

Online Data Supplement

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

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Table E1. ABCDE Bundle-Related Educational Efforts^a

- 1) 30-minute online, interprofessional ABCDE Bundle training program.
- 2) Delirium expert presentation on institution's medical ground rounds.
- 3) 8-hour ABCDE Bundle education day.
- 4) Nursing based in-services.
- 5) Medical based In-services.
- 6) Pharmacist-developed and -administered sedation survey followed by tailored group and individual education.
- 7) Administration of ABCDE bundle case scenarios followed by individual feedback.
- 8) ABCDE Bundle training incorporated into annual nursing education process and orientation.
- 9) Unit-based posters and educational flyers.
- 10) Distribution of agitation/sedation and delirium assessment pocket cards.

ABCDE = Awakening and Breathing Coordination, Delirium Monitoring/Management, and Early Exercise/Mobility Bundle

^aAdapted from: Balas MC, Burke WJ, Gannon D, et al: Implementing the ABCDE bundle into everyday care: Opportunities, challenges, and lessons learned for implementing the ICU pain, agitation, and delirium guidelines. *Crit Care Med* 2013; 41(9):S116-S127

Table E2. Baseline Characteristics by Mechanical Ventilation Status

Variable	Mechanically Ventilated			Not Mechanically Ventilated		
	Pre N=93	Post N=94	<i>p</i>	Pre N=53	Post N=56	<i>p</i>
Age, mean (SD), yr	57.7 ± 16.2	55.4 ± 14.5	0.30	61.7 ± 15.8	56 ± 15.7	0.06
Female, n (%)	44 (47.3%)	35 (37.2%)	0.16	23 (43.4%)	29 (51.8%)	0.38
Caucasian, n (%)	85 (92.4%)	83 (89.3%)	0.46	49 (94.2%)	50 (89.3%)	0.49
Residence Preadmission ^a , n (%)			0.14			0.37
Home	76 (81.7%)	84 (89.4%)		42 (79.3%)	48 (85.7%)	
Nursing home	5 (5.4%)	3 (3.2%)		2 (3.8%)	4 (7.1%)	
SNF	2 (2.2%)	3 (3.2%)		2 (3.8%)	3 (5.4%)	
Rehabilitation center	3 (3.2%)	0 (0%)		2 (3.8%)	0 (0%)	
Other hospital	4 (4.3%)	1 (1.1%)		5 (9.4%)	0 (0%)	
Other	3 (3.2%)	3 (3.2%)		0 (0%)	1 (1.8%)	
APACHE II score, median (IQR)	26 (22, 31)	23 (19, 33)	0.16	17 (12, 23)	16 (9, 21)	0.31
CCI, median (IQR)	3 (1, 5)	2 (1, 4)	0.26	2 (0, 4)	2 (1, 4)	0.71
Admitting ICU diagnosis, n (%)			NT			NT
Medical ^b						
Shock	15 (16.1%)	12 (12.8%)		5 (9.4%)	8 (14.3%)	
Respiratory	27 (29.0%)	23 (24.5%)		10 (18.9%)	12 (21.4%)	
Cardiac	4 (4.3%)	2 (2.1%)		2 (3.8%)	3 (5.4%)	
Neurologic/other	15 (16.1%)	22 (23.4%)		10 (18.9%)	12 (21.4%)	
Surgical ^c						
Neurosurgical	13 (14.0%)	10 (10.6%)		16 (30.2%)	14 (25%)	
Cardiothoracic/vascular	6 (6.5%)	19 (20.2%)		0 (0%)	1 (1.8%)	
General surgery/trauma	11 (11.8%)	5 (5.3%)		10 (18.9%)	6 (10.7%)	
Other (transplant liver, kidney)	2 (2.2%)	1 (1.1%)		---	---	
Admission type (elective), n (%)	23 (24.7%)	27 (28.7%)	0.54	7 (13.2%)	12 (21.4%)	0.26
Sedation received before study enrollment, median (IQR); N						
Benzodiazepines (mg) ^d	10.8 (3.2, 34) N=70	13.6 (2.9, 34.2) N=72	0.99	1.6 (0.4, 2) N=17	1.6 (0.8, 2) N=15	0.88
Opiates ^e (mg)	25.7 (8, 44) N=67	31.3 (13.3, 56.7) N=69	0.43	11 (5, 32.2) N=40	19 (6.7, 36) N=38	0.43
Propofol (mg)	250 (100, 2300) N=39	240 (120, 1390) N=33	0.81	160 (110, 250) N=11	150 (100, 200) N=17	0.64
Dexmedetomidine (ug)	1034 (748, 1320) N=2	70.9 (24, 184) N=3	NT	----	127 (56.5, 292) N=4	----
Haloperidol (mg)	5 --- N=1	1 --- N=1	NT	----	----	----
Surgery on/during ICU admission, n (%)	42 (46.2%)	50 (53.2%)	0.34	21 (41.2%)	20 (35.7%)	0.56
RASS first study day, median (IQR), N	-2 (-3, -1) N=74	-2 (-4, -1) N=82	0.55	0 (-2, 0) N=47	0 (-1, 0) N=49	0.37

APACHE = Acute Physiology and Chronic Health Evaluation; CCI = Charlson Comorbidity Index; ICU = intensive care unit; IQR = interquartile range; N = number; NT = not tested (not enough subjects); mg = milligram; RASS = Richmond Agitation-Sedation Scale; SD = standard deviation; yr = year; ug = microgram

^aData were re-categorized as home/other for purposes of statistical analysis.

