Insights on Implementing a Bundle for ICU Delirium

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Learning Objectives

1. Provide an overview of the ABCDE Bundle implementation program: its rationale, governance, tools and methodologies, resources, and outcomes.

2. Articulate the specific barriers to ABCDE Bundle adoption encountered at BSWH and demonstrate the solutions applied.

3. Identify high-impact practice adoption approaches learned from one integrated delivery system’s real-world ABCDE Bundle implementation experience.

"I think that's the single best piece of advice: constantly think about how you could be doing things better and questioning yourself."

Elon Musk
Baylor Scott & White Health (BSWH)

- More than 500 patient care sites including 43 hospitals in North and Central Texas
- 5.3 million patient encounters annually
- 34,000 employees
- 6,000 affiliated physicians
- Scott & White Health Plan
- $8.3 billion in total assets
- $5.8 billion in total net operating revenue
ICU Delirium (“Ever vs. Never”)

- Increased ICU length of stay (8 vs 5 days)
- Increased hospital length of stay (21 vs 11 days)
- Increased time on ventilator (9 vs 4 days)
- Higher ICU costs ($22,000 vs $13,000)
- Higher ICU mortality (19.7% vs 10.3%)
- Higher hospital mortality (26.7% vs 21.4%)
- 3-fold increased risk of death at 6 months
- Building evidence as a risk factor for long-term cognitive impairment

Ely, et al. ICM 2001; 27, 1892-1900
Lin, SM CCM 2004; 32: 2254-2259

Daily Awakening and Breathing Trials

- Shorter duration of mechanical ventilation
- Shorter ICU and hospital LOS
- Fewer tests for altered mental status
- Reduced mortality

Girard et al. Lancet 2008; 371:126-34
Benefits of Early Mobility

- ↑ functional independence at discharge
- ↓ duration of delirium
- ↓ time on ventilator
- ↓ length of stay
- ↓ costs
- Improved neurocognitive outcomes

Schweickert et al 2009; 373:1874-82
Chiang et al 2006; 86:1271-81
Needham et al 2010; 91:536-42
Morris et al CCM 2008; 36:2238-43

A New Paradigm for ICU Delirium

- Risk for ICU delirium is now considered modifiable rather than an unavoidable complication of critical illness (similar to central line related blood stream infections and venous thromboembolism)
- Delirium can be mitigated when it does occur
- Iatrogenic factors are a major contributor to delirium incidence
- Risks can be countered with specific care processes
Synergy of the ABCDE Bundle

Effectiveness and Safety of the Awakening and Breathing Coordination, Delirium Monitoring/Management, and Early Exercise/Mobility Bundle

Balas et al. Observed:

- Decrease in delirium incidence (OR = 0.55, p = 0.03)
- Increase in ventilator-free days (24 vs. 21, p = 0.04)
- Increased odds of mobilizing out of bed (OR = 2.11, p = 0.003)
- Reduced hospital mortality (OR 0.56, p = 0.09)
Breakout #1: The Elevator Speech

- Your facility has just built a new critical care tower
- You happen to be sharing an elevator ride with key members of the C-Suite
- What is your “business case” for addressing ICU delirium as a quality improvement and safety priority?

Divide up into groups of 8-12
Think broadly
Appoint a spokesperson to report out

The ABCDE Toolbox....
Wake Up and Breathe Protocol and other materials available at this site:
www.ICUdelirium.org

- Benzodiazepines are associated with increased risk of delirium
- Relative advantages to propofol and dexmedetomidine
- Adequate pain control is essential
- Bolus dosing rather than continuous drips


Delirium Monitoring and Management

Step 1: Sedation Assessment (RASS)

RICHMOND AGITATION-SEDATION SCALE (RASS)

