Closing the Hospital Practice Adoption Gap: The Case for Delirium as a QI Priority

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These research grants are unrelated to the presentation content. No commercial products or services will be referenced.
Baylor Scott & White Health

- More than 900 patient care sites including 48 hospitals
- 5.1 million patient encounters annually
- $10B in total assets
- 40,000 employees; 6,000 affiliated physicians
- Scott & White Health Plan
- ACO: Baylor Scott & White Quality Alliance
- Physician Practice Networks
  - Health Texas Provider Network
  - Scott & White Clinic
Learning Objectives

1. Articulate the imperative for strategically addressing delirium as a hospital quality and safety initiative

2. Delineate specific tactics and cultural changes to promote ABCDEF Bundle deployment and consistent use

3. Identify dissemination approaches learned from one delivery system’s experience with a delirium QI program
Context: Health Care Value Trend


Value=Quality/Cost
$900 Billion in Waste

Figure. Proposed “Wedges” Model for US Health Care, With Theoretical Spending Reduction Targets for 6 Categories of Waste

Gap Between Knowledge and Care Delivery

Daugherty D, JAMA 2008
Rationale for a Delirium QI Program

Andros Island by N Rakov, NEJM 2011;365:457
Shift to Value-Based Reimbursement

Share of Traditional Medicare Payments Flowing Through Alternative Payment Models: Historical and Goals

Percent of payments

- 2010: 0%
- 2014: ~20%
- 2016: 30%
- 2018: 50%

HHS Goals
Increasing Chronic Disease Burden

U.S. Population by Age Cohorts


Project Growth In Population With Chronic Conditions, 2013-25

Source: Health Care Demand Microsimulation Model projections.
U.S. ICU Utilization

Delirium = Organ System Dysfunction

- Develops over a short period of time (hours to days) and fluctuates over time
- Results in a disturbance of consciousness
- Characterized by:
  - inattention
  - change in cognition
  - perceptual disturbance
ICU Delirium Epidemiology

- 30-80% incidence in critically ill patients (varies according to ICU population; > in medical ICUs)
- Certain populations (elderly, multiple chronic diseases) are predisposed
- Delirium subtypes:
  - Hyperactive (restless, agitated patient); 5-20% of cases
  - Hypoactive
  - Mixed > 80% of cases
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
The End Game: Quality of Life

Post Intensive Care Syndrome

Patient

Mental Health
Anxiety/ASR
Depression
PTSS PTSD
Complicated Grief

Quality of Life

Mental Health
Anxiety/ASR
Depression
PTSS PTSD

Cognitive
Executive Function
Memory
Attention

Physical
Pulmonary
Neuromuscular

Quality of Life

Davidson JE et al., Critical Care Medicine, 2013; 41: S136-45
ABCDEF: A Bundle of Best Practices

A: Assess for, prevent, and manage pain

B: Both spontaneous awakening trial (SAT) and spontaneous breathing (SBT) trial

C: Choice to use (and of) analgesia and sedation

D: Delirium assessment, prevention, and management

E: Early activity and mobility

ABCDE Bundle

F=Family Engagement
Learning Health System Model for New Therapies

Rawlins, *JAMA* 2016
Eligibility

• **Study Population**
  – Patients admitted to study ICUs from July 2012-June 2015
  – IRB approved protocol under a waiver of informed consent

• **Inclusion Criteria**
  – 18 years of age or older
  – ICU admission lasting >24 hours
  – On the ventilator for >48 hours and <14 days

• **Exclusion Criteria**
  – On comfort/hospice care
  – Pending transfer to non-ICU bed
  – Never on the ventilator
  – Primary diagnosis of brain tumor, mental disorder, stroke, intracranial injury, or poisoning
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

## 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>1-2 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</td>
<td>4-6 month cycle to launch each unit; multiple “reinforcement” sessions required.</td>
</tr>
<tr>
<td>a. “Train the trainer”</td>
<td></td>
</tr>
<tr>
<td>b. Frontline staff</td>
<td></td>
</tr>
<tr>
<td>c. E-learning modules</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>
Identify Stakeholders

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

Collaborative Patient Care Team

Interdisciplinary Effort

- Respiratory
- Nursing
- Pharmacists
- Physicians
- PT/OT
Workflow: EHR Modifications
Bundle Inclusion in Team Rounds/Unit Huddles
Standardized Performance Reporting

