Solving the Delirium Dilemma

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Purpose

The purpose of this project is to prevent and reduce the incidence of delirium in our ICU and Intermediate Care Unit (IMC).

Implemented via:
- Confusion Assessment Method for the ICU (CAM-ICU) delirium assessment
- ABCDE bundle
What Is Delirium?

- Disruption of neurotransmission (drug action, inflammation, acute stress response), ie, acute brain dysfunction
- **Delirium**: rapid onset, inattention, altered level or contents of consciousness, fluctuating mental status
- **Dementia**: gradual onset, intellectual impairment, memory disturbance, personality/mood change, no conscious clouding
Delirium Subtypes

**Hyperactive Delirium**
- Acute, combative agitation often requiring sedation
- Easier to diagnose
- “ICU psychosis”

**Hypoactive Delirium**
- Quiet and peaceful behavior, despite cognitive impairment; more difficult to assess
- Associated with worse prognosis
Delirium Subtypes

Mixed Delirium

- Features a mix of elements from both hyperactive and hypoactive delirium
- Fluctuating course
Why Delirium?

Overwhelming Evidence Base:
- Each day a patient has delirium = 10% increase in risk of death
- 50%-80% of patients who are ventilated develop delirium, and 20%-50% of lower-severity ICU patients develop delirium
- Delirium increases mortality, ventilator time, length of stay (LOS), and hospital costs
Why Delirium?

- Previously unregulated in our facility
- Perceived by staff as frequently occurring
- Great opportunity to implement education and standardized assessment tools for better patient management
CAM-ICU Assessment Tool

STEP 2

DELIRIUM ASSESSMENT

1. Acute Change or Fluctuating Course of Mental Status:
   - Is there an acute change from mental status baseline? **OR**
   - Has the patient's mental status fluctuated during the past 24 hours?

   **NO** → CAM-ICU negative
   **YES** → NO DELIRIUM

2. Inattention:
   - “Squeeze my hand when I say the letter ‘A’.”
     Read the following sequence of letters: S A V E A H A A R T
     ERRORS: No squeeze with ‘A’ & Squeeze on letter other than ‘A’
   - If unable to complete Letters → Pictures

   **> 2 Errors** → CAM-ICU negative
   **0 - 2 Errors** → NO DELIRIUM

3. Altered Level of Consciousness
   Current RASS level (think back to sedation assessment in Step 1)

   **RASS = zero**

4. Disorganized Thinking:
   1. Will a stone float on water?
   2. Are there fish in the sea?
   3. Does one pound weigh more than two?
   4. Can you use a hammer to pound a nail?

   Command: “Hold up this many fingers” (Hold up 2 fingers)
   “Now do the same thing with the other hand” (Do not demonstrate)
   **OR** “Add one more finger” (If patient unable to move both arms)

   **> 1 Error** → DELIRIUM Present
   **0 - 1 Error** → CAM-ICU negative
The ABCDE Bundle

**A**wakening and **B**reathing
**C**oordination
**C**hoice of Sedative

**D**elirium Identification and Management

**E**arly Exercise and Mobility
Goals

Short-Term:
- Educate 75% of staff in IMC and ICU on CAM-ICU assessment tool and ABCDE bundle

Intermediate:
- Achieve 50% staff compliance using CAM-ICU by the end of 2013

Long-Term:
- Reduce average ventilator days by 0.5 by April 2014
- Reduce ICU and hospital LOS
Pre-Education Survey Results

- At least 50% of staff reported never using a sedation scale (RASS) during their shift.
- 80% of staff either never heard of the CAM-ICU tool or heard of it but never used it.
- About 75% of staff thought delirium was unnoticed either very or somewhat frequently.
Implementation

February and March 2013

- Brainstorming
- Research and literature review
- Group meetings
Implementation

April and May 2013

- Meetings with director and managers
- Getting the word out with unit e-mails and huddle updates
- Development of educational presentation
- Pre-implementation unit-data collection
Implementation

June 2013

- Staff survey
- Poster for staff break room
- In-services
- Developed bedside CAM-ICU tool for rooms
- Presentation at supervisor meeting
- Kickoff hot dog party
Presentation at Supervisor Meeting
In-Services and Hot Dog Kickoff Party
Implementation

July 2013

- Provided Healthstream education for all ICU and IMC staff
- Offered promotional pen lights/T-shirts: “Defeat Delirium”
- Included CAM-ICU training at annual competency fair
- Presented progress at critical care directors’ meeting

August 2013

- Awarded prizes for attendance at in-services
- Continued data collection and group meetings
Competency Fair – July 2013
Implementation

September 2013

- Auditing of CAM-ICU documentation and spot-checking
- Project reinforcement to continue culture change
- Initiated multidisciplinary meetings on early mobility
Implementation

October and November 2013

- Prepared and presented mid-project presentation on October 10
- Avoided formal training in November to help prevent change fatigue
Implementation

