Rebooting Your Unit Culture: Preventing Sepsis by Reducing Health care Acquired Infection

Kathleen Vollman
ADVANCING NURSING THROUGH KNOWLEDGE & INNOVATION

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Disclosures

- Consultant-Michigan Hospital Association Keystone Center
- Subject matter expert on CAUTI, CLABSI, HAPI, Safety culture for AHA
- Consultant and speaker bureau
  - Stryker's Sage business
  - Baxter healthcare
  - Potrero Medical
  - Atlas Lift Tech

Objectives

- Discuss trends in CLABSI & VAP rates during the pandemic
- Discuss strategies for getting back to the basics in resetting the culture of safety
- Identify and detail the evidence-based practices that help prevent CLABSI's & VAP.

Impact of COVID on Healthcare-Associated Infections (HAIs) in 2020 Compared to 2019: Data from NHSN

	2020 Q1	2020 Q2	2020 Q3	2020 Q4
CLABSI	↓ -11.8%	↑ 27.9%	↑ 46.4%	↑ 47.0%
CAUTI	↓ -21.3%	No Change[1]	↑ 12.7%	↑ 18.8%
VAE	↑ 11.3%	↑ 33.7%	↑ 29.0%	↑ 44.8%
SSI: Colon surgery	↓ -9.1%	No Change[1]	↓ -6.9%	↓ -8.3%
SSI: Abdominal hysterectomy	↓ -16.0%	No Change[1]	No Change[1]	↓ -13.1%
Laboratory-identified MRSA bacteremia	↓ -7.2%	↑ 12.2%	↑ 22.5%	↑ 33.8%
Laboratory-identified CDI	↓ -17.5%	↓ -10.3%	↓ -8.8%	↓ -5.5%

Weiner-Lastinger LM, Pattabiraman V, Konnor RY, et al. The impact of coronavirus disease 2019 (COVID-19) on healthcare-associated infections in 2020: A summary of data reported to the National Healthcare Safety Network. *Infection Control & Hospital Epidemiology*. 2021:1-14. doi:10.1017/ice.2021.362

Qualitative Feedback on Rationale for Increase

Shortage of personal protective equipment (PPE)

Staffing changes

- Travelers
- Non-ICU clinicians

Reduced frequency of contact

- Less chlorhexidine bathing
- Alterations in line care due to IV pumps in the hallway
- Scrub the hub compliance

Line and dressing integrity gaps related to prone positioning of patients

Increase in line draws for blood cultures

Less line rounding/competing priorities

Fakih MG, et al. Infection Control & Hospital Epidemiology, 2021;:1-6
Patel PR, et al. *Infect Control Hosp Epidemiol*. 2021;1-4.

International Journal of Infectious Diseases 118 (2022) 83–88

Contents lists available at ScienceDirect

International Journal of Infectious Diseases

journal homepage: www.elsevier.com/locate/ijid

The impact of COVID-19 on health care–associated infections in intensive care units in low- and middle-income countries: International Nosocomial Infection Control Consortium (INICC) findings

Victor D. Rosenthal[a,b,*], Sheila Nainan Myatra[c], Jigeeshu Vasishtha Divatia[c],

Table 1
Comparison of pooled HAI rates per 1,000 device days and relative risk in ICUs of 7 INICC hospitals from LMICs in 2019 and 2020.

	2019			2020					
HAI type	Device days, n	HAIs, n	HAI rate	Device days, n	HAIs, n	HAI rate	RR[a]	95% CI[a]	P-value
CLAB[a]	36,652 CL[a] days	93 CLABs	2.54 CLAB per 1,000 CL days	9,515 CL days	45 CLABs	4.73 CLAB per 1,000 CL days	1.85	1.30-2.65	.0006
VAE[a]	13,801 MV[a] days	134 VAEs	9.71 VAE per 1,000 MV days	4,611 MV days	58 VAEs	12.58 VAE per 1,000 MV days	1.29	0.95-1.75	.10
CAUTI[a]	24,919 UC[a] days	41 CAUTIs	1.64 CAUTI per 1,000 UC days	7,653 UC days	11 CAUTIs	1.43 CAUTI per 1,000 UC days	1.14	0.58-2.22	.69

Acute care hospitals were located in India, Mongolia, Jordan, Turkey, Egypt, Palestine, and Lebanon.
CAUTI = catheter associated urinary tract infection; CI = confidence interval; CL = central line; CLAB = central line–associated bloodstream infection; HAI = health care–associated infection; ICU = intensive care unit; INICC = International Nosocomial Infection Control Consortium; LMIC = low- and medium-income country; MV = mechanical ventilator; RR = relative risk; UC = urinary catheter; VAE = ventilator-associated event.

Mortality Comparison 2019 to 2020: 15.2% & 23.2% with an increase in mean LOS by almost 2 days

Life after a Crisis

Life is about how much you can take and keep fighting, how much you can suffer and keep moving forward.~ Anderson Silva

Don't dwell on what went wrong. Instead, focus on what to do next. Spend your energies on moving forward toward finding the answer. ~Denis Waitley

If everyone is moving forward together, then success takes care of itself. ~Henry Ford

One day? Or day one. You decide.

From the Field

“We're on our knees here, and it's really difficult and we're all trying the best we can and we don't feel... we feel like we could be doing more, and I know we can’t ... We’re staying away from our families and we're putting ourselves in danger to try and save other people's loved ones. It feels like a losing battle but it's not, we've all got hope and we're all trying to do what we can.”

Maben J, Bridges J. Covid-19: Supporting nurses' psychological and mental health. Journal of Clinical Nursing. 2020; 29: 2742-2750. doi:10.1111/jocn.15307

The Problem is Large

- 3 million central venous catheters (CVCs) inserted each year-15 million catheter days
- 30,100 CLABSIs in ICU yearly
- More of the CLABSI now occur outside the ICU
- 12 to 25%
- 2.27-fold increased risk for mortality

Centers for Disease Control and Prevention. (2015). Bloodstream infection event (central line-associated bloodstream infection and non-central line-associated bloodstream infection).
Buetti N, et al. Shea/IDSA/APIC Practice Recommendation. Infection Control & Hosp Epidemiology, 2022;1-17*

Excess Mortality Estimates for Hospital Acquired Conditions (HACs)

	N	Range (RR)	Estimates of RR (95% CI)	Underlying Mortality	Estimates of Excess Mortality (95% CI)
Adverse Drug Events (ADE)	6	0.68–3.09	1.61 (1.14–2.27)	0.020	0.012 (0.003–0.025)
Catheter-Associated Urinary Tract Infections (CAUTI)	4	1.28–1.97	1.50 (1.06–2.11)	0.071	0.036 (0.004–0.079)
Central Line-Associated Bloodstream Infections (CLABSI)	**5**	**1.86–4.88**	**2.72 (1.81–4.10)**	**0.086**	**0.150 (0.070–0.270)**
Falls	1	3.50	3.50 (2.73–4.48)	0.020	0.050 (0.035–0.070)
Obstetric Adverse Events (OBAE)	—	—	—	—	0.005 (0.003–0.013)
Pressure Ulcers	3				0.013–0.093)
Surgical Site Infections (SSI)	3	1.75–5.70	3.32 (1.79–6.18)	0.0114	0.026 (0.009–0.059)
Ventilator-Associated Pneumonia (VAP)	10	0.52–4.90	1.48 (0.64–3.42)	0.300	0.140 (-0.110–0.730)
Venous Thromboembolism (VTE)	9	1.01–13.63	3.15 (2.02–4.91)	0.020	0.043 (0.040–0.078)
***C. difficile* Infections (CDI)**	13	1.17–9.60	1.60 (1.38–1.87)	0.073	0.044 (0.028–0.064)

For Every 1000 in-hospital CLABSI cases, there are 150 excess deaths

For Every 1000 in-hospital VAP cases, there are 140 excess deaths

http://www.ahrq.gov/hai/pfp/haccost2017-results.html

Additional Inpatient Costs & Mortality for HAC's: Building the Business Case

	Studies (n)	Range of Estimates	Estimate (95% CI)
Adverse Drug Events (ADE)	2	$1,277–$9,062	$5,746 (-$3,950–$15,441)
Catheter-Associated Urinary Tract Infections (CAUTI)	6	$4,694–$29,743	$13,793 ($5,019–$22,568)
Central Line-Associated Bloodstream Infections (CLABSI)	7	$17,896–$94,879	$48,108 ($27,232–$68,983)
Falls	3	$2,680–$15,491	$6,694 (-$1,277–$14,665)
Obstetric Adverse Events (OBAE)	2	$13–$1,190	$602 (-$578–$1,782)
Pressure Ulcers	4	$8,573–$21,075	$14,506 (-$14,506–$41,326)
Surgical Site Infections (SSI)	5	$11,778–$42,177	$28,219 ($18,237–$38,202)
Ventilator-Associated Pneumonia (VAP)	5	$19,325–$80,013	$47,238 ($21,890–$72,587)
Venous Thromboembolism (VTE)	4	$11,011–$31,687	$17,367 ($11,837–$22,898)
***C. difficile* Infections (CDI)**	9	$4,157–$32,394	$17,260 ($9,341–$25,180)

http://www.ahrq.gov/hai/pfp/haccost2017-results.html

Resetting the Culture
Notes on Hospitals: 1859

"It may seem a strange principle to enunciate as the very first requirement in a hospital that it should do the sick no harm."

- Florence Nightingale

Advocacy = Safety

Protect The Patient From Bad Things Happening on Your Watch

Implement
Interventional Patient Hygiene

INTERVENTIONAL PATIENT HYGIENE

Hand Hygiene

- Hygiene…the science and practice of the establishment and maintenance of health
- Interventional Patient Hygiene….nursing action plan directly focused on fortifying the patients host defense through proactive use of evidence-based hygiene care strategies