Table 1. SAT Adherence Rate

<table>
<thead>
<tr>
<th></th>
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</tr>
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<tbody>
<tr>
<td>n</td>
<td>12</td>
<td>18</td>
<td>23</td>
<td>21</td>
<td>13</td>
<td>26</td>
<td>26</td>
<td>24</td>
<td>13</td>
<td>12</td>
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<tr>
<td>%</td>
<td>63</td>
<td>48</td>
<td>56</td>
<td>62</td>
<td>57</td>
<td>11</td>
<td>68</td>
<td>63</td>
<td>80</td>
<td>62</td>
<td>71</td>
<td>65</td>
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</table>

Table 2. SBT Adherence Rate

<table>
<thead>
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<tbody>
<tr>
<td>n</td>
<td>13</td>
<td>15</td>
<td>23</td>
<td>19</td>
<td>16</td>
<td>2</td>
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<td>22</td>
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<tr>
<td>%</td>
<td>93</td>
<td>61</td>
<td>85</td>
<td>86</td>
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<td>40</td>
<td>93</td>
<td>92</td>
<td>93</td>
<td>93</td>
<td>93</td>
<td>87</td>
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</tbody>
</table>

Table 3. CAM-ICU Adherence Rate

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>81</td>
<td>80</td>
<td>113</td>
<td>103</td>
<td>88</td>
<td>36</td>
<td>247</td>
<td>164</td>
<td>101</td>
<td>66</td>
<td>66</td>
<td>153</td>
</tr>
<tr>
<td>%</td>
<td>79</td>
<td>77</td>
<td>70</td>
<td>72</td>
<td>77</td>
<td>72</td>
<td>75</td>
<td>70</td>
<td>82</td>
<td>58</td>
<td>64</td>
<td>75</td>
</tr>
</tbody>
</table>

Table 4. Delirium Incidence

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>n</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>%</td>
<td>57</td>
<td>56</td>
<td>27</td>
<td>46</td>
<td>74</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
</tr>
</tbody>
</table>
Training/Education

- “Super-trainer” course:
  - Capability of teaching peers in CAM-ICU (including teach-back)
  - High degree of acumen with EHR changes
  - Case studies

- Basic course for frontline staff:
  - Understand components of the ABCDE bundle and ways to incorporate those processes into routine clinical care
  - Identify potential barriers and facilitators to implementation of the ABCDE bundle
  - Become comfortable with bundle related changes in the EHR

- Development of e-learning modules
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)
"As the rep had recognized, human interaction is the key force in overcoming resistance and speeding change."

-Atul Gawande

“Diffusion of innovations is essentially a social process.” New evidence, improved technology, or incentive programs are insufficient on their own to ensure adoption.

-Everett Rogers
Challenge the Status Quo

“Well, hey....these things just snap right off.”
Results

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

Then a miracle occurs...
## Interrater Reliability of CAM-ICU

<table>
<thead>
<tr>
<th></th>
<th>Performance of CAM-ICU in Eligible Patients</th>
<th>Inter-rater Reliability of CAM-ICU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td></td>
<td>Patients with documented CAM-ICU (%)</td>
<td>Patients with documented CAM-ICU (%)</td>
</tr>
<tr>
<td>Tertiary Hospital</td>
<td>65</td>
<td>84*</td>
</tr>
<tr>
<td>Community Hospital</td>
<td>70</td>
<td>85*</td>
</tr>
<tr>
<td>Combined</td>
<td>66</td>
<td>84*</td>
</tr>
</tbody>
</table>

*P-value <0.05
Composite Bundle Uptake by Intervention Group

Maintaining at > 90%
Impact on Delirium and Coma Outcomes (Risk Adjusted for Illness Severity):

