY TO AVOID THESE MEDICATIONS:**
- Sleeping aids
- Anxiety medications
- Muscle relaxants

Some medicines may be tolerated at home, but may not be appropriate in the hospital.

**TIPS TO KEEP THINKING CLEARLY**
- Keep lights on and stay awake during the day
- Try to get out of bed when possible
- Use your glasses and hearing aids
- Stay mentally active

Please talk to your doctor or pharmacist if you have any questions about your medications or side effects.
Building a Quality Delirium Prevention Program

- **DEFINE**
  - Cultivate program champions
    - Disseminate innovative educational support tools

- **MOBILIZE**
  - Leverage existing technology

- **IMPLEMENT**
  - Provide targeted interventions

- **EVALUATE**
Targeted Interventions

✓ Adopt and adapt an automated delirium risk stratification tool
✓ Houston Methodist criteria:

<table>
<thead>
<tr>
<th>Low Risk 0-1 points</th>
<th>Intermediate Risk 2-3 points</th>
<th>High Risk 4 points or more</th>
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<tbody>
<tr>
<td>Age 70-84 years old with no clinical factors of delirium</td>
<td>Age &gt; 85 years old OR Age 70-84 years old with TWO clinical factors of delirium*</td>
<td>Existing diagnosis of Dementia OR Previous or current episode of Delirium/admitting dx of cognitive impairment OR Order for PRN anti-psychotic OR Age ≥85 years old with ≥ TWO clinical factors of delirium* OR Age 70-84 years old with ≥ THREE clinical factors of delirium*</td>
</tr>
</tbody>
</table>

*Clinical Factors of Delirium: Age ≥ 85 years (2 points); ICU stay (1 point); BUN/Cr ratio >18 on admission (1 point); Dependent for ambulation (1 point); As needed/STAT or x1 doses of anti-psychotic (4 points); Past medical history of cognitive deficit (4 points); Positive delirium screen (4 points); Prescription for dementia med (4 points); Age ≥ 70 years (0 points); Admitting cognitive diagnosis (4 points)
Targeted Interventions

Deployed based on patient delirium risk classification to maximize resources

**High Risk:**
- Home health visits
- All intermediate and low risk interventions

**Intermediate Risk:**
- Post-discharge care navigator call
- Volunteer visits
- All Low risk interventions

**Low Risk:**
- Pharmacy monitoring & intervention
- Nursing screens
Building a Quality Delirium Prevention Program

- Define
- Mobilize
- Implement
- Evaluate

- Effectiveness
- Challenges
- Stories from the field
Outcomes: Houston Methodist Hospital

↓ Delirium Incidence

↑ Delirium Detection

Incidence of encounters that developed delirium by discharge quarter for Houston Methodist Hospital

Proportion of encounter screened for delirium by discharge quarter for Houston Methodist Hospital
Outcomes: Houston Methodist Hospital

↑ Safety Measures
Outcomes: Houston Methodist Hospital

Target High-Risk Medication Alerts
Jan 2013 – Mar 2015

- 7,963 medication Alerts
- 5,038 alerts acknowledged (63%)
- 2,008 resulted in changes (40%)
- 62% discontinued
- 14% dose reduced
- 24% changed to alternative
- 3,030 alerts continued (60%)

~27,000 patient encounters electronically monitored

Common reasons for necessary continued orders include:
- Clinically indicated
- Physician refusal
- Patient takes at home & refuses alternatives
Outcomes: Houston Methodist Hospital

↓ High-risk Medication Use
Outcomes: Houston Methodist Hospital

↓ High-risk Medication Use
Outcomes: Houston Methodist Hospital

CPOE-triggered alerts during discharge medication reconciliation

June 2014 - February 2015

No. of alerts

HMH-TMC | Willowbrook | Santacinto Facility | Sugarland | West Houston

- Med Alerts
- Discontinued Medications
Challenges

- Changing culture from reactive (treatment) to proactive (prevention)
- **Pharmacy:** limited data on safer alternatives or dosing strategies
- **Nursing:** Incomplete or inaccurate screening assessment and documentation
- **Volunteers:**
  - High turnover rates
  - Varying demographics and skill level
- **Home Health Visits:**
  - High utilization of resources
  - Low patient consent rates
Overcoming Challenges

- Promote delirium prevention as a visible indicator of quality and safety
- Pilot a trial program
- Make it easier to do the right thing
  - Standard order set modifications offering lower dose options and safer alternatives (age-specific)
  - Therapeutic interchanges
  - Delirium management order set
  - Innovative educational tools and brochures
Overcoming Challenges

- Nursing
  - Streamline documentation process
  - Develop prompts in the electronic medical record
  - Periodically audit screening process
  - Cultivate nursing champions to reinforce education

- Engage staff and senior leadership in defining challenges and testing solutions

- Share data and celebrate successes
Sustainability
Houston Methodist Delirium Program Perspective

Initiatives
- Workforce development
- Nurse screening
- Pharmacy interventions
- Volunteer program
- Home health visits
- Care Navigator calls
Sustainability

Pharmacy Interventions

- Education
- Pharmacovigilance
- Order set modifications
- Policy changes
  - Zolpidem dose substitutions
  - Diphenhydramine therapeutic interchange
- Electronic CPOE alerts at discharge

EFFORT

Low
Moderate
High

YIELD

Low
Moderate
High

- Education
- Pharmacovigilance
- Order set modifications
- Policy changes
  - CPOE alerts at discharge
Next Steps

- Finalize analysis and evaluation
- Maintain gain with current pharmacy initiatives and identify new opportunities
- Initiate community-based transitions in care referral program
- Expand delirium screening to the emergency department to facilitate early detection
Key Takeaways

1. Engage key stakeholders

2. Invest in program champions

3. Make it easier to do the right thing

4. Promote delirium prevention as a visible indicator of quality and safety
Acknowledgements

Delirium Core Team

Pharmacy Team
Questions and Discussion