Catheter Care

Bathing & Assessment

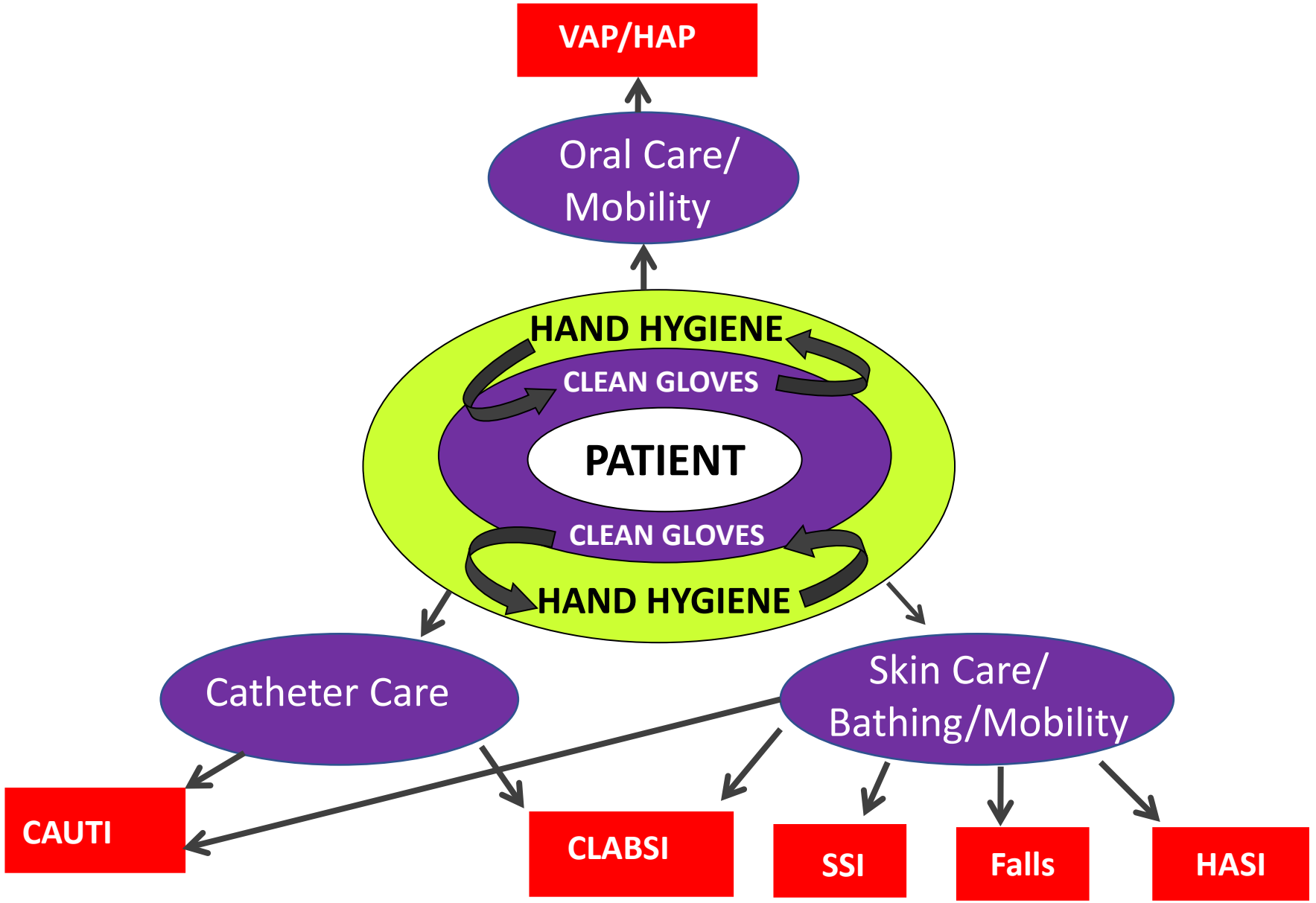
Comprehensive Oral Care Plan

Incontinence Associated Dermatitis Prevention Program

Pressure Ulcer Prevention

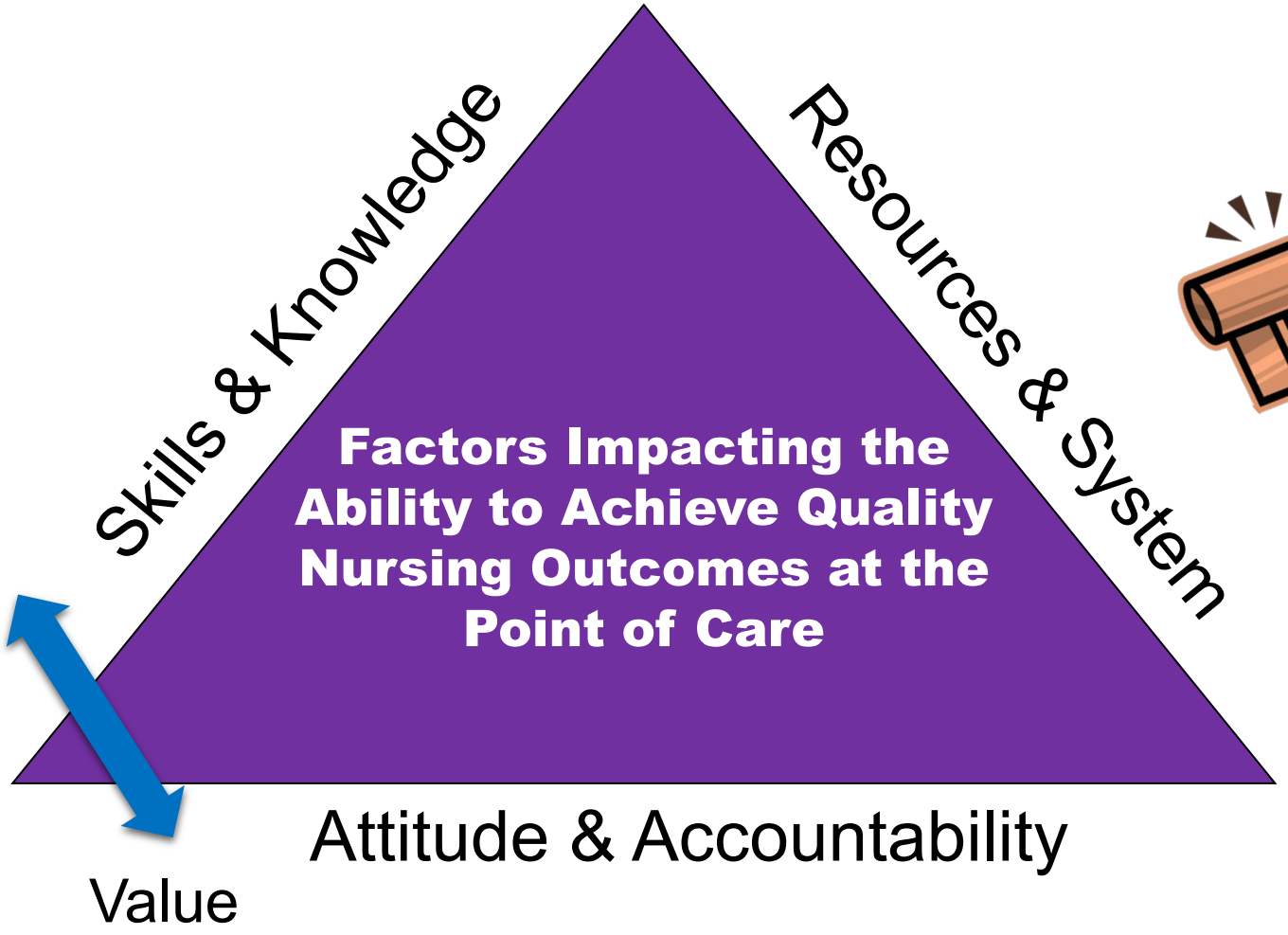
Vollman KM. Intensive Crit Care Nurs, 2013;22(4): 152-154

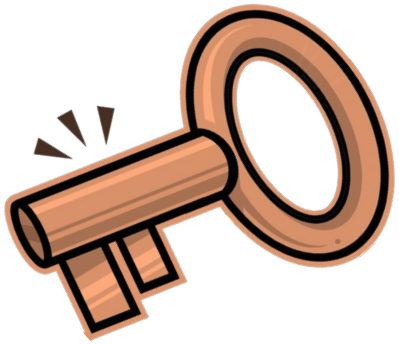
INTERVENTIONAL PATIENT HYGIENE(IPH)



Vollman KM. Intensive Crit Care Nurs, 2013;22(4): 152-154

Achieving the Use of the Evidence





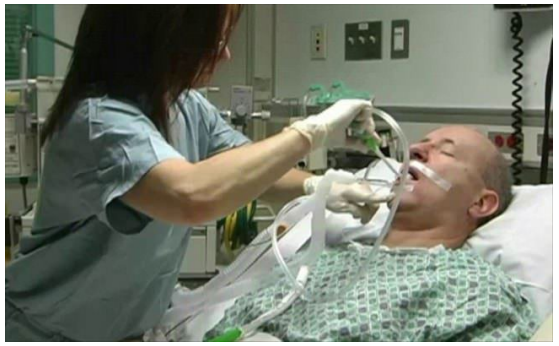
Vollman KM. Intensive Crit Care Nurs, 2013;22(4): 152-154

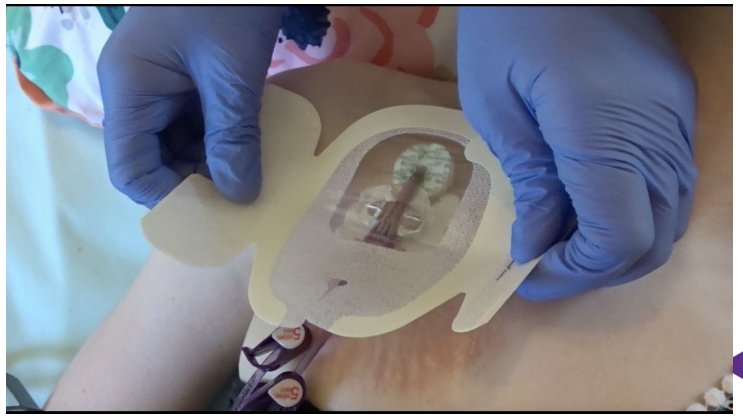
Polling Question

- On quality measures, were you able to keep track on CLABSI data during the pandemic?
  - △Yes
  - △No

Chat in:
Did it get worse or better?

Teamwork and Fundamental Nursing Interventions





Teamwork

- What teamwork strategies learned through the pandemic will help you and your team to getting back on track? Select all that apply!
  - △ More streamlined communication
  - △ Creative communication strategies
  - △ Faster development & approval of practice changes
  - △ Resiliency practices (individual or organizational)
  - △ Managing change on the quick (Rapid PDCA's)
  - △ Just do it
  - △ Nimbleness that we didn't believe we had

Key Team/Culture Work to Re-Engage

- Place CAUTI & CLABSI as permanent agenda items for the Multidisciplinary Team/CUSP team
- Consider revising goals for the work based on the current state
- Creating a plan for re-engagement of staff post-COVID
- Share unit-specific data again with frontline staff, physicians, safety committee
- Refresh on expectations/clinical practice & documentation
- Reestablish unit-based improvement practices & meetings (improvement huddle, unit-based council mtgs, learn from a defect huddles)
- Continue to measure and make data-driven decisions
  - △Use data and staff feedback

Do you and the staff you work with see HAPI, CAUTI/CLABSI as harm?

Strategies to Link Harm with Nurse Patient Advocacy Role

- Do No Harm Rounding
- Immediate learn from a deficit
- Incorporate action plans and data into daily huddle

Learn from Defects Tool Worksheet CLABSI

Date: _____

Attendees: _____

Name: _____
MRN: _____
Fin: _____
DOB: _____ M ☐ F ☐

What happened? (brief description) Patient with documented CLABSI
Infection Control:

Nursing:

Significant co-morbidities:

Location of CLABSI: Unit _____ Date of CLABSI _____

Date of Line Insertion: _____

Where was the catheter inserted: OR ☐ ED ☐ ICU _____ Unit _____

Type of Line

- ☐ Non-tunneled (other than dialysis)
- ☐ Tunneled (other than dialysis)
- ☐ Dialysis (tunneled)
- ☐ Dialysis (non-tunneled)
- ☐ PICC
- ☐ Port

No. of Lumens

Single ☐ Double ☐ Triple ☐

Insertion Site

☐ Chest ☐ IJ ☐ SC ☐ Femoral ☐ Upper Extremity

What is the indication for the line?

Hemodynamic monitoring ☐ Poor venous access ☐ Long-term Antibiotics ☐
Vessicants or irritant drugs ☐ Chemo ☐ Hemodialysis ☐
Multiple incompatible fluids ☐ Other _____

Why was the line accessed?

☐ Lab draws ☐ Medication Administration ☐ IV Fluid Administration
☐ TPN ☐ Hemodialysis Other

Why did it happen? (what factors contributed) - summarize what happened to cause the defect from below

1) Was patient receiving TPN? ☐ Y ☐ N ☐ Unknown
2) Were there any observed breaches of proper hand hygiene by anyone involved in line care for this patient? ☐ Y ☐ N ☐ Unknown
3) Was line necessity assessed daily? ☐ Y ☐ N ☐ Unknown
4) Was the dressing integrity difficult to maintain? ☐ Y ☐ N ☐ Unknown
5) Was this line manipulated/used by any other staff besides the unit's physicians/nurses (e.g., anesthesia, radiology, etc)? ☐ Y ☐ N ☐ Unknown
6) Was the tubing changed appropriately for the duration of the line? ☐ Y ☐ N ☐ Unknown
7) Was the catheter occluded at any time while the line was in place? ☐ Y ☐ N ☐ Unknown
   If yes, was TPA used? ☐ Y ☐ N ☐ Unknown
8) Where there any problems drawing off the line prior to the infection date? ☐ Y ☐ N ☐ Unknown
9) Anything else, patient factors or otherwise, that may have contributed to the infection? ☐ Y ☐ N
   If yes, describe briefly _____
10) Do you feel this infection was potentially preventable?_____
11) Other Comments:

+ **What prevented it from being worse?**	- **What happened to cause the defect?**
	Duration of central line catheter # days: (Time of insert to discontinue) Is the patient being treated for any other infections? Comments:

What can we do to reduce the risk of it happening with a different person?

Action Plan	Responsible Person	Targeted Date	Evaluation Plan – How will we know risk is reduced?