December 2013 and January 2014

- Developed CAM-ICU assessment tool for electronic charting in Meditech
- Met with IT and critical care directors to trial and approve electronic charting tool
Implementation

February and March 2014

- Developed audit tool for assessing multiple factors related to delirium assessment and treatment
  - Began auditing charts
- Collaborated with director of respiratory therapy to begin analysis of large ventilator data set
Implementation

April, May, and June 2014

- Progress presentation at multidisciplinary Critical Care Council
- Dillon Gerhardt represented our group’s work at NTI
- Preparation for final presentation
- Handoff to management to safeguard evolving culture change
Cost Significance of Critical Care

Critical care costs in 2005 represented 13.4% of total hospital costs nationally, or $81.7 billion. This represents a 44.2% increase from expenditures in 2000.

Constant scrutiny of health care cost demands that we deliver better care for less.
Cost Significance of the ABCDE Bundle

- LOS is often identified as the primary source of high critical care costs.
- ABCDE bundle provides an evidence-based approach to optimize critical care management.
- The following improvements are all variables with a relationship to LOS, mortality, and cost.
Awakening and Breathing Trial Coordination

Evidence promotes coordinating targeted sedation protocols, spontaneous awakening trials, and spontaneous breathing trials.

Girard, et al found this approach safe and effective in a randomized controlled trial:

- ICU LOS reduced by 4 days
- Overall improvement in 1-year survival
  - 32% reduction in risk of death
Awakening and Breathing
Trial Coordination

Optimizing sedation management and breathing trials can reduce:
- Prolonged ventilation, ventilator-associated pneumonia, immobility
- Delirium
- Oversedation/undersedation
- LOS/Cost
Awakening and Breathing
Trial Coordination

Crucial Teaching Points:

- Analgesia use before sedative increase prevents oversedation
- Documentation of RASS trends and goals is a routine aspect of appropriate sedation management
Choice of Sedative

The new 2013 Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium note that nearly 30% of delirium is related to medications.

Crucial Teaching Points:
- Several studies demonstrate reductions in LOS and ventilator days by avoiding these deliriogenic medications:
  - Anticholinergic drugs
  - Benzodiazepines
Delirium Management

Delirium has been noted in the literature as prevalent (affecting up to 80% of ICU cases) and expensive (associated costs estimated at between $4 billion and $16 billion annually).

This cost is largely explained by the resulting increase in LOS.

Crucial Teaching Points:

- When delirium is present, consider atypical antipsychotic medications during rounds where appropriate (avoid with QTc prolongation).
Delirium Management

Delirium is central to the bundle:
- Delirium prevention facilitates Awakening and Breathing.
- Faster extubation reduces sedative use, immobility, and delirium risk.
- Delirium risk factors refocus our Choice of Sedation.
- Validated Delirium screening optimizes management.
- Successful ABCD implementation facilitates Early Mobility, reducing delirium risk.
Delirium Management

Human Cost of Delirium:

- A longer duration of delirium is associated with worse cognitive and executive functioning outcomes at 3 and 12 months.
- Survivors of delirium often report substantial losses of function per testimonials submitted to researchers.
Early Mobility

- Patients who are not extubated or delirious can participate in their plan of care.
- Early mobility results in improved physical strength and cognitive function, and reduces the duration of delirium when present.
Successful Implementation at a Glance

- Decreased LOS & Mortality
- Successful Early Mobility
- Successful Delirium Screening
- Successful Awakening & Breathing
- Successful Choice of Sedative

AACN CSI Academy™
Clinical Scene Investigator
Conversely...

Prolonged ventilation increases time sedated

Excessive sedation prevents Awakening & Breathing, promotes Delirium, impairs Early Mobility

Delirium impairs extubation and Early Mobility via inattention
Projected Savings

Delirium can indirectly affect restraint use, duration of immobility, and falls. Cost savings are based on addressing multiple factors.

**Delirium Increases:**
- Ventilator time
- Pharmaceutical cost
- ICU and hospital LOS
- Morbidity/mortality
- Admissions to long-term care facilities
Conservative Estimate of Savings

We estimate that our mean reduction of 0.3 ventilator day post-implementation has yielded a savings of approximately $718,300 per year.

We also found a cross-quarterly savings of $732,450 and $815,474 when examining our highest-acuity quarter and after accounting for outliers. This represents 43% and 31% of the data respectively.