<table>
<thead>
<tr>
<th>Scale</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>COMATOSE</td>
<td>Comatose, unable to communicate</td>
</tr>
<tr>
<td>5</td>
<td>VERY AGITATED</td>
<td>Pulls to remove tubes or catheters, aggressive</td>
</tr>
<tr>
<td>4</td>
<td>AGITATED</td>
<td>Frequent non-purposeful movement, fights ventilator</td>
</tr>
<tr>
<td>3</td>
<td>RESTLESS</td>
<td>Anxious, apprehensive, movements not aggressive</td>
</tr>
<tr>
<td>2</td>
<td>ALERT &amp; CALM</td>
<td>Spontaneously pays attention to caregiver</td>
</tr>
<tr>
<td>1</td>
<td>DROWSY</td>
<td>Not fully alert, but has sustained awakening to voice (eye opening &amp; contact &lt;10 sec)</td>
</tr>
<tr>
<td>0</td>
<td>LIGHT SEDATION</td>
<td>Briefly awakens to voice (eyes open &amp; contact &gt;10 sec)</td>
</tr>
<tr>
<td>-1</td>
<td>MODERATE SEDATION</td>
<td>Movement or eye opening to voice (no eye contact)</td>
</tr>
<tr>
<td>-2</td>
<td>DEEP SEDATION</td>
<td>No response to voice, but movement or eye opening to physical stimulation</td>
</tr>
<tr>
<td>-3</td>
<td>UNAROUSABLE</td>
<td>No response to voice or physical stimulation</td>
</tr>
</tbody>
</table>

If RASS is 2-3 proceed to CAM-ICU (if patient CAM-ICU positive or negative)

If RASS is 4 or 5 → STOP (update ABC+CNS+XAM, RECHECK later)
Step 2: Assess for Delirium with the CAM-ICU

Feature 1: Acute change or fluctuating course of mental status

And

Feature 2: Inattention

And

Feature 3: Altered level of consciousness

Or

Feature 4: Disorganized thinking

Delirium Subtypes

Hyperactive Delirium

Mixed Delirium

Hypoactive Delirium

Alert & Calm

Combative

Agitated

Restless

Lethargic

Sedated

Stupor
Stop and THINK

Do any meds need to be stopped or lowered?
• Especially consider sedatives
• Is patient on minimal amount necessary?
  – Daily sedation cessation
  – Targeted sedation plan
  – Assess target daily
• Do sedatives need to be changed?
• Remember to assess for pain!

Toxic Situations
• CHF, shock, dehydration
• New organ failure (liver/kidney)

Hypoxemia

Infection/sepsis (nosocomial), Immobilization

Nonpharmacologic interventions
• Hearing aids, glasses, reorient, sleep protocols, music, noise control, ambulation

K+ or electrolyte problems

Consider antipsychotics after evaluating etiology & risk factors

Early Exercise and Mobility Protocol Progression

<table>
<thead>
<tr>
<th>RASS -5 / -4</th>
<th>RASS ≥ -3</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Exercises, but Passive Range of Motion allowed</td>
<td>Active ROM (in bed)</td>
</tr>
<tr>
<td></td>
<td>Sit/ Dangle</td>
</tr>
<tr>
<td></td>
<td>Transfer</td>
</tr>
<tr>
<td></td>
<td>March/ Walk</td>
</tr>
</tbody>
</table>

Exercise screen

Progress as tolerated

ICU Discharge

Progression
Bundle Adoption is a Team Sport

Table: Identify Stakeholders

- VP of Medical Affairs/ CMO
- Hospital and Unit Directors
- Nursing
- Physicians
- RT
- PT/OT
- Pharmacy
- IT
- Quality Improvement
- Patient Safety

Table: Compose Interdisciplinary Patient Care Team

- Respiratory
- Nursing
- Pharmacists
- PT/OT
- Physicians

Breakout #2-Team Development

- Based on the success of your highly persuasive elevator speech, you have been granted authority to appoint an ICU Delirium QI Team at your facility
- Who do you recruit at your facility to participate?
- What are your resource needs?