Data Drive Performance

- Audits of Insertion and Maintenance practices-specific to areas of challenge
- Early & Late Infections
- Display of Data

Infection	Days Since Last Infection
CAUTI	150 days
CLABSI	200 days
MRSA transmission	50 days

Measure unit specific instances of CLABSI and report data on a regular basis (high level of evidence)

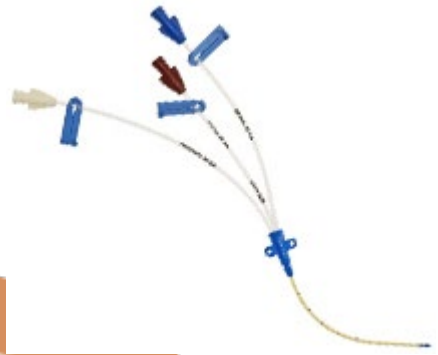
Buetti N, et al. Shea/IDSA/APIC Practice Recommendation. Infection Control & Hosp Epidemiology, 2022;1-17

Central Line -Associated Blood Stream Infections: Prevention is Key

Disrupting the Lifecycle of the Catheter

Step 0:
Avoid
Catheter is
Possible

1 Aseptic Insertion



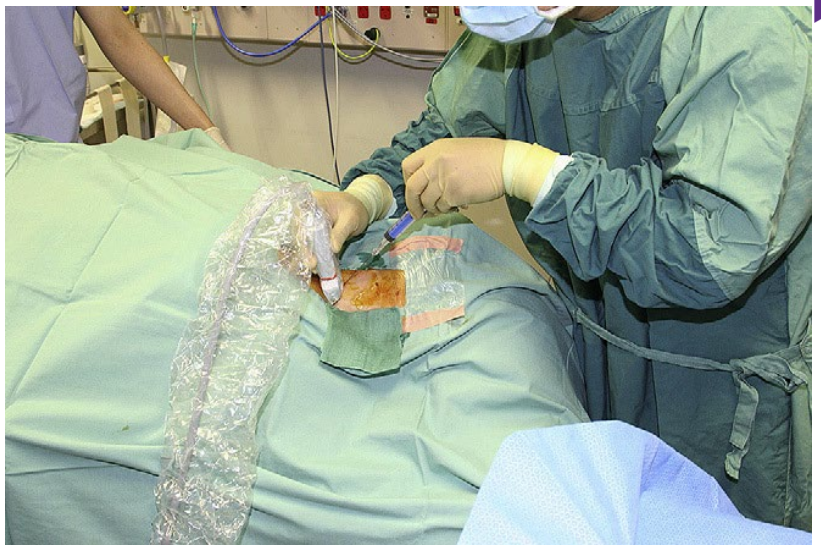
2 Maintaining Awareness and Proper Care of Catheters

3 Prompting Catheter Removal

www.catheterout.org, (Adapted Meddings. Clin Infect Dis 2011)

BSI Prevention Bundle

- Remove/Avoid unnecessary lines
- Hand hygiene
- Maximal barrier
- Alcoholic/Chlorhexidine for skin prep
- Subclavian preferred* (high level evidence)



984 Adult intensive care units (ICUs) in 632 hospitals:
Bundle compliance on all 5 elements > 95% greatest reduction (33% ↓)
Bundle compliance of 1 element > 95 % second best reduction
Bundle compliance < 75% no change in rates seen

Furuya EY, et al. Infect Control Hosp Epidemiol, 2016;37:805-810

Grady NP, et al. CDC Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011. www.cdc.gov
Buetti N, et al. Shea/IDSA/APIC Practice Recommendation. Infection Control & Hosp Epidemiology, 2022;1-17*

The Right Catheter for the Right Length of Time for the Right Infusate

Magic Guidelines: Peripherally Compatible Infusate

Device Type	Proposed Duration of Infusion			
	≤5 d	6–14 d	15–30 d	≥31 d
Peripheral IV catheter	No preference between peripheral IV and US-guided peripheral IV catheters for use ≤5 d			
US-guided peripheral IV catheter	US-guided peripheral IV catheter preferred to peripheral IV catheter if proposed duration is 6–14 d			
Nontunneled/acute central venous catheter	Central venous catheter preferred in critically ill patients or if hemodynamic monitoring is needed for 6–14 d			
Midline catheter	Midline catheter preferred to PICC if proposed duration is ≤14 d			
PICC		PICC preferred to midline catheter if proposed duration of infusion is ≥15 d		
Tunneled catheter				PICC preferred to tunneled catheter and ports for infusion 15–30 d
Port				

Appropriate | Neutral | Inappropriate | DIsagreement

Chopra V, et al. Annals of Internal Medicine. 2015;suppl

Magic Guidelines: Peripherally Incompatible Infusate

Device Type	Proposed Duration of Infusion			
	≤5 d	6–14 d	15–30 d	≥31 d
Peripheral IV catheter				
US-guided peripheral IV catheter				
Nontunneled/acute central venous catheter	Central venous catheter preferred in critically ill patients or if hemodynamic monitoring is needed for 6–14 d			
Midline catheter				
PICC		PICCs rated as appropriate at all proposed durations of infusion		
Tunneled catheter		Tunneled catheter neutral for for use ≥15 d	No preference between tunneled catheter and PICC for proposed durations ≥15 d	
Port				No preference among port, tunneled catheter, or PICC for ≥31 d

Appropriate | Neutral | Inappropriate | DIsagreement

Chopra V, et al. Annals of Internal Medicine. 2015;suppl

Line Location

- 2-fold risk of CLABSI's using Jugular vs. Subclavian
- Higher risk of CLABSI and thrombosis with Femoral vs. Subclavian
- Ultrasound utilization/Simulation training/Subclavian safe
- Different approach to Internal Jugular (Dr Jack LeDonne)
- Ultrasound guided peripheral placements-extended dwell
- Use of Midline catheters (infections less-more mechanical issues)
- No difference in DVT between PICC and Midline

Bing S, et al. JACS, 2020;231(4): suppl 2:p135
DeVries M, et al. Am J of IC. 2019;47:1118-1121
Au AK, et al. Am J Emerg Med. 2012;30(9):1950-1954.
Parienti J-J, et al. New England Journal of Medicine. 2015;373(13):1220-1229

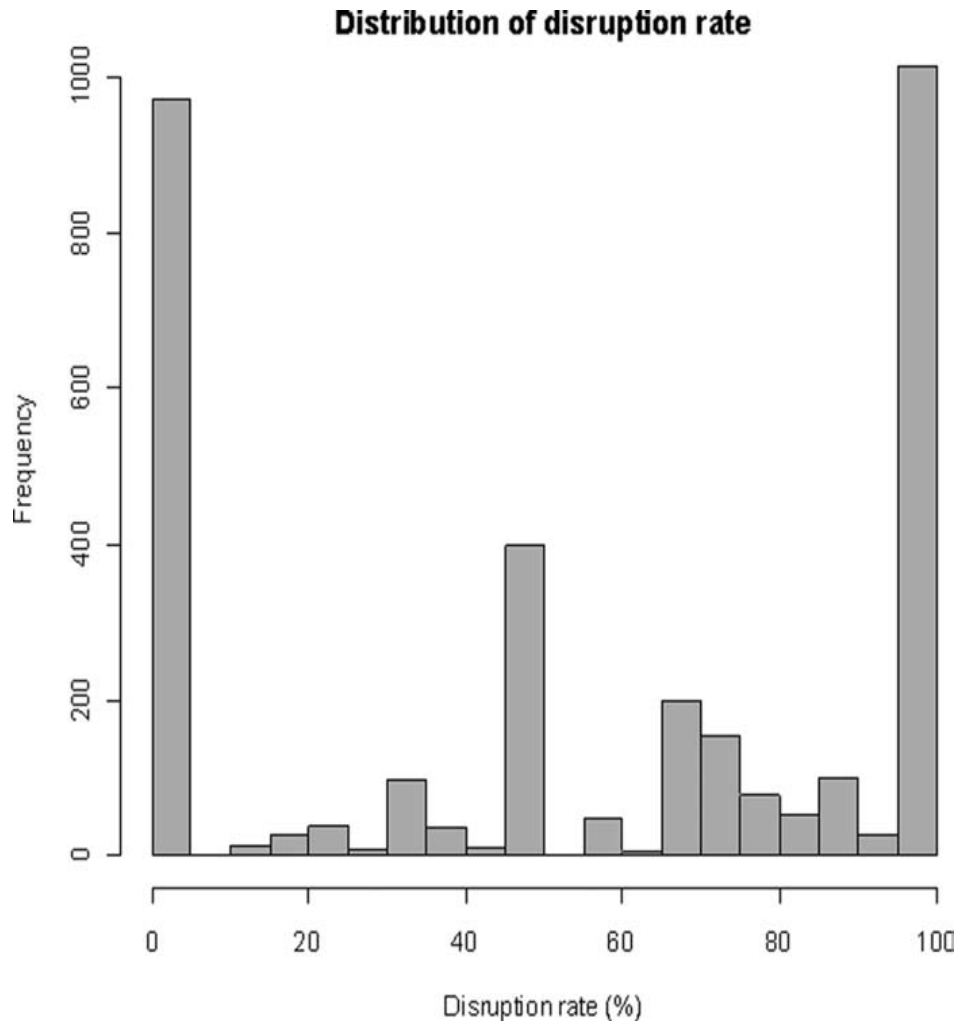
After Insertion Bundle

- CHG Dressings/Dressing Integrity/Site Securement
- Bathing
- Accessing the site
- Antimicrobial impregnated CVC & PICCs
- Appropriate nursing staff levels in ICUs (high level evidence)

Health Research & Educational Trust (2017). *Central Line-Associated Bloodstream Infections (CLABSI) Change Package: 2017 Update.* Chicago, IL: Health Research & Educational Trust. Accessed at www.hret-hiin.org
Buetti N, et al. Shea/IDSA/APIC Practice Recommendation. Infection Control & Hosp Epidemiology, 2022;1-17

Dressing Disruption: A Major Risk Factor for Catheter-Related Infections

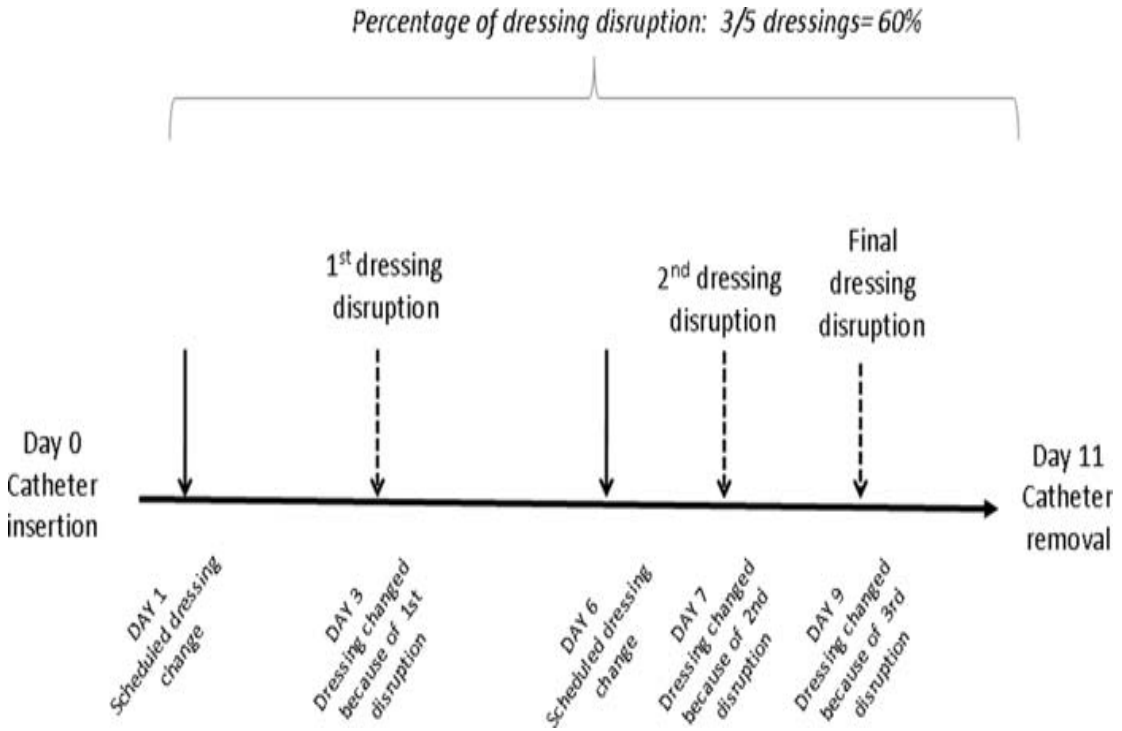
- Secondary analysis of an randomized controlled trial (RCT)
- 1,419 patients (3,275 arterial or central venous catheters)
- 296-Colonize catheters, 29 major catheter related infections and 23 CLABSI
- 11,036, dressing changes and 7,347 (67%) were performed before the planned date



Timsit JF, et al Crit Care Med; 2012:1707-1714

Impact of Dressing Disruption

- Dressing cost inversely related to rate of disruption
- Number of dressing disruptions r/t ↑ risk for colonization of the skin around the catheter at removal ($p < .0001$)
- Risk of infection increased threefold after 2nd dressing disruption
- Risk of infection increased 10-fold when the final dressing was disrupted independently of other risk factors of infection