These figures are derived from the following analysis of our ventilator data set.
Ventilator Data Analysis

- Analyzed 15 months of ventilator data to evaluate the results of education and implementation
- Data collected from January 2013 to March 2014
- 703 intubation cases, described in terms of length, mortality, and primary diagnosis
Data Analysis: Cautious Optimism

- We found no statistically significant difference in time to extubation before \( (4.2 \pm 5.9 \text{ days}) \) or after \( (3.9 \pm 5.7 \text{ days}) \) education \( (P > 0.05) \).
  - Pre-data collected January 1, 2013, through September 15, 2013
  - Post-data collected September 16, 2013, through March 31, 2014
- This constitutes a **0.3-day reduction** in mean ventilator time.
- Though not statistically significant \( (P > 0.05) \), there is a clinically meaningful trend when differentiating by quarter: a **0.7-day reduction** when comparing Quarter 1 2013 and Quarter 1 2014.
Data Analysis: Differentiating Extubation Results by Quarter

<table>
<thead>
<tr>
<th>Extubation</th>
<th>2013 Q1</th>
<th>2013 Q2</th>
<th>2013 Q3</th>
<th>2013 Q4</th>
<th>2014 Q1</th>
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<td>120</td>
<td>96</td>
<td>152</td>
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<tr>
<td>Mean</td>
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<td>3.7</td>
<td>3.6</td>
<td>4.2</td>
<td>3.9</td>
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<tr>
<td>Standard Deviation</td>
<td>6.7</td>
<td>5.5</td>
<td>5.7</td>
<td>5.7</td>
<td>5.0</td>
</tr>
</tbody>
</table>
Data Analysis: Exclusions

- Determined subgroups, potentially skewing results
- Focus shifted to a moderate acuity patient, most likely to benefit from the ABCDE bundle
- To avoid taking credit for independently rapid or prolonged extubations, we excluded:
  - Open-heart surgeries
  - Cases with near-immediate mortality (fatal cerebrovascular accidents or prolonged out-of-hospital cardiac arrests)
  - Extremely long ventilator times associated with tracheostomy ventilator weaning
Data Analysis: Exclusions

- Removing these 3 groups from the data set yielded a reduction of 1.1 mean ventilator days when comparing Q1 2013 to Q1 2014.

- Variance occurred during our facility’s busy season, characterized by heavy patient acuity due to:
  - Flu season
  - Increases in patient census
Data Analysis: Differentiating by Quarter With Exclusions

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<td>7.7</td>
<td>8.7</td>
<td>9.7</td>
<td>10.7</td>
</tr>
</tbody>
</table>
Estimated Savings

1 ventilator day at St. David’s Medical Center (SDMC) = $3670

- A pre/post-implementation comparison yields a mean reduction of 0.3 ventilator day: equivalent to an estimated savings of $1100 per patient.

- Comparing Q1 2013 and Q1 2014 (without exclusions) yields a mean reduction of 0.7 ventilator day: equivalent to an estimated savings of $2570 per patient.

- Comparing Q1 2013 and Q1 2014 (with exclusions) yields a mean reduction of 1.1 ventilator days: equivalent to an estimated savings of $4037 per patient.
Estimated Savings

- If we take our 0.3-day reduction and multiply the associated savings of $1100 by the number of cases in 2013 (653, or 100% of the data), we arrive at an annual savings of **$718,300**.

- If we take our 0.7-day reduction and multiply the associated savings of $2570 by the number of cases in Q1 2013/Q1 2014 (285, or 43% of the data), we arrive at a cross-quarterly savings of $2570 x 285 or **$732,450**.
Estimated Savings

- If we take our 1.1-day reduction and multiply the associated savings of $4037 by the number of cases after exclusions in Q1 2013/Q1 2014 (202, or 31% of the data), we arrive at a cross-quarterly savings of $4037 x 202 or $815,474.

- Using the same calculations with the national average cost of a ventilator day ($1522), we arrive at an annual savings of $456.60 x 653 or $298,159; a cross-quarterly savings of $1065.40 x 285 or $303,639; and a cross-quarterly savings of $1674.20 x 202 or $338,188.
CAM-ICU Audit Data

- Strong correlation between immobility and CAM (+) status
- Average duration of recorded delirium: 3.87 days +/- 0.5 day
- We continue to have room for improvement:
  - Almost none of our CAM (+) patients had been mobilized
  - Due to the newness of the initiative, our inter-rater reliability is still inconsistent
Disposition/Discharge Data

March 2014:
- 11.1% of SDMC discharges to long-term acute care (LTAC) were CAM (+) influenced

April 2014:
- 8.3% of SDMC discharges to LTAC were CAM (+) influenced
- 2.2% of SDMC discharges to rehab were CAM (+) influenced
Case Study and Personal Experience

17-year-old male admitted with subdural hematoma early in implementation:

- Developed delirium
- On large amounts of propofol and versed, patient was in ICU for 30 days
- After the ABCDE bundle was implemented, patient was discharged to rehab in 13 days
Moving Forward: Sustainability

- Electronic charting: makes audits easier, increases staff compliance
- Perpetuating culture change: leading by example
- ABCDE bundle now part of new employee orientation
- Early mobility committee planned
- CAM-ICU part of annual skills checkoff
- Champions selected for the unit
- Partnering with SDMC leadership team: giving all of our research to our managers, director, and district CMO
Lessons Learned

- If someone wrote an article that inspires you, let them know.
- We have been amazed by and grateful for the support and collaboration from well-known researchers in the field. All we had to do was ask.
References

References

References