D9/E9:  
Insights on Implementing a Bundle for ICU Delirium

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"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

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.
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

Andros Island by N Rakov, NEJM 2011;365:457
**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

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**Daily Awakening and Breathing Trials**

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

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Ely, et al. ICM2001; 27: 1892-1900
Lin, SM CCM 2004; 32: 2254-2259

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


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

C²: Choice of Sedation

- 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):

- **Scale**: Levels of agitation or sedation
- **Label**: Descriptions of each level

Example:
- **Level 4**: Conscious, oriented, immediate danger to self
- **Level 3**: Very agitated: patient refuses to cooperate, resists, combative
- **Level 2**: Agitated: frequent non-purposeful movement, high ventilator
- **Level 1**: Restless: restless, apprehensive, movements not aggressive
- **Level 0**: Alert & calm: spontaneously pays attention to caregiver
- **Level -1**: Drowsy: not fully alert, has sustained awakening to voice, eye opening & contact
- **Level -2**: Light sedation: briefly awakens to voice (eyes open & contact) < 10 sec
- **Level -3**: Moderate sedation: movement or eye opening to voice (no eye contact)
- **Level -4**: Deep sedation: no response to voice, but movement or eye opening to physical stimulation
- **Level -5**: Unrousable: no response to voice or physical stimulation

If RASS is 2-3 proceed to CAM-ICU using patient CAM-ICU positive or negative?
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
- Combative
- Agitated
- Restless

Mixed Delirium

Alert & Calm

Lethargic
- Sedated
- Stupor

Hypoactive Delirium

Ely, et. al. CCM 2001; 29:1370-1379.4
Ely, et. al. JAMA 2001; 286:2703-2710.5
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!

Consider antipsychotics after evaluating etiology & risk factors

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

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>

Progress as tolerated

Exercise screen

ICU Discharge

RASS -5 / -4
Bundle Adoption is a Team Sport

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

**Compose Interdisciplinary Patient Care Team**

- Respiratory
- Nursing
- PT/OT
- Pharmacists
- 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>No protocol (&quot;State of Nature&quot;)</td>
<td>40%</td>
</tr>
<tr>
<td>2</td>
<td>Pseudo-protocol: 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>Protocol: well-integrated into orders at point-of-care</td>
<td>65-85%</td>
</tr>
<tr>
<td>4</td>
<td>Enhanced protocol: complementary strategies increase use of protocol</td>
<td>90%</td>
</tr>
<tr>
<td>5</td>
<td>Measure-vention: oversights identified &amp; addressed in real time</td>
<td>90+%</td>
</tr>
</tbody>
</table>

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

Cycles of Improvement Correlate to the Hierarchy
**ABCDEF 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>4-6 month cycle to launch each unit; multiple &quot;reinforcement&quot; sessions required.</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>

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**Order Set**

**Spontaneous Breathing Trial**
- Onset Spontaneous breathing, 1st with Continuous Positive Airway Pressure Support 5 cmH2O. If patient:
  - spontaneous breathing stable or worsens.
  - Not weaning indicated.
  - Fio2 0.0% to 10%.
  - Oxygen saturation greater than 94%.
  - No active medical intervention within the past 24 hours.
  - Patient awake and able to follow 2 of the 3 following commands:
    - Open eyes with verbal command.
    - Points two fingers upon instructions.
    - Follows commands to name, open eyes.
  - Tidal volume and airway open and patent.
- Discontinue spontaneous breathing (clinical evidence of spontaneous breathing) begins.
- Respiratory rate greater than 20 or less than 10 minute or less.
- Utterly clear an area of greater than 95% for greater than 1 minute.
- Alerted change in mental status.
- Acute Cardiogenic Edema.
- Heart rate greater than 100 or less than 60.
- Accessory muscle use.
- Abnormal Cardiopulmonary Fluid Retention.
- Diaphoresis.
- Marked hypoxia.
- Call physician after 30 minutes with results of trial.

_Evidence-based management of acute respiratory failure in the ICU_
### Critical Care Flowsheet

![Critical Care Flowsheet](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”
Huddle Boards

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

<table>
<thead>
<tr>
<th>Performance of CAM-ICU in Eligible Patients</th>
<th>Inter-rater Reliability of CAM-ICU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Patients with documented CAM-ICU (%)</td>
<td>Pre Kappa Coefficient (95% CI)</td>
</tr>
<tr>
<td>Post Patients with documented CAM-ICU (%)</td>
<td>Paired cases N</td>
</tr>
<tr>
<td>Paired cases N</td>
<td>Post Kappa Coefficient (95% CI)</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Tertiary Hospital</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>0.53</td>
</tr>
<tr>
<td>84*</td>
<td>(0.43-0.63)</td>
</tr>
<tr>
<td>183</td>
<td>140</td>
</tr>
<tr>
<td>0.71</td>
<td>(0.62-0.80)</td>
</tr>
<tr>
<td>Community Hospital</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>0.49</td>
</tr>
<tr>
<td>85*</td>
<td>(0.29-0.66)</td>
</tr>
<tr>
<td>41</td>
<td>16</td>
</tr>
<tr>
<td>0.89</td>
<td>(0.69-1.00)</td>
</tr>
<tr>
<td>Combined</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>0.53</td>
</tr>
<tr>
<td>84*</td>
<td>(0.44-0.61)</td>
</tr>
<tr>
<td>224</td>
<td>165</td>
</tr>
<tr>
<td>0.73</td>
<td>(0.64-0.81)</td>
</tr>
</tbody>
</table>

*P-value <0.05

Presented at 2014 ATS Meeting, San Diego, CA

ABCD-E-Composite Bundle Adherence Trends

[Graph showing adherence trends over time]
### Individual Bundle Element Adherence Trends

![Graphs showing adherence trends for different elements.](Image)

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

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

www.icudelirium.org

Society Of Hospital Medicine

- Greg Maynard, MD, MSc

Intermountain Healthcare

- Lucy Savitz, PhD

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Questions/Discussion

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