Timsit JF, et al Crit Care Med; 2012:1707-1714

Meta-analysis on Impact of CHG Dressings on CLABSI's

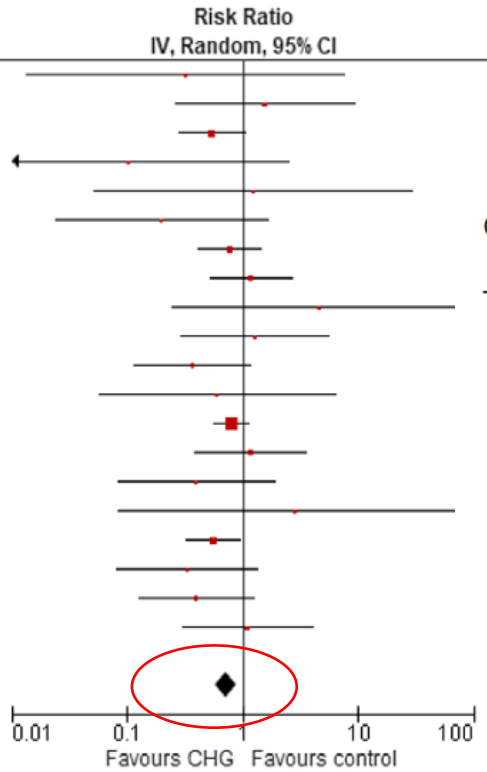
- 20 studies, 18 RCT's and 15,590 catheters
- No evidence of publication bias
- Mostly performed in ICU's
- Independent of CHG dressing type

Use of CHG dressing in all patients > 2 months of age (High level of evidence

A *Catheter-related bloodstream infections*

Study or Subgroup	log[Risk Ratio]	SE	Weight	Risk Ratio IV, Random, 95% CI
Arpa 2013	-1.147	1.623	0.4%	0.32 [0.01, 7.64]
Arvaniti 2012	0.445	0.906	1.4%	1.56 [0.26, 9.21]
Biehl 2016	-0.616	0.335	9.9%	0.54 [0.28, 1.04]
Chambers 2005	-2.267	1.62	0.4%	0.10 [0.00, 2.48]
Chan 2017	0.216	1.621	0.4%	1.24 [0.05, 29.76]
Düzkaya 2016	-1.609	1.077	1.0%	0.20 [0.02, 1.65]
Ergul 2018	-0.249	0.319	10.9%	0.78 [0.42, 1.46]
Garland 2001	0.17	0.41	6.6%	1.19 [0.53, 2.65]
Gerçeker 2017	1.54	1.504	0.5%	4.66 [0.24, 88.92]
Lewy 2005	0.246	0.745	2.0%	1.28 [0.30, 5.51]
Maki 2000	-0.997	0.587	3.2%	0.37 [0.12, 1.17]
Margatho 2018	-0.511	1.203	0.8%	0.60 [0.06, 6.34]
O'Horo 2013	-0.216	0.18	34.3%	0.81 [0.57, 1.15]
Pedrolo 2014	0.159	0.565	3.5%	1.17 [0.39, 3.55]
Pivkina 2018	-0.916	0.796	1.8%	0.40 [0.08, 1.90]
Roberts 1998	1.041	1.786	0.3%	2.83 [0.09, 93.83]
Ruschulte 2009	-0.579	0.275	14.7%	0.56 [0.33, 0.96]
Timsit 2009	-1.109	0.718	2.2%	0.33 [0.08, 1.35]
Timsit 2012	-0.919	0.585	3.2%	0.40 [0.13, 1.26]
Yu 2019	0.101	0.667	2.5%	1.11 [0.30, 4.09]
Total (95% CI)			**100.0%**	**0.71 [0.58, 0.87]**

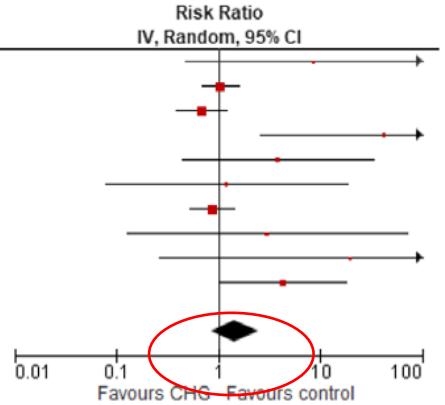
Heterogeneity: Tau² = 0.00; Chi² = 15.38, df = 19 (P = 0.70); I² = 0%
Test for overall effect: Z = 3.23 (P = 0.001)



C *Adverse events*

Study or Subgroup	log[Risk Ratio]	SE	Weight	Risk Ratio IV, Random, 95% CI
Arpa 2013	2.149	1.48	3.1%	8.58 [0.47, 155.98]
Biehl 2016	0.051	0.218	25.1%	1.05 [0.69, 1.61]
Chan 2017	-0.373	0.287	22.5%	0.69 [0.39, 1.21]
Garland 2001	3.746	1.43	3.3%	42.35 [2.57, 698.37]
Lewy 2005	1.345	1.106	5.1%	3.84 [0.44, 33.54]
Margatho 2018	0.182	1.396	3.4%	1.20 [0.08, 18.51]
Pedrolo 2014	-0.135	0.254	23.7%	0.87 [0.53, 1.44]
Pivkina 2018	1.099	1.613	2.7%	3.00 [0.13, 70.84]
Timsit 2009	2.977	2.195	1.5%	19.63 [0.27, 1449.71]
Timsit 2012	1.456	0.733	9.6%	4.29 [1.02, 18.04]
Total (95% CI)			**100.0%**	**1.46 [0.85, 2.50]**

Heterogeneity: Tau² = 0.26; Chi² = 18.65, df = 9 (P = 0.03); I² = 52%
Test for overall effect: Z = 1.36 (P = 0.17)



Puig-Asensio, et al. Infection Control & Hospital Epid, 2020'41:1388-1395

Durability and Costs of Different CVC Dressings

- Dressing duration was captured prospectively on four different dressings on five critical care units over a 12-month period
- 590 CVCs with 1,229 dressing changes
- Staff received training on evidence-based CVC dressing practices and a 'how to guide' was implemented

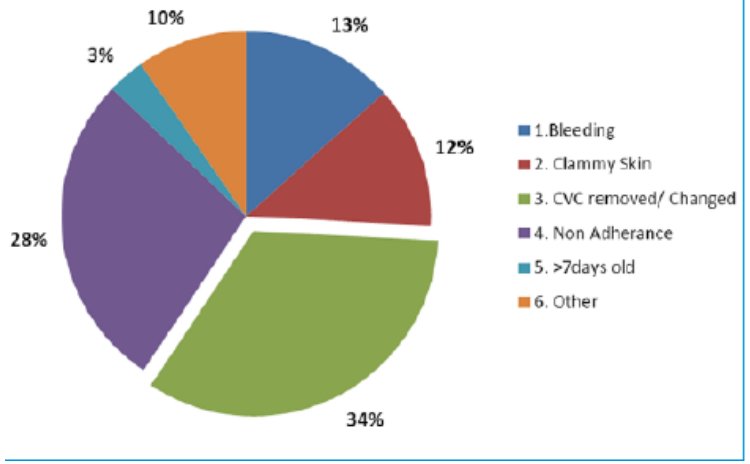
Phase	Months	CVC dressing evaluated	Other securement techniques
One	1–4	Standard dressings: sterile, transparent, semi-permeable polyurethane dressings (Opsite IV 3000 and 3M Tegaderm®)	None
Two	5–8	3M Tegaderm® IV Advanced: sterile, transparent, semi-permeable polyurethane dressings	Dressing with an integrated border around the dressing. Separate Hyperfix® border applied to create a further secure 'window' around the edge of the dressing
Three	9–12	Sorbaview®: sterile, transparent, semi-permeable polyurethane dressings	Integrated two piece dressing, one part for the site with a wide border and second part with a wide supporting bridge

Richardson A, et al. J of Infection Control. 2015;16(6):256-261

Durability and Costs of Different CVC Dressings: Results

- 3-4 dressings lasted < 48hr, 1 dressing a mean of 68hrs
- Mean time to change the dressing:13.5 min
- Cost range: $2.85 to $7.20
- Only 3% lasted 7 days

Figure 1. Reasons for dressing removal, all CVC (n=590).



Dressing Type	Dressings removed for any reason, n=1229			Dressings removed for non-adherence, clammy skin, or bleeding under dressing n=630		
	Number of dressings observed	Dressing duration (hrs) median [IQR]	z value*	Number of dressings observed	Dressing duration (hrs) median [IQR]	z value**
Opsite IV 3000	310	43.5 [21–78]	–1.79	160	36.0 [15-67.5]	–1.21
Tegaderm	237	46.0 [22–85]	–0.33	122	45.5 [22-73.8]	1.17
IV Advanced	262	40.5 [20–85]	–1.12	143	32.0 [14-69.5]	–1.98
Sorbaview	116	68.5 [32–105]	4.51	42	53.0 [30-95]	3.39
Unrecorded	304			163		

IQR, inter quartile range; *P < 0.001 and ** P = 0.002 for at least one difference between dressings.

Richardson A, et al. J of Infection Control. 2015;16(6):256-261

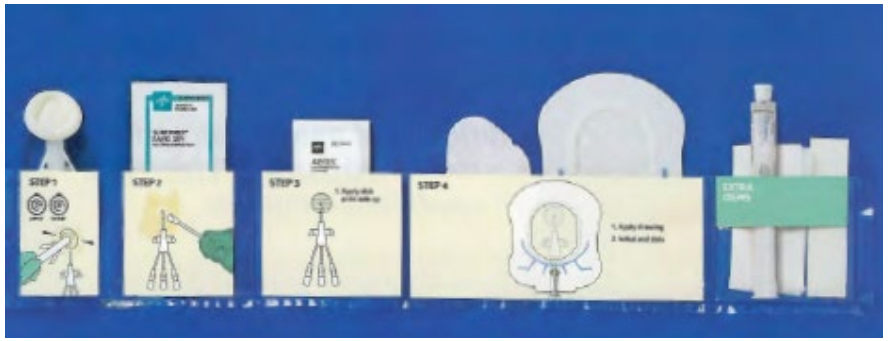
Polling Question

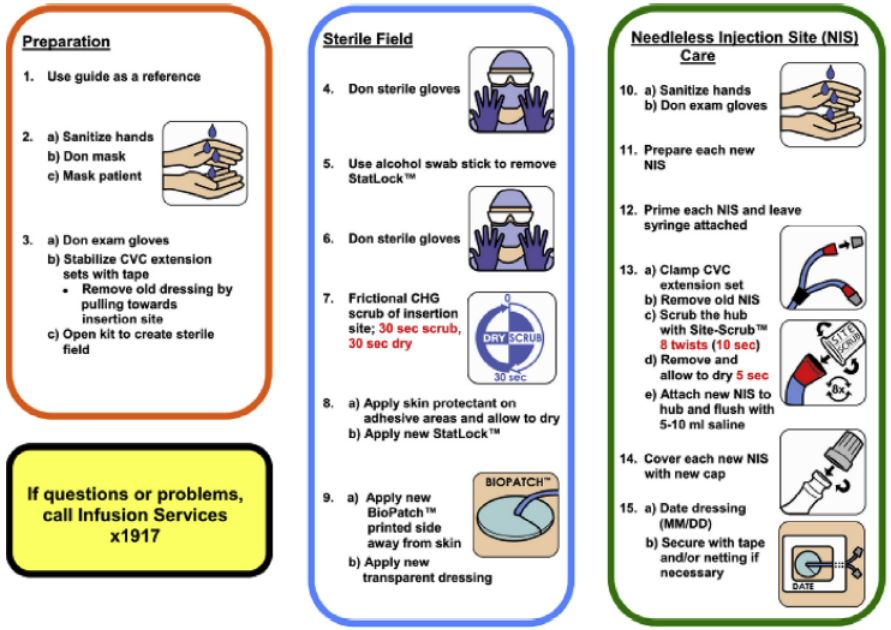
- Does your organization have a dressing kit that includes all the necessary components to complete an evidence-based dressing change?
  - Yes
  - No

Human Factor Engineering of Central Line Maintenance

- 29 month prospective
- 95 nurses, 151 patients
- 126 observation pre compared with 90 post intervention procedures (kit use)
- Results
  - △Pre CLABSI:2.21/1,000 cath days
  - △Post CLABSI:0/1,000 cath days
  - △Practice Adherence: Better aseptic technique, better CHG scrub, hand sanitization & disinfecting hub
  - △Procedure omission ↓ by 44%

10 fold decrease





Drews FA, et al. American Journal of Infect Control. 2017;45:1224-30

After Insertion

- CHG Dressings/Dressing Integrity/Site Securement
- Bathing
- Accessing the site/Disinfecting the hub
- Antimicrobial impregnated CVC & PICCs
- Appropriate nursing staff levels in ICUs

Health Research & Educational Trust (2017). *Central Line-Associated Bloodstream Infections (CLABSI) Change Package: 2017 Update.* Chicago, IL: Health Research & Educational Trust. Accessed at www.hret-hiin.org