Divide up into groups of 8-12
Think in terms of both personnel and clinical workflow
Be specific (but no names) according to your facility/system
Appoint a spokesperson to report out
The Real Challenge - Deployment

AHRQ Grant-Specific Aims

1. To implement a standardized set of care interventions targeting the prevention and amelioration of ICU delirium as an integrated, interdisciplinary bundle (“the ABCDE bundle”) for critically ill patients in ICUs across 3 different hospital environments (tertiary, community, rural) in the Baylor Health Care System, using a multifaceted approach to promote bundle uptake.

2. To evaluate the impact of the ABCDE bundle implementation program on quantitative and qualitative outcomes using mixed-methods analyses:
   - **Practice adoption**: Uptake of ABCDE bundle practices on pre-/post-intervention analyses and comparison with concurrent BHCS hospital controls not receiving the implementation program.
   - **Patient-centered clinical outcomes**: Prevalence/duration of delirium; delirium/coma-free days; mortality; length of ICU/hospital stays; discharge disposition; unintended consequences of bundle use.
   - **Cost**: Program implementation costs (financial, time, and effort).
   - **Qualitative assessments**: Quality improvement culture and strategies at organizational and local levels, as well as contextual variables related to diffusion of the ABCDE bundle innovation.

3. To disseminate project findings, methodology, and tools for ABCDE bundle implementation by:
   a. Building a structured implementation toolkit based on "lessons learned" from Aims 1 and 2.
   b. Local spread through a 4-month dissemination phase, where all BHCS hospitals not receiving the formal implementation program will have access to the toolkit.
   c. External sharing through collaboration with the Society of Hospital Medicine (SHM), a 30,000-member organization well-versed in promoting the uptake of patient safety practices. We will partner with SHM to develop a web-based resource (maintained on the SHM website) related to ABCDE bundle implementation.
   d. Revising the toolkit and SHM web resource content according to feedback from the BHCS local dissemination phase and SHM expert reviewers. The final implementation toolkit will then be distributed to other professional organizations and health care media sites.
Hierarchy of Reliability

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Predicted Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>No protocol</strong> (&quot;State of Nature&quot;)</td>
<td>40%</td>
</tr>
<tr>
<td>2</td>
<td><strong>Pseudo-protocol</strong>: decision support exists but not linked to order writing, or prompts within orders but no decision support</td>
<td>50%</td>
</tr>
<tr>
<td>3</td>
<td><strong>Protocol</strong>: well-integrated into orders at point-of-care</td>
<td>65-85%</td>
</tr>
<tr>
<td>4</td>
<td><strong>Enhanced protocol</strong>: complementary strategies increase use of protocol</td>
<td>90%</td>
</tr>
<tr>
<td>5</td>
<td><strong>Measure-vention</strong>: oversights identified &amp; addressed in real time</td>
<td>90+%</td>
</tr>
</tbody>
</table>

*Protocol = standardized decision support, embedded within an order set

Maynard G, UC-San Diego

Cycles of Improvement Correlate to the Hierarchy

[Diagram showing cycles of improvement correlated to the hierarchy]
### ABCDE Bundle Implementation Tactics

<table>
<thead>
<tr>
<th>Adoption Program Component</th>
<th>Time to Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activate Nurse/Physician Champions and secure clinical staff conceptual buy-in</td>
<td>1-3 months (based on hospital size)</td>
</tr>
<tr>
<td>Assess current state (workflow, performance)</td>
<td>1-month</td>
</tr>
<tr>
<td>Development of supportive EHR Documentation and order set with incorporation into production (live use) environment</td>
<td>9-12 months</td>
</tr>
<tr>
<td>Training Sessions (staged at hospitals with multiple ICUs):</td>
<td></td>
</tr>
<tr>
<td>a. “Train the trainer” (with outside consultants)</td>
<td></td>
</tr>
<tr>
<td>b. Frontline staff training (2-hour session)</td>
<td></td>
</tr>
<tr>
<td>Use of daily rounding tool</td>
<td>9-12 months</td>
</tr>
<tr>
<td>Standardized Performance Reporting (hospital and unit levels)</td>
<td>4 months after completion of EHR workflow tools</td>
</tr>
<tr>
<td>Optimization/EHR refinement/standing meetings</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Accountability as a system critical care goal</td>
<td>3 months after standardized reporting</td>
</tr>
</tbody>
</table>