Comparison Group: 25%-50% Composite Bundle Adherence

<table>
<thead>
<tr>
<th>Risk-adjusted Outcomes</th>
<th>Medium Adherence 50-75% (n = 1337)</th>
<th>High Adherence 75-100% (n = 869)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence of delirium (OR)</td>
<td>1.49* (1.21, 1.84)</td>
<td>1.73* (1.37, 2.18)</td>
</tr>
<tr>
<td>Duration of delirium (days)</td>
<td>0.10 (-0.08, 0.29)</td>
<td>0.23 (-0.04, 0.50)</td>
</tr>
<tr>
<td>Incidence of coma (OR)</td>
<td>0.67* (0.51, 0.88)</td>
<td>0.53* (0.40, 0.71)</td>
</tr>
<tr>
<td>Duration of coma (days)</td>
<td>-0.32* (-0.37, -0.27)</td>
<td>-0.52* (-0.72, -0.33)</td>
</tr>
<tr>
<td>% Coma/delirium free days</td>
<td>0.18* (0.13, 0.23)</td>
<td>0.23* (0.13, 0.33)</td>
</tr>
</tbody>
</table>

*a For patients diagnosed with delirium  
*b For patients diagnosed with coma  
*p < 0.05
Impact on Additional Clinical Outcomes (Risk Adjusted for Illness Severity):

<table>
<thead>
<tr>
<th>Risk-adjusted Outcomes</th>
<th>Medium Adherence 50-75% (n = 1337)</th>
<th>High Adherence 75-100% (n = 869)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>CI</td>
</tr>
<tr>
<td>ICU Length of Stay(^a)</td>
<td>0.03</td>
<td>(-0.05, 0.11)</td>
</tr>
<tr>
<td>Hospital Length of Stay(^a)</td>
<td>0.00</td>
<td>(-0.04, 0.03)</td>
</tr>
<tr>
<td>Ventilator days</td>
<td>-0.05</td>
<td>(-0.14, 0.03)</td>
</tr>
<tr>
<td>Mobilized out of bed (OR)</td>
<td>2.49(^*)</td>
<td>3.97(^*)</td>
</tr>
<tr>
<td></td>
<td>(1.97, 3.15)</td>
<td>(3.05, 5.16)</td>
</tr>
<tr>
<td>Discharged home (OR)</td>
<td>1.76(^*)</td>
<td>2.16(^*)</td>
</tr>
<tr>
<td></td>
<td>(1.41, 2.21)</td>
<td>(1.69, 2.75)</td>
</tr>
<tr>
<td>Inpatient mortality (OR)</td>
<td>0.39(^*)</td>
<td>0.25(^*)</td>
</tr>
<tr>
<td></td>
<td>(0.31, 0.48)</td>
<td>(0.19, 0.31)</td>
</tr>
</tbody>
</table>

\(^a\)Patients who died during ICU stay were excluded from LOS calculations

\(^*\)p < 0.05
Program Economics
## 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><strong>$165K</strong></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
Hidden Program Costs
Hospital Stay Cost Variability: Sepsis DRGs

Cost Variation by DRG and Dept Group

Inpatient Sepsis - Comparison by DRG

- AVG 870: SEPTICEMIA OR SEVERE SEPSIS W/ MV >96 HOURS
- AVG 871: SEPTICEMIA OR SEVERE SEPSIS W/O MV >96 HOURS W MCC
- AVG 872: SEPTICEMIA OR SEVERE SEPSIS W/O MV >96 HOURS W/O MCC

Legend:
- 40: Implants
- 25: BMT
- 24: Transplant
- 23: PACU
- 22: Sterile Processing
- 21: Anesthesia
- 20: Physical Medicine
- 12: Room
- 11: Respiratory
- 10: Radiology
- 09: Pharmacy
- 08: Other
- 07: Operating Room
- 06: L&D
- 05: Lab
- 04: ICU
- 03: GI
- 02: ER
- 01: Cardio
90-Day Episode CMS Payment: DRG 870