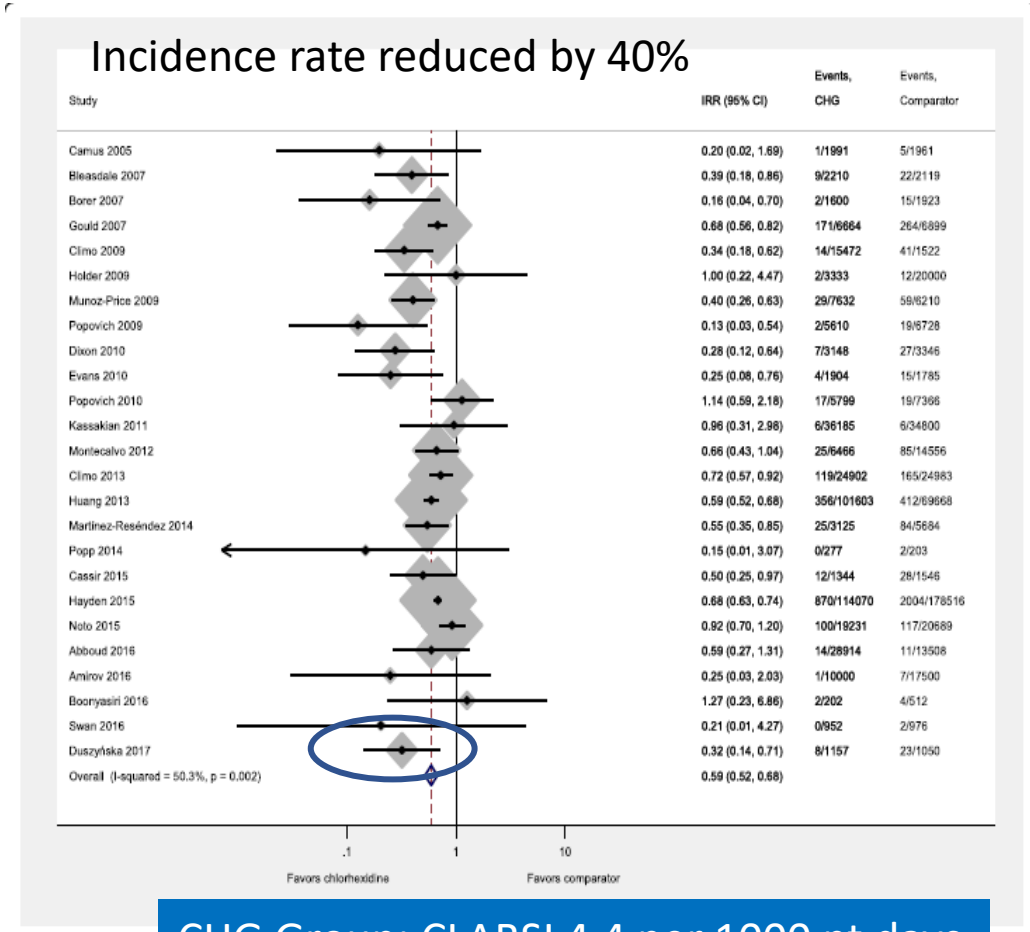
Traditional Bathing

Soap and water basin bath was an independent predictor for the development of a CLABSI

Bleasdale SC, e tal. Arch Intern Med. 2007;167(19):2073-2079

CHG Impact on CLABSIs: A Meta-analysis

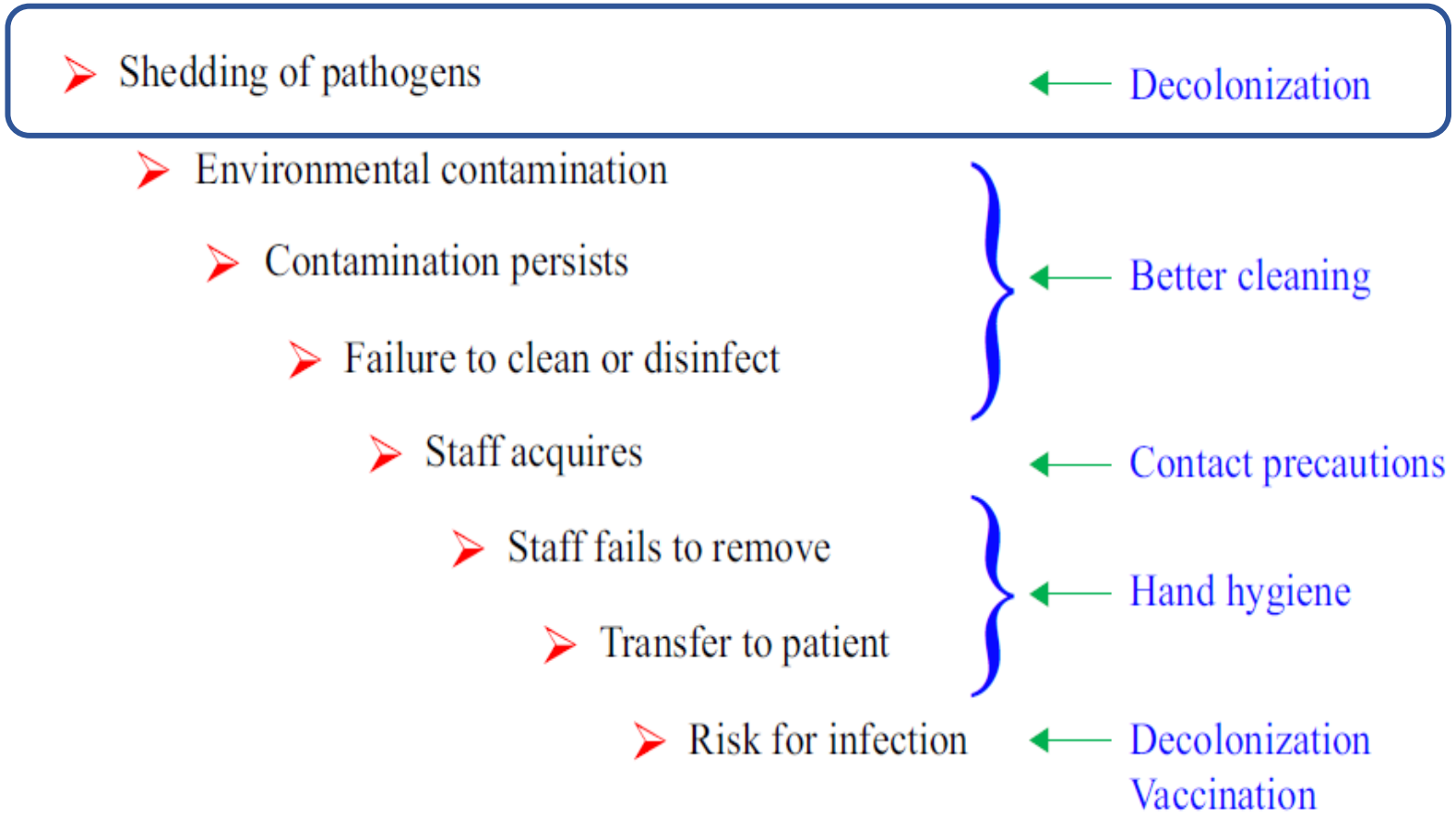
- 26 studies
  - 18 non-randomized
  - 8 randomized controlled trials (RCTs) (19 in the ICU)
  - 18/27 studies used 2% CHG cloth
- 861,546 patient-days
- 5259 CLABSI
- Evaluated 5 measure of fidelity
  - Adherence
  - Exposure/dose
  - Quality of delivery
  - Participant responsiveness
  - Program differentiation
- 12% all 5, 12% 4, 15% 3, 27% 2, 35% 1
- Adverse events: 16 studies-skin rashes, dryness and pruritus



CHG Group: CLABSI 4.4 per 1000 pt days
Comparison Group: 7.5 per 1000 pt days

Musuuza JS, et al.. BMC Infect Dis. 2019;19(1):416

CHG Bathing: Works Upstream

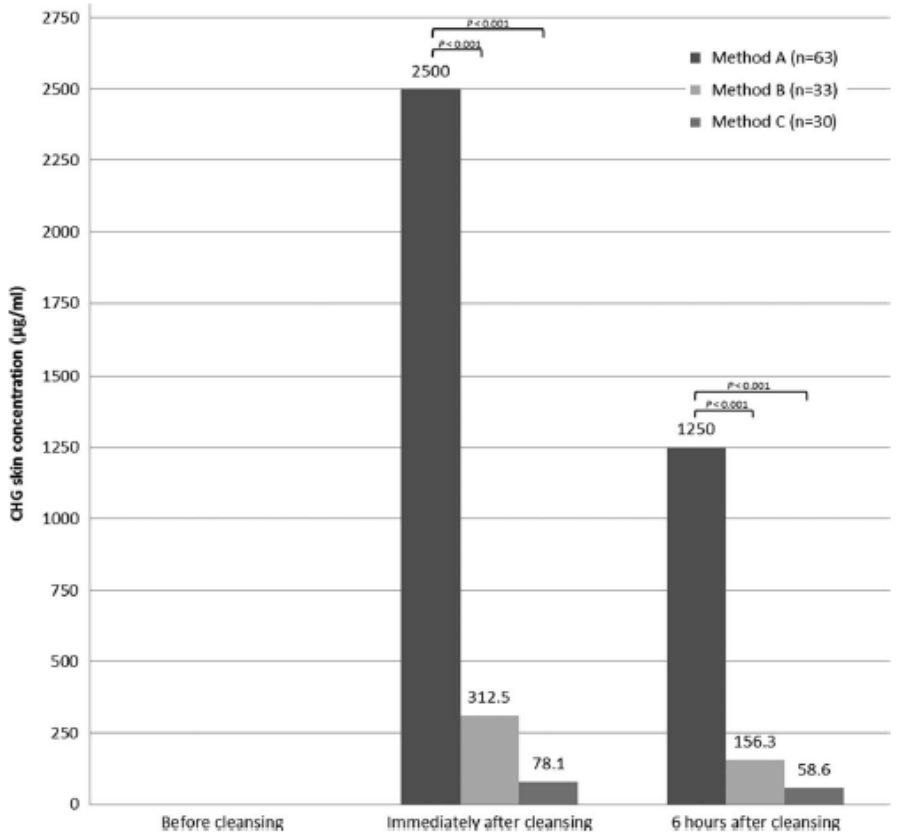


Huang SS. J Hosp Infect. 2019;103(3):235-243.

Differential Effects of Antisepsis Skin Cleansing Methods

Rhee Y, et al. Infect Control Hosp Epidemiol 2018;39:405–411

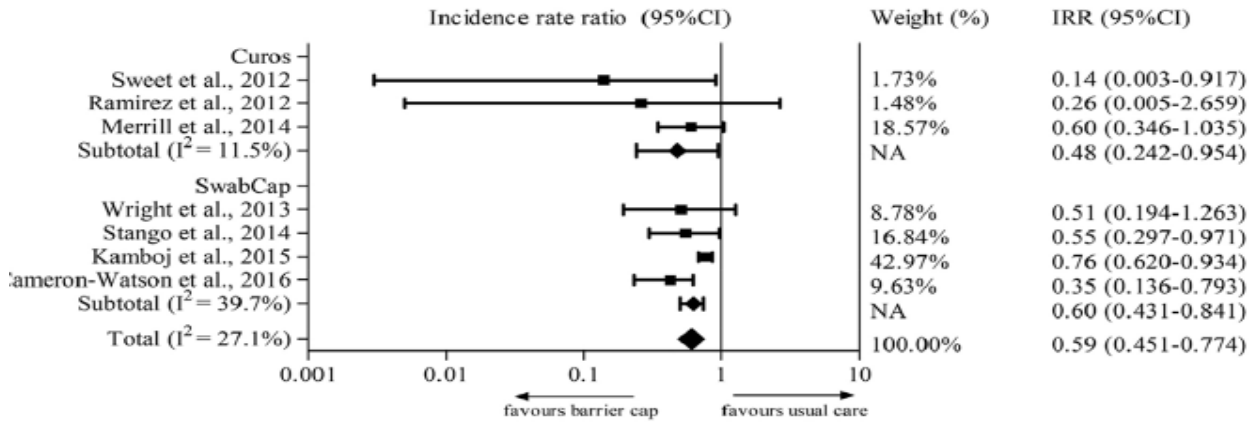
- Prospective, randomized 2-center study with blinded assessment.
- To determine whether 3 different CHG skin cleansing methods yield similar residual CHG concentrations and bacterial densities on skin.