^bMedical category includes the following subsections: Shock states-Including sepsis, adult respiratory distress syndrome, cardiac arrest, and shock not otherwise specified; Respiratory-Including pneumonia, chronic obstructive pulmonary disease exacerbation, and respiratory failure not otherwise specified; Cardiac-Including myocardial infarction/ischemia, atrial arrhythmias; Neurologic/Other-Including seizures, ischemic stroke, Guillain-Barre, encephalitis, meningitis, and other diagnoses including hepatic or renal failure, diabetic ketoacidosis, malignancy and/or neutropenia, upper/lower gastrointestinal bleed, change in mental status, and alcohol withdrawal.

^cSurgical category includes the following subsections: Neurosurgical-Including subarachnoid/subdural hemorrhage, intracerebral hemorrhage, brain tumor, other neurosurgical diagnosis; Cardiothoracic/vascular-Including coronary artery bypass grafting (CABG), valve replacements, CABG with valve replacements, other cardiothoracic surgery, abdominal aortic or other aneurysm repair, and other vascular surgery; General/trauma surgery-Including Whipple procedure, colon resection, gastrectomy, orthopedic surgery, head and neck surgery, and multisystem trauma; Other-Including liver transplantation, kidney transplantation.

^dExpressed in lorazepam equivalents. Includes the following medications: lorazepam, midazolam, clonazepam, diazepam, temazepam. The total dose includes continuous infusions and bolus doses given intravenously, intramuscularly, and orally.

^eExpressed in Morphine Equivalents. Includes the following medications: morphine, hydromorphone, and fentanyl. The total dose includes continuous infusions and bolus doses given intravenously, intramuscularly, and orally.

Table E3. Clinician's documented reasons for not performing components of ABCDE Bundle

Component	Safety Screen Failure Reasons	Trial Failure Reasons
Spontaneous Awakening Trial	<ul style="list-style-type: none"> • Active seizures (9) • Agitation requiring sedation (9) • Use of neuromuscular blockade (9) • Increased ICP (9) • Myocardial ischemia (1) • Other reasons (15) including: high PEEP levels (4) ECMO (2), "on Bi-ventilation settings" (2), medications to control ICP (3), "just got intubated last night", "high respiratory rate", "decreased saturation", "not responsive" 	<ul style="list-style-type: none"> • Anxiety/agitation/pain (48) • Respiratory rate >35 (12) • Pulse oximetry <88% (6) • Significant distress (5) • Acute arrhythmia (4) • Myocardial Ischemia (1) • Other reasons (10) including: ECMO, high PEEP (2), per physician order (3), apnea, coughing, spontaneous breathing trial already in progress, elevated blood pressure
Spontaneous Breathing Trial	<ul style="list-style-type: none"> • Set PEEP \geq7.5 (80) • FiO₂ >50% (46) • Lack of inspiratory effort (20) • Increasing vasopressor use (12) • Increased ICP (12) • Pulse oximetry <88% (6) • Chronic ventilator patient (8) • Agitation (4) • Myocardial ischemia (4) • Other reasons (8) including: Bi-ventilation settings (5), "condition not stable", per physician order", "not following commands" 	<ul style="list-style-type: none"> • Respiratory rate >35 (30) • Signs of distress (16) • Mental status changes (2) • Pulse oximeter <88% (6) • Respiratory Rate <8 (4) • Acute arrhythmia (3) • Other reasons (14) including: Bi-ventilation, operating room (2), respiratory acidosis per blood gas (2), agitation, apneic episodes, compliance not obtained due to patient effort, heart rate in 40s, physician order, shortness of breath, agitation, anxiety/tachypnea, "he is tired", withdrew care

ICP = intracranial pressure; PEEP = Positive End Expiratory Pressure; ECMO = extracorporeal membrane oxygenation; FiO₂ = Fraction inspired oxygen

Table E4. Drug Conversion Factors used in Study

Opiates

Fentanyl mcg

'x' **mg** IV morphine = ('x' **mcg** IV fentanyl) / 15

Conversion factor 0.0667

Hydromorphone (Dilaudid) (IV/IM) mg

'x' mg IV morphine = ('x' mg IV hydromorphone)/0.15

Conversion factor 6.7

Sedatives

Midazolam (Versed) mg

'x' mg IV lorazepam = ('x' mg IV midazolam)/2.5

Conversion factor = 0.4

Alprazolam (Xanax) mg

'x' mg IV lorazepam = ('x' mg alprazolam)/0.5

Conversion factor = 2

Clonazepam (Klonopin) in mg

'x' mg IV lorazepam = ('x' mg clonazepam)/0.25

Conversion factor = 4

Diazepam (Valium) (IV/IM) mg

'x' mg IV lorazepam = ('x' mg diazepam)/5

Conversion factor = 0.2

Diazepam (Valium) (PO) mg

'x' mg IV lorazepam = ('x' mg diazepam)/5

Conversion factor = 0.2

Temazepam (Restoril) mg

'x' mg IV lorazepam = ('x' mg temazepam)/15

Conversion factor = 0.0667

References

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