$140K

Benchmarks
## Correlating Clinical Outcomes with Financial Impact

### Comparison Group: 25% - 50% Composite Bundle Adherence

<table>
<thead>
<tr>
<th>Risk-adjusted Outcomes</th>
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<th>High Adherence 75-100% (n = 869)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU Length of Stay&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.03 (0.05, 0.11)</td>
<td>0.04 (-0.05, 0.12)</td>
</tr>
<tr>
<td>Hospital Length of Stay&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.00 (-0.04, 0.03)</td>
<td>-0.03 (-0.08, 0.03)</td>
</tr>
<tr>
<td>Ventilator days</td>
<td>-0.05 (-0.14, 0.03)</td>
<td>-0.20* (-0.36, -0.05)</td>
</tr>
<tr>
<td>Mobilized out of bed (OR)</td>
<td>2.49* (1.97, 3.15)</td>
<td>3.97* (3.05, 5.16)</td>
</tr>
<tr>
<td>Discharged home (OR)</td>
<td>1.76* (1.41, 2.21)</td>
<td>2.16* (1.69, 2.75)</td>
</tr>
<tr>
<td>Inpatient mortality (OR)</td>
<td>0.39* (0.31, 0.48)</td>
<td>0.25* (0.19, 0.31)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Patients who died during ICU stay were excluded from LOS calculations

*p < 0.05
Delirium Program Expansion Beyond ICUs

- Patients > 65 years on medical-surgical floors
- Nurse evaluation with Confusion Assessment Method once per shift
- Non-pharmacologic interventions are standing protocols
Post-Hospital Syndrome

Proportions of Rehospitalizations for Causes Other Than the Condition at Initial Discharge.

Data are from Jencks et al.¹
CAM Adherence/Incidence: Med-Surg

Average Delirium Test Adherence Rate by Facility

- DAL-UMC: 89.7%
- GAR-MC: 89.2%
- DAL-HVH: 85.3%
- PLA-MC: 85.0%
- WAX-MC: 83.4%
- MCK-MC: 79.7%
- BSWH: 74.5%
- PLA-HH: 73.3%
- FWT-MC: 70.9%
- GRP-MC: 68.5%
- CAR-MC: 64.1%
- IRV-MC: 63.2%
- DENT-HH: 41.5%

Delirium Incidence by Facility (patients with no tests excluded)

- GAR-MC: 16.6%
- CAR-MC: 10.4%
- GRP-MC: 10.4%
- MCK-MC: 9.8%
- FWT-MC: 9.2%
- BSWH: 6.8%
- IRV-MC: 6.0%
- PLA-MC: 5.9%
- WAX-MC: 4.1%
- DAL-UMC: 3.5%
- PLA-HH: 2.5%
- DAL-HVH: 1.9%
- DENT-HH: 1.7%
Delirium Duration: Med-Surg

Average Days of Delirium by Facility

- DAL-UMC: 1.8
- PLA-HH: 1.7
- GRP-MC: 1.6
- BSWH: 1.4
- CAR-MC: 1.4
- FWT-MC: 1.3
- PLA-MC: 1.2
- GAR-MC: 1.1
- MCK-MC: 1.1
- IRV-MC: 0.9
- DAL-HVH: 0.9
- WAX-MC: 0.6
- DEN-HH: 0.1
Interventions: Med-Surg

Non-ICU Order Set Use in Delirium Positive Patients

- DAL-HMH: 14.5%
- DAL-UMC: 5.3%
- FWT-MC: 3.7%
- PLA-MC: 1.6%
- IRV-MC: 1.1%
- CAR-MC: 0.9%
- GAR-MC: 0.6%
- GRP-MC: 0.3%
- WAX-MC: 0.0%
- MCK-MC: 0.0%
- DEN-HH: 0.0%

Sitter Use in Delirium Positive Patients

- % Sitter Use
- Graph showing sitter use from June 2016 to September 2017
Utilization Impact

Length of Stay (in days) and Readmission Rate (%)

Discharge Dispositions

BaylorScott&White HEALTH
Delirium Program Uptake: Lessons Learned

- We view this as an example of successful application of HIT facilitating deployment of best clinical practices
- 1:1 relationship between clinical workflow and EHR structured documentation/CDS; deploying the EHR modifications should be a core step in hardwiring a care process
- Hospitals with a strong pre-existing QI acumen were able to leverage the EHR modifications with minimal support
- Even with HIT tools, “person-to-person” propagation, clear lines of accountability, and generation of local evidence were crucial to adoption of the ABCDE bundle
- Focusing resources on EHR modification (placing this phase as early as possible in the implementation program sequence) appears to be a high-yield practice uptake approach
Closing Thoughts

• Installation [of any new system or approach] is **hard**, and mainly technical

• Implementation is **really hard**, and mainly organizational

• Transition (lasting change) is **incredibly hard**, and purely human

• Transformation is a state of profound **new personal and enterprise behavior**

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Questions?