Method A- 2% CHG cloth
Method B- 4% CHG liquid poured onto non-medicated cloth
Method C-4% CHG liquid on cotton wash cloth

Passive Disinfection: Meta-Analysis

- To compare the effects of antiseptic barrier cap use and manual disinfection on the incidence of CLABSIs
- Outcome
  - Reduction in CLABSIs per 1,000 catheter-days
  - Studies were included if 1) conducted in a hospital setting, 2) used antiseptic barrier caps on hubs of central lines with access to the bloodstream, and 3) reported the number of CLABSIs per 1,000 catheter-days when using the barrier cap and when using manual disinfection
  - 7 were included in the random effects meta-analysis



Unresolved issue: Whether mechanical disinfection needs to occur is using passive disinfection

Buetti N, et al. Shea/IDSA/APIC Practice Recommendation. Infection Control & Hosp Epidemiology, 2022;1-17

Voor in t Holt AF, et al. International Journal of Nursing Studies 69 (2017) 34–40

Replacement of Administration Sets

- Routine administration sets can be changed at intervals up to seven days
  - This does not include blood, blood products or lipid formulations
  - Optimal replacement for intermittent used sets is unresolved

Buetti N, et al. Shea/IDSA/APIC Practice Recommendation. Infection Control & Hosp Epidemiology, 2022;1-17

Rickard CM, et al. Lancet, 2021;397:1447-58

01-CHSS Blue Plus-Antimicrobial Impregnated

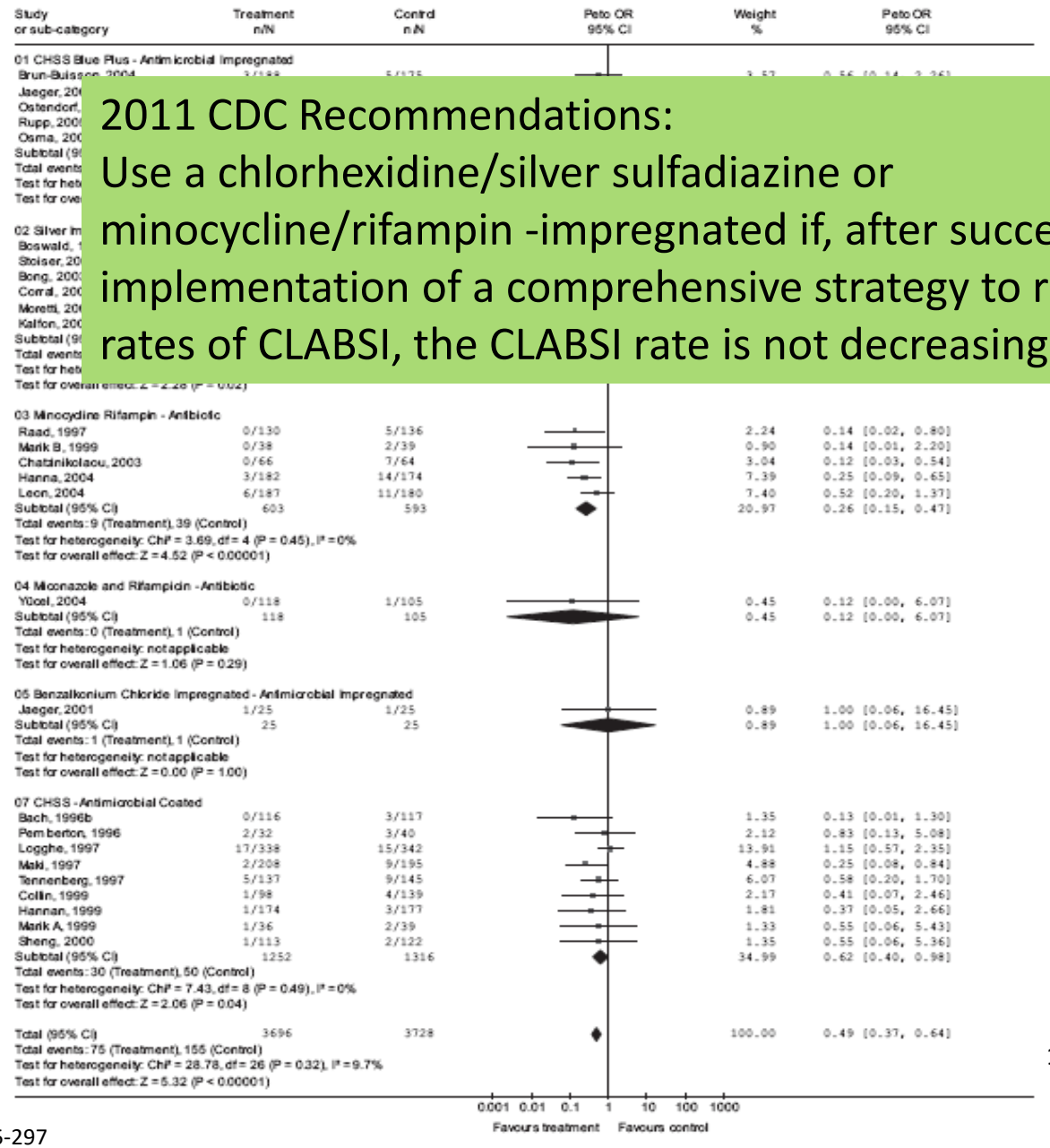
02-Silver Impregnated-Antimicrobial Impregnated

03-Minocycline-Rifampin-Antibiotic

04-Miconazole & Rifampicin -Antibiotic

05-Benzalkonium Chloride Impregnated-Antimicrobial Impregnated

06-CHSS-Antimicrobial coated



1

2011 CDC Recommendations:
Use a chlorhexidine/silver sulfadiazine or minocycline/rifampin -impregnated if, after successful implementation of a comprehensive strategy to reduce rates of CLABSI, the CLABSI rate is not decreasing. [2,3]

1. Matheos T, et al. Infect Control Hosp Epidemiol 2010;31:295-297
2. Grady NP, et al. CDC Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011. www.cdc.gov
3. Buetti N, et al. Shea/IDSA/APIC Practice Recommendation. Infection Control & Hosp Epidemiology, 2022;1-17

VAP
Prevention is Key

Minimizing Risk Factors

Building Blocks to Best Practice in Caring for Mechanically Ventilated Patients & ↓ VAP

Ventilator Bundle: HOB 30, Deep Vein Thrombosis (DVT) prophylaxis, Peptic Ulcer Disease (PUD) prophylaxis, Sedation interruption, Spontaneous breathing trial, daily care with chlorhexidine

VAP Bundle: HOB 30, Sedation interruption, Spontaneous breathing trial, oral care 6x per day, CHG rinse 2x per day, subglottic secretions drainage if expected to be ventilated > 72hrs

ABCDEF Bundle: Assess & manage pain, Both Spontaneous awakening trial (SAT) & spontaneous Breathing trial(SBT), Choice of Sedation, Delirium Assessment and management, Early Mobility, Family and Patient Engagement

http://www.ihi.org/resources/Pages/Tools/HowtoGuidePreventVAP.aspx
www.ICUliberation.org
Rawat N, et al. Crit Care Med, 2017;45:1208-1215

ASSESS, PREVENT & MANAGE PAIN

Recommendations/Guidelines

Society of Critical Care Medicine

August 2018

- Severe pain negatively effects ICU patients
- Vital Signs and behaviors are flags to investigate.
- Recommend use of a protocol based pain assessment and management program
- Treat pain first

Use a valid and reliable assessment tool

The American Society of Pain Management Nursing

July 2011

- Inability to self report = lack of recognition
- Poor pain control
- Vital signs are not “sensitive”

CPOT is acceptable for the critically ill/unconscious

Devlin J. Crit Care Med. 2018 Sep;46(9):e825-e873

Treating Acute Pain in the ICU

Situation	Preferred Intervention
Acute pain	Fentanyl IVP until pain resolves
Acute pain that persists/recurs	Fentanyl infusion plus fentanyl IVP for breakthrough
Acute pain in chronic opioid user?	Account for previous opioid use when using IV opioid (may consider ketamine)
Planned transition out of ICU and patient on IV opioid infusion	Start scheduled oral/enteral opioid therapy (e.g., oxycodone) plus intermittent IV opioid (e.g., IVP or PCA)

New Guidelines Recommend: Adjuncts to opioids- acetaminophen, nefopam, ketamine

www.ICU liberation.org
Devlin J. Crit Care Med. 2018 Sep;46(9):e825-e873

Agitation

- **Light sedation suggested:**
  - Sedative medications should be titrated to maintain **lighter** levels of sedation, unless clinically contraindicated.
  - Use daily awakening or a titrated sedation strategy to maintain patient wakefulness.
- **Choice of sedative:**
  - Suggest using propofol or dexmedetomidine over benzodiazepines to improve clinical outcomes in mechanically ventilated ICU patients.
- **Cardiac Surgery Patients**
  - Suggest using propofol over a benzodiapine

Devlin J. Crit Care Med. 2018 Sep;46(9):e825-e873

Barr J. **Crit Care Med.** 2013;41:263-306

Agitation

- Assess q 4hrs or prn with change in dose or patients condition
- Use validated tool (RASS or SAS)
- RASS target -1 to +1
- SAS target 3 to 4

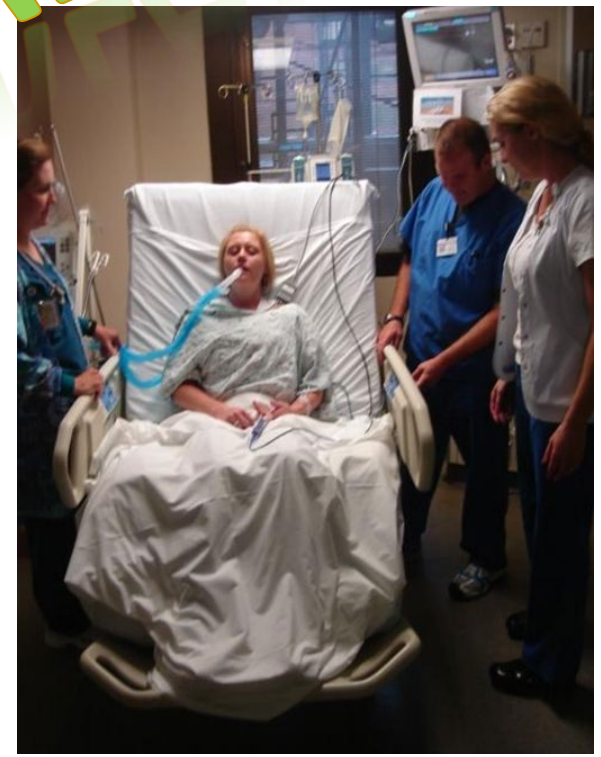
TABLE 1. RICHMOND AGITATION–SEDATION SCALE

Score	Term	Description
+4	Combative	Overtly combative or violent; immediate danger to staff
+3	Very agitation	Pulls on or removes tube(s) or catheter(s) or has aggressive behavior toward staff
+2	Agitated	Frequent nonpurposeful movement or patient–ventilator dyssynchrony
+1	Restless	Anxious or apprehensive but movements not aggressive or vigorous
0	Alert and calm	
−1	Drowsy	Not fully alert, but has sustained (more than 10 seconds) awakening, with eye contact, to voice
−2	Light sedation	Briefly (less than 10 seconds) awakens with eye contact to voice
−3	Moderate sedation	Any movement (but no eye contact) to voice
−4	Deep sedation	No response to voice, but any movement to physical stimulation
−5	Unarousable	No response to voice or physical stimulation

Procedure

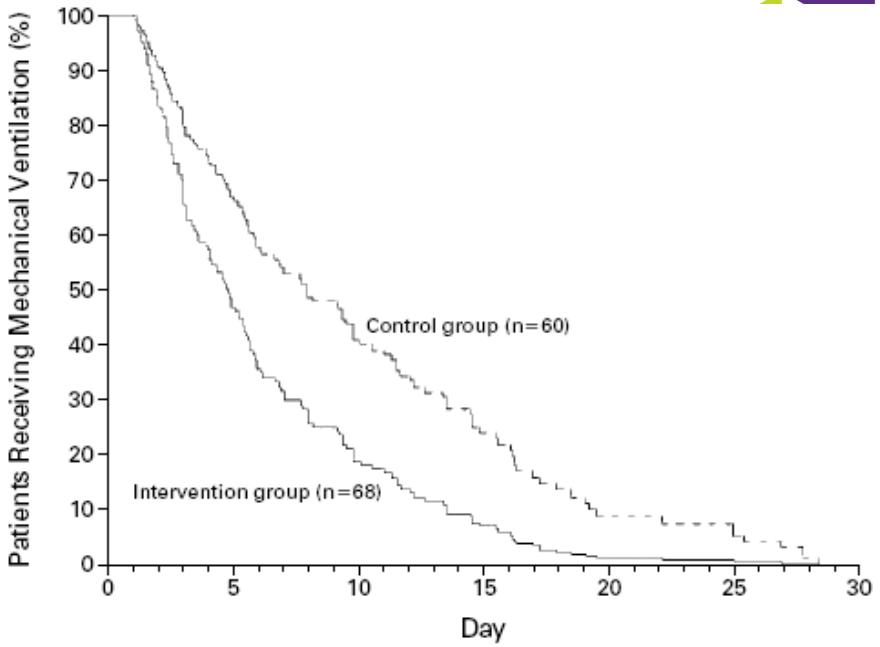
1. Observe patient. Is patient alert and calm (score 0)?
   Does patient have behavior that is consistent with restlessness or agitation (score +1 to +4 using the criteria listed above, under DESCRIPTION)?
2. If patient is not alert, in a loud speaking voice state patient's name and direct patient to open eyes and look at speaker. Repeat once if necessary. Can prompt patient to continue looking at speaker.
   Patient has eye opening and eye contact, which is sustained for more than 10 seconds (score −1).
   Patient has eye opening and eye contact, but this is not sustained for 10 seconds (score −2).
   Patient has any movement in response to voice, excluding eye contact (score −3).
3. If patient does not respond to voice, physically stimulate patient by shaking shoulder and then rubbing sternum if there is no response to shaking shoulder.
   Patient has any movement to physical stimulation (score −4).
   Patient has no response to voice or physical stimulation (score −5).