#### Order Set

![Order Set Image](Image)
Frontline Staff Training

- “Launch Training” was a 4-hour workshop on the ABCDE Bundle offered to ICU nurses, respiratory therapists, and physical therapists

- Main takeaways ➔ staff should be able to:
  - List the components of the ABCDE bundle and describe their benefits
  - Identify ways to incorporate the bundle into routine clinical care
  - Describe strategies for implementing each component of the bundle
  - Describe potential barriers and facilitators to implementation of the ABCDE bundle
  - Understand changes in documentation changes in the electronic health record
Super Trainer Courses

- Incorporated all the elements of frontline staff training
- Taught nurses how to train their peers in delirium identification and management
- Included a brief lecture about RASS and CAM-ICU
- Included role playing regarding delirium identification and case studies
- Discussed electronic documentation of RASS and CAM-ICU
- Participants watched a 10-minute CAM-ICU video
- Additional phased interactive hands-on training followed the courses
Standardized Performance Reporting

Eligibility for Report:
- Vent ≥ 24 hours
- Vent ≤ 2 weeks
- Specific neuro. diagnoses excluded
- Based on admin. data

Real-Time Reporting for “Measure-Vention”
Accountability

**Goal:** For ICU patients with acute respiratory failure requiring mechanical ventilation for ≥ 24 hours, adherence to specific components of the ventilator management bundle (daily awakening trials, spontaneous breathing trials, delirium screening, early mobility). The denominator will be based on the # of observations for which the patient is eligible (i.e. had an appropriate indication and met safety criteria to receive that process) on a daily basis. Observations after > 14 days on mechanical ventilation will be excluded. Points assigned for process performance levels and added cumulatively.

**Performance Targets:**

- **Daily Awakening Trial:** 60-70% (1 point); 71-80% (2 points), above 80% (3 points)
- **Breathing Trials:** 60-70% (1 point); 71-80% (2 points); above 80% (3 points)
- **Delirium Screening:** 70-80% (1 point), 81-90% (2 points); above 90% (3 points)
- **Exercise/Mobility:** 50-60% (1 point); 61-70% (2 points); above 70% (3 points)

**Composite Bundle:** 50-60% (1 point), 61-70% (2 points), above 70% (3 points)
Breakout #3: Troubleshooting

- Divide up into 5 groups
- Each group will be given a specific case scenario with a commonly encountered ABCDE Bundle adoption barrier
- Applied solutions can be based on tactics presented in this session or other change management strategies you have used (creativity is encouraged here)
- Report back on how you would approach the problem in your facilities

Case Scenarios
- The Recalcitrant Physician
- Project Management Predicament
- Same System, Miles Apart
- The Prodigal Nurse (2 parts)
- No Movement on Mobility

Program Results
# Effect of Training on CAM-ICU

## Performance of CAM-ICU in Eligible Patients

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
<th>Paired cases</th>
<th>Pre Kappa Coefficient (95% CI)</th>
<th>Post Kappa Coefficient (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tertiary Hospital</td>
<td>65</td>
<td>84*</td>
<td>183</td>
<td>0.53 (0.43-0.63)</td>
<td>0.71 (0.62-0.80)</td>
</tr>
<tr>
<td>Community Hospital</td>
<td>70</td>
<td>85*</td>
<td>41</td>
<td>0.49 (0.29-0.68)</td>
<td>0.89 (0.69-1.00)</td>
</tr>
<tr>
<td>Combined</td>
<td>66</td>
<td>84*</td>
<td>224</td>
<td>0.53 (0.44-0.61)</td>
<td>0.73 (0.64-0.81)</td>
</tr>
</tbody>
</table>