WAKE UP AND BREATHE



Daily Sedation Interruption Decreases Duration of Mechanical Ventilation

- Hold sedation infusion until patient awake, then restart at 50% of prior dose
- "Awake" defined as any 3 of the following:
  - Open eyes in response to voice
  - Use eyes to follow investigator on request
  - Squeeze hand on request
  - Stick out tongue on request



- Length of MV 4.9 vs. 7.3 days (P=0.004)
- ICU LOS 6.4 vs. 9.9 days (P=0.02)
- Fewer diagnostic tests to assess changes in mental status
- No increase in rate of agitated-related complications or episodes of patient-initiated device removal
- No increase in PTSD or cardiac ischemia

Kress J. **N Engl J Med**.2000;342:1471-7.
Needham D. **Crit Care Med**. 2012;40:502-9
www.ICUliberation.org.

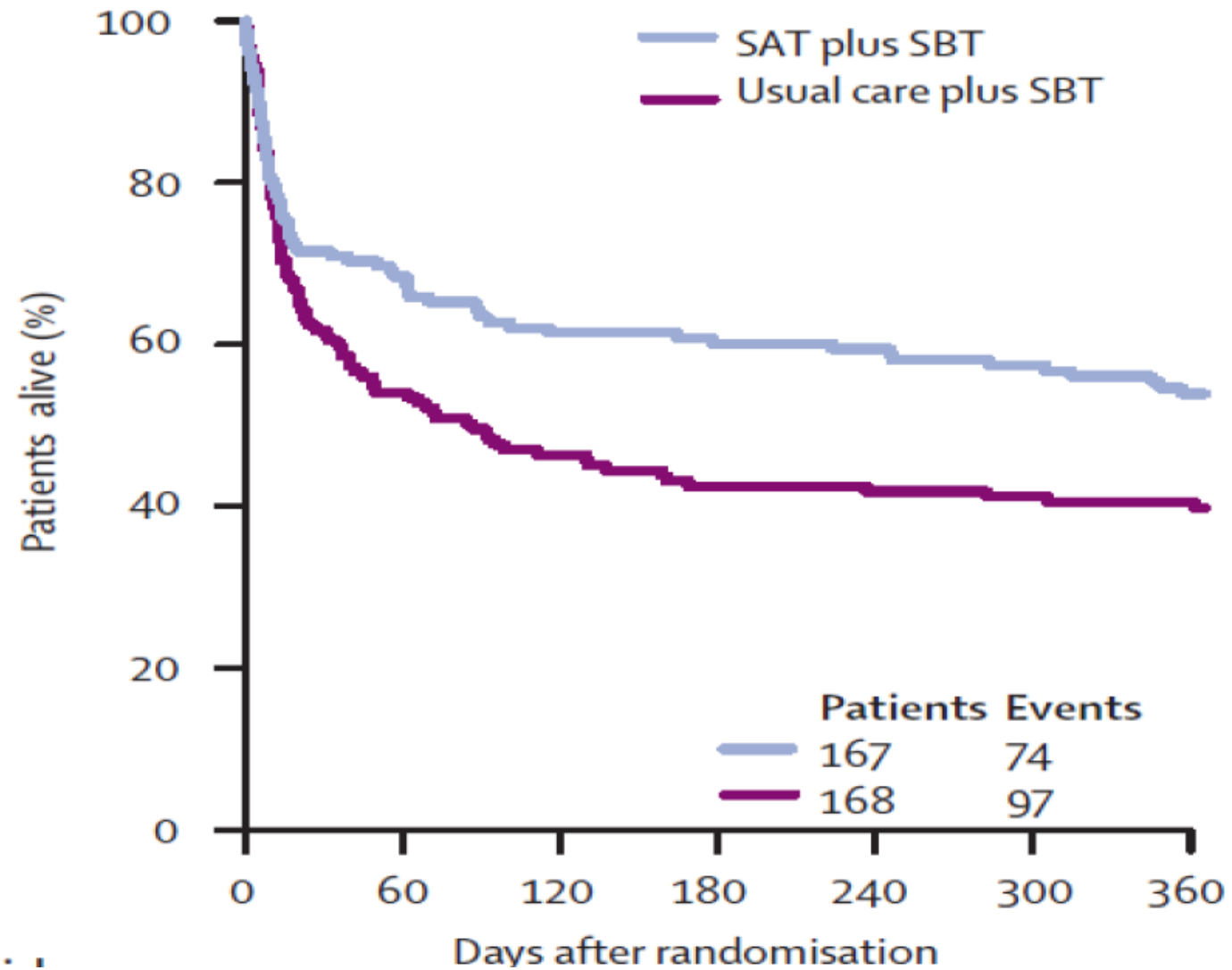
ABC Trial (RCT Paired Sedation & Vent Weaning Protocols)

Outcome*	SBT	SAT+SBT	*P* value
Ventilator-free days	12	15	0.02
Time-to-event, days			
Successful extubation, days	7.0	5	0.05
ICU discharge, days	13	9	0.02
Hospital discharge, days	19	15	0.04
Death at 1 year, n (%)	97 (58%)	74 (44%)	0.01
Days of brain dysfunction			
Coma	3.0	2.0	0.002
Delirium	2.0	2.0	0.50

*Median, except as noted

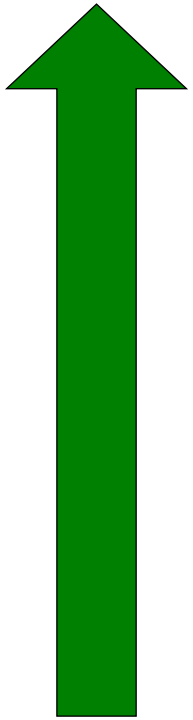
Girard, et al, Lancet. 2008;371:126-34

ABC Trail: Mortality at 1 Year



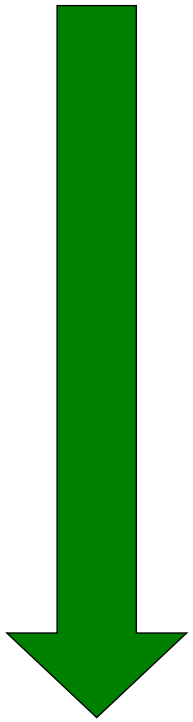
Girard, et al, Lancet. 2008;371:126-34

CDC Prevention Epicenters' Wake Up and Breathe Collaborative



SATs / SBTs

- 63% ⇧ in SATs
- 16% ⇧ in SBTs
- 81% ⇧ in SBTs done with sedatives off



VAEs

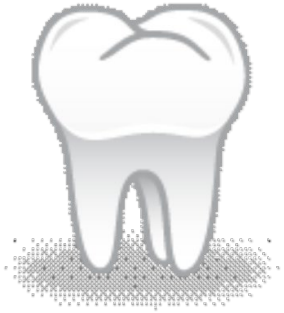
- 37% ⇩ in VACs
- 65% ⇩ in IVACs

Klompas M. (CDC ABCDE Collaborative) Am J Respir Crit Care Med. 2015;191:292-301.

Making it Happen: Wake Up & Breathe

- Process Measure: Daily audit of SAT/SBT compliance or documentation of contraindication
  - Determine if they meet SAT criteria
  - Decrease or stop sedation per protocol
  - Determine if patient meets Readiness to Wean/Resp
  - Determine if meet SBT protocol criteria/Resp
  - Consider one time of day-coordinate between resp and nursing (white board-EMR-communication tool)
  - Discuss results in multidisciplinary rounds
  - Include in nurse to nurse handoff/other handoffs
  - Dedicated RRT in rounds speaking up
  - Ventilator LOS posted/Extubation rates posted

Oral Cavity & VAP



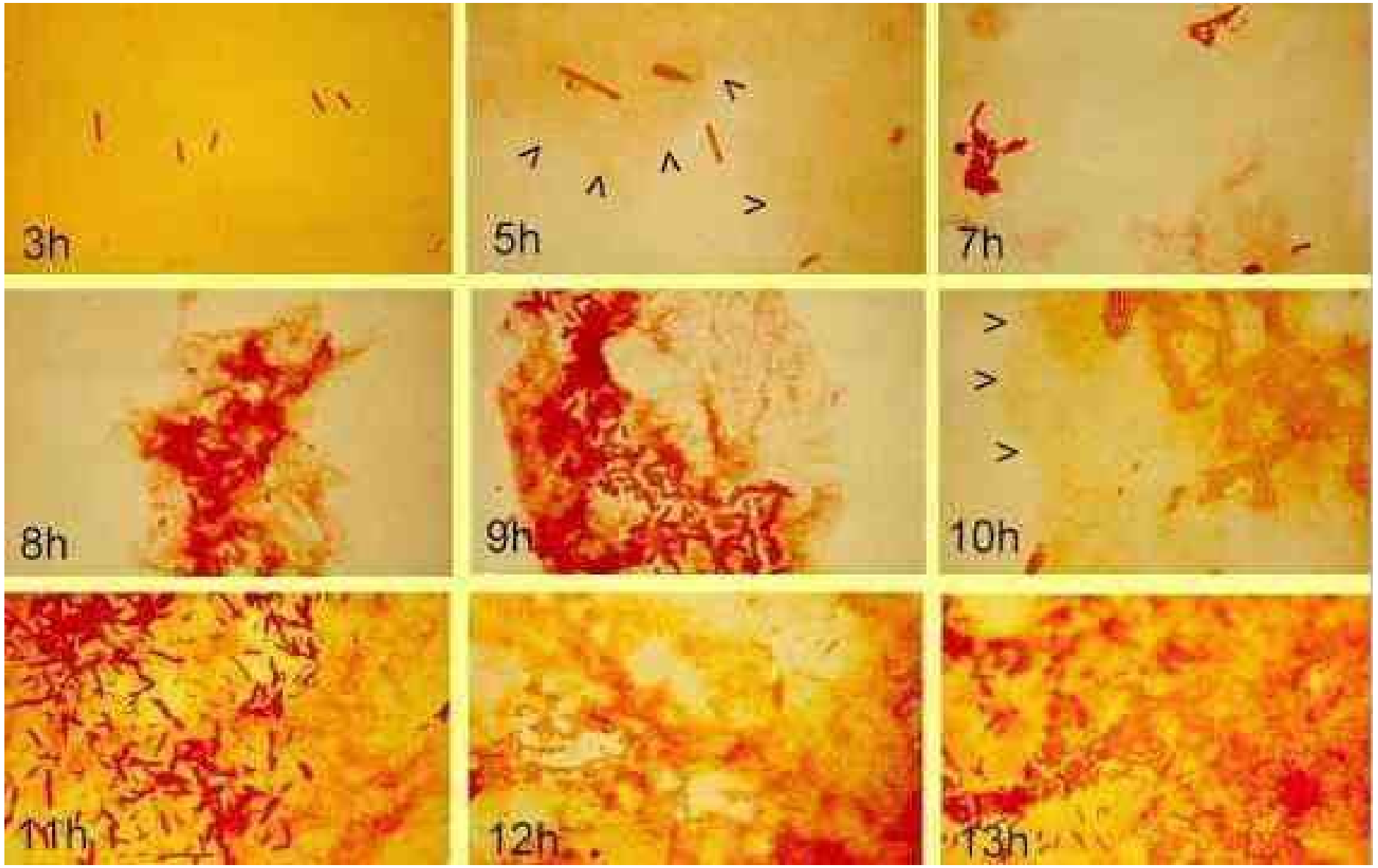
- 89 critically ill patients
- Examined microbial colonization of the oropharynx through out ICU stay
- Used pulse field gel electrophoresis to compare chromosomal DNA
- Results:
  - Diagnosed 31 VAPs
  - 28 of 31 VAP's the causative organism was identical via DNA analysis

Garrouste-Orgeas et. al. Am J Respir Crit Care Med. 1997;156:1647-1655

- 49 elderly nursing home residents admitted to the hospital
- Examined baseline dental plaque scores & microorganism within dental plaque
- Used pulse field gel electrophoresis to compare chromosomal DNA
- Results
  - 14/49 adults developed pneumonia
  - 10 of 14 pneumonias, the causative organism was identical via DNA analysis

El-Solh AA. Chest. 2004;126:1575-1582

Formation of Biofilm Over 13 Hours

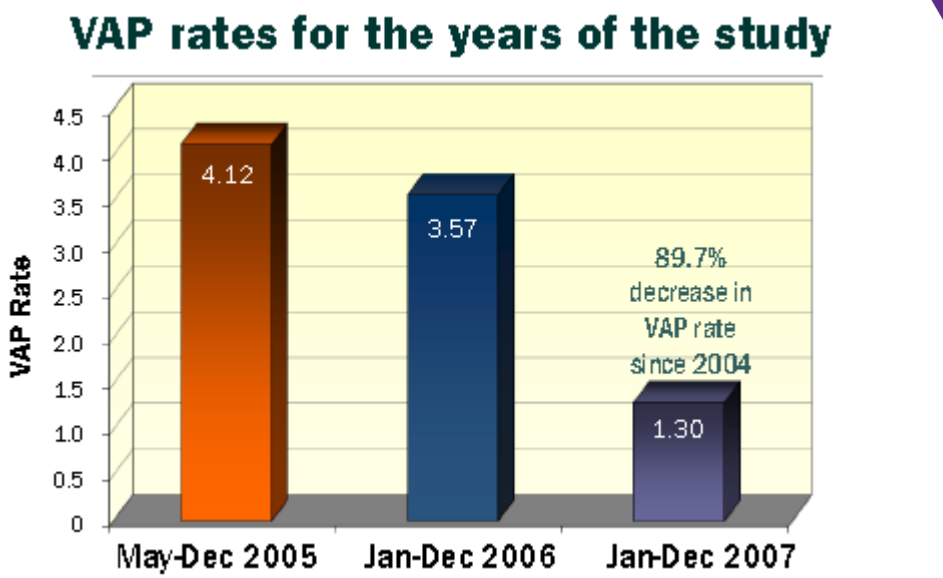


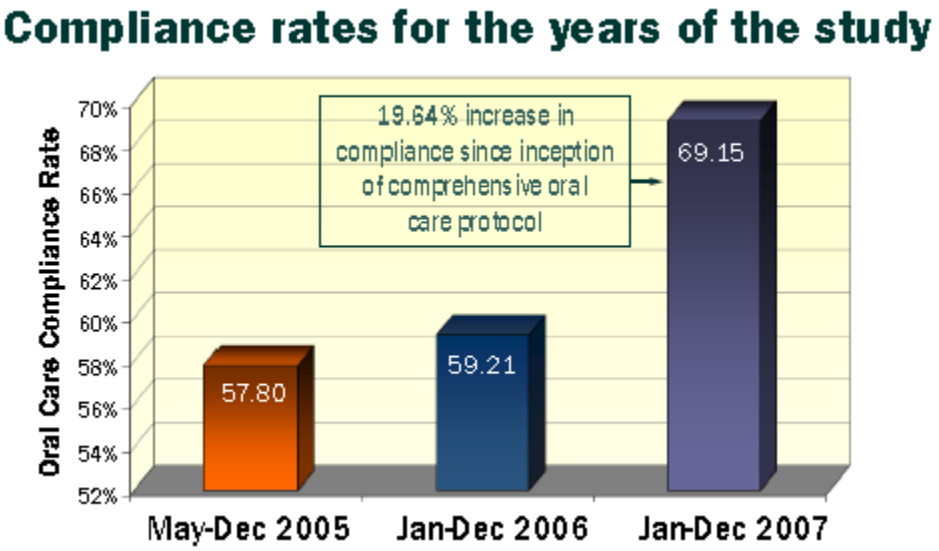
Loesche, W. 2012

http://helios.bto.ed.ac.uk/bto/microbes/biofilm.htm

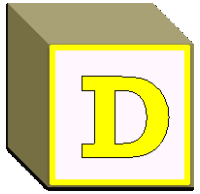
Does Compliance Make A Difference?

Oral care compliance & use of the ventilator bundle resulted in a 89.7% reduction in VAP





Hutchins K, et al. Amer J of Infect Control. 2009;37(7):590-597.

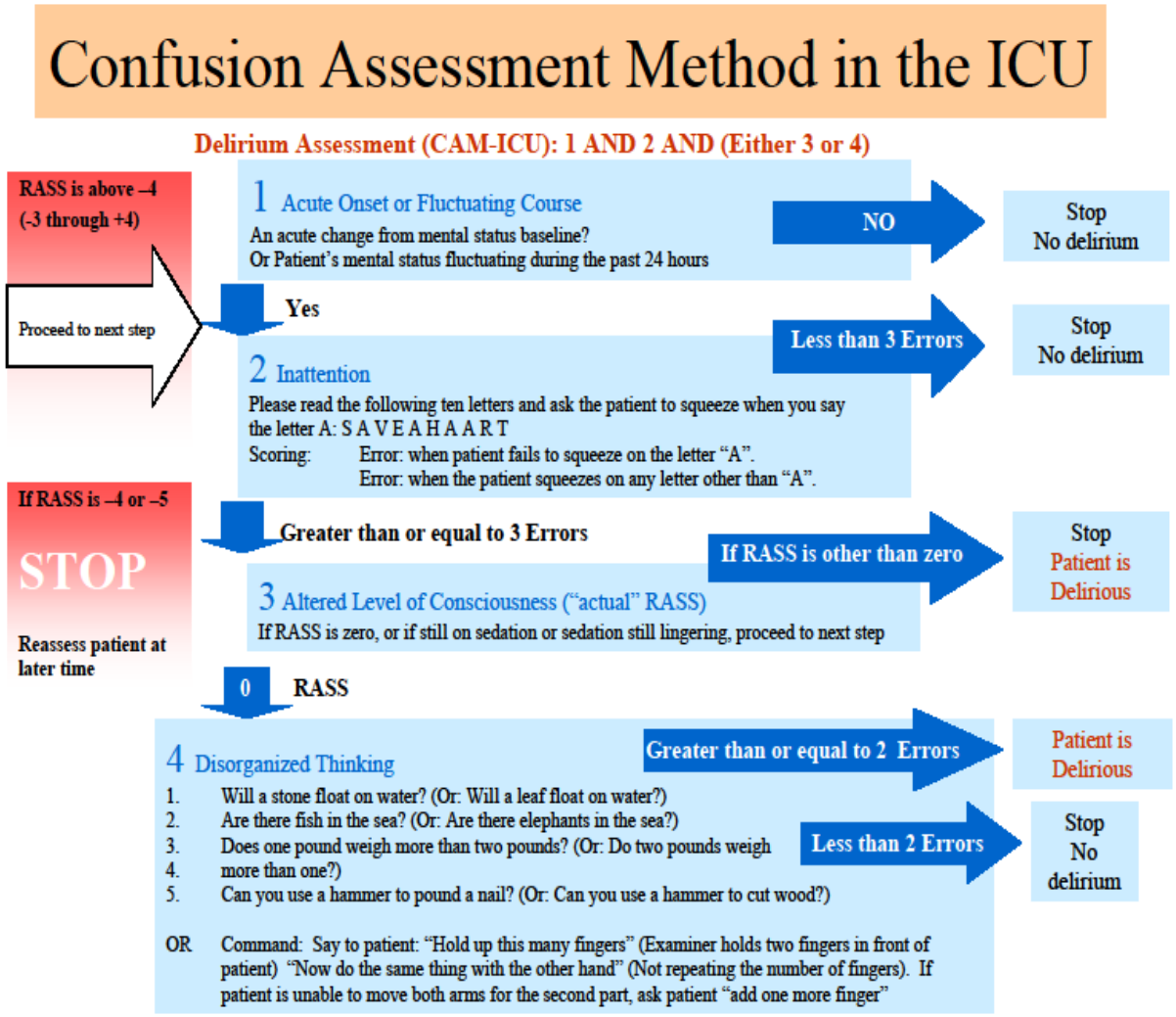


Delirium: First Focus on Prevention

- Pain and sedation scores
- Analgesia and Sedative Algorithm
  - Control pain first, then anxiety
  - Use intermittent meds first before continuous
- Target RASS + 1 to -1
- Daily SAT (spontaneous awakening trial)
- Daily SBT (spontaneous breathing trial)
- Implement non-pharmacological strategies

Delirium Assessment & Management

- Delirium Assessment:
  - ICU-CAM
  - ICU Delirium Screening Checklist
- Frequency:
  - Q shift & prn



Non-Pharmacological Strategies

Sleep Promotion

- Appropriate Medications
- Bath during day
- Chair position
- Lighting
- Television
- Hearing/Vision Aids/Dentures
- Control Noise

Other

- Cognitive Stimulation/Music
- Familiar objects in room/pictures

Mobility Promotion

- Evaluate for Physical Therapy
- Range of Motion
- Sleep
- Work with PT
- Spontaneous Awakening Trial

Sedation Holidays

- Sleep Promotion
- Mobility

Pandharipande P et al. (Lorazepam) *Anesthesiology* 2006;104:21–26;
Oimet ICM 2007; 33:1007-1013;
Pandharipande P et al. (Midazolam) *J Trauma* 2008
Dubois MJ et al., (Morphine) *Intensive Care Med* 2001; 27:1297–

Outcomes of Early Progressive Mobility Program

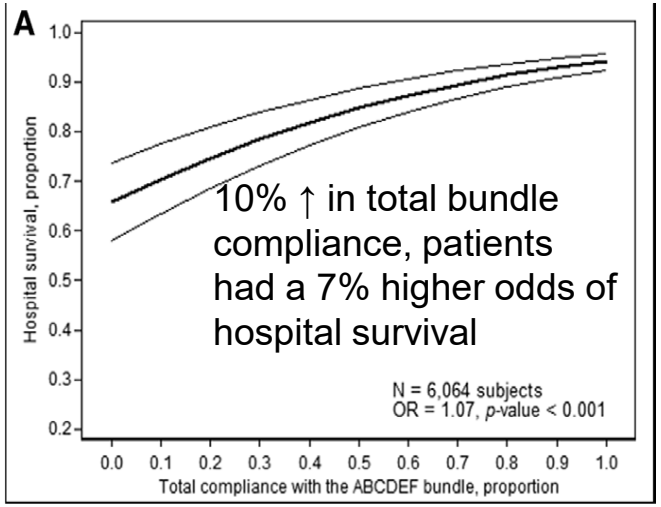
- ↓ incidence of skin injury
- ↓ time on the ventilator
- ↓ incidence of VAP
- ↓ days of sedation
- ↓ delirium
- ↑ ambulatory distance
- Improved function

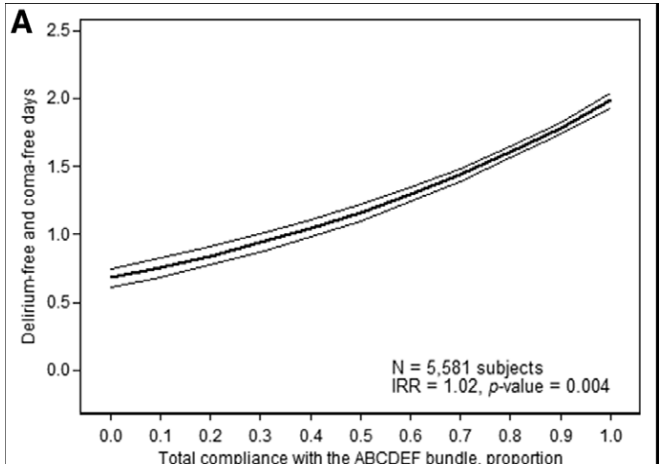
Staudinger t, et al. Crit Care Med, 2010;38.
Abroung F, et al. Critical Care, 2011;15:R6
Morris PE, et al. Crit Care Med, 2008;36:2238-2243
Pohlman MC, et al. Crit Care Med, 2010;38:2089-2094
Schweickert WD, et al. Lancet, 373(9678):1874-82.
Thomsen GE, et al. CCM 2008;36;1119-1124
Winkelman C et al, CCN,2010;30:36-60


“Even if you are on the right track, you will get run over if you just sit there.”
Will Rogers

ABCDEF Bundle: Improving Survival & Reducing Brain Dysfunction

- Ventilated and non-ventilated medical and surgical ICU patients enrolled between January 1, 2014, and December 31, 2014
- Determine association between ABCDEF bundle compliance/total & partial & outcomes of hospital survival and delirium-free and coma-free days/
- Patients experienced more days alive and free of delirium and coma with both total bundle compliance and partial bundle compliance