*P-value < 0.05

## ABCDE-Composite Bundle Adherence Trends

![Adherence Trends Graph](image)
## Individual Bundle Element Adherence Trends

### Improvement in ABCDE Practice Adherence: Pre- vs. Post-Implementation Program

<table>
<thead>
<tr>
<th>%</th>
<th>Basic</th>
<th>Enhanced</th>
<th>Basic</th>
<th>Enhanced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre n=290</td>
<td>Post n=394</td>
<td>Difference</td>
<td>p-value</td>
</tr>
<tr>
<td>SAT</td>
<td>0.23</td>
<td>0.60</td>
<td>0.37</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>SBT</td>
<td>0.22</td>
<td>0.72</td>
<td>0.50</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>CAM-ICU</td>
<td>0.33</td>
<td>0.68</td>
<td>0.35</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Early Mobility</td>
<td>0.06</td>
<td>0.55</td>
<td>0.49</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>ABCDE Bundle</td>
<td>0.26</td>
<td>0.65</td>
<td>0.39</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>
Delirium Incidence

- Delirium incidence increased with bundle uptake (OR = 1.25; 95% CI: 1.03-1.52)
- This is likely a result of detection bias and unmasking of “hidden” delirium
- Substantial variability (20%-80%) in incidence according to unit type
- Highest rates observed in medical ICU patients

Bundle Impact on Patient Outcomes: Preliminary Data

Patients with Bundle Adherence Rate ≥ 60%
- Spent less time on the ventilator (-.32 days; 95% CI: -0.55, -0.08)
- No change in documented coma incidence (OR=0.97; 95% CI: 0.76-1.23)
- Had fewer days with coma or delirium (45%; 95% CI: 0.30-0.59)
- Were more likely to be mobilized out of bed (OR = 2.05, 95% CI: 1.67-2.53)
- Were more likely to be discharged home (OR = 1.22; 95% CI: 1.01-1.47)
- Had reduced risk of inpatient mortality (OR = 0.43; 95% CI: 0.32-0.57)
Implementation Costs (System Level)

<table>
<thead>
<tr>
<th>Key Personnel</th>
<th>FTE</th>
<th>Estimated Average Yearly Salary</th>
<th>Salary Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Lead</td>
<td>.10</td>
<td>$187,200</td>
<td>$18,720</td>
</tr>
<tr>
<td>Project Manager</td>
<td>.40</td>
<td>$82,790</td>
<td>$33,116</td>
</tr>
<tr>
<td>Physician Champions</td>
<td>.20</td>
<td>$187,200</td>
<td>$37,440</td>
</tr>
<tr>
<td>Nurse Champions</td>
<td>.20</td>
<td>$65,470</td>
<td>$13,094</td>
</tr>
<tr>
<td>Data Analyst</td>
<td>.50</td>
<td>$77,080</td>
<td>$38,540</td>
</tr>
<tr>
<td>Information Services</td>
<td>.25</td>
<td>$100,000</td>
<td>$25,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>≈ $165K</td>
</tr>
</tbody>
</table>

- Costs represent initial 1-year deployment period
- Annual cost for maintenance phase decreases to $30-40K range (data management, reports, training)
- *United States Department of Labor, Bureau of Labor Statistics

Key Lessons Learned

- Staff training should extend beyond a 15-minute in service as ABCDE involves a cultural change.
- Delirium management by physicians needs to keep pace with improved recognition by nurses.
- SATs and early mobility have been the most refractory bundle components.
- “Person-to-person” propagation and clear lines of accountability are crucial to adoption of the ABCDE bundle (similar to adoption of other innovations).
- Focusing resources on EHR modification (and placing this phase as early as possible in the implementation program sequence) appears to be a higher-yield practice uptake approach.
Thanks to All! (I)

**Vanderbilt ICU Delirium and Cognitive Impairment Study Group**
- Wes Ely, MD, MPH
- Eduard Vasilevskis, MD
- Cayce Strength, RN
- Arniee Hoskins, RN

[www.icudelirium.org](http://www.icudelirium.org)

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- Greg Maynard, MD, MSc

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- Lucy Savitz, PhD

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"I think you should be more explicit here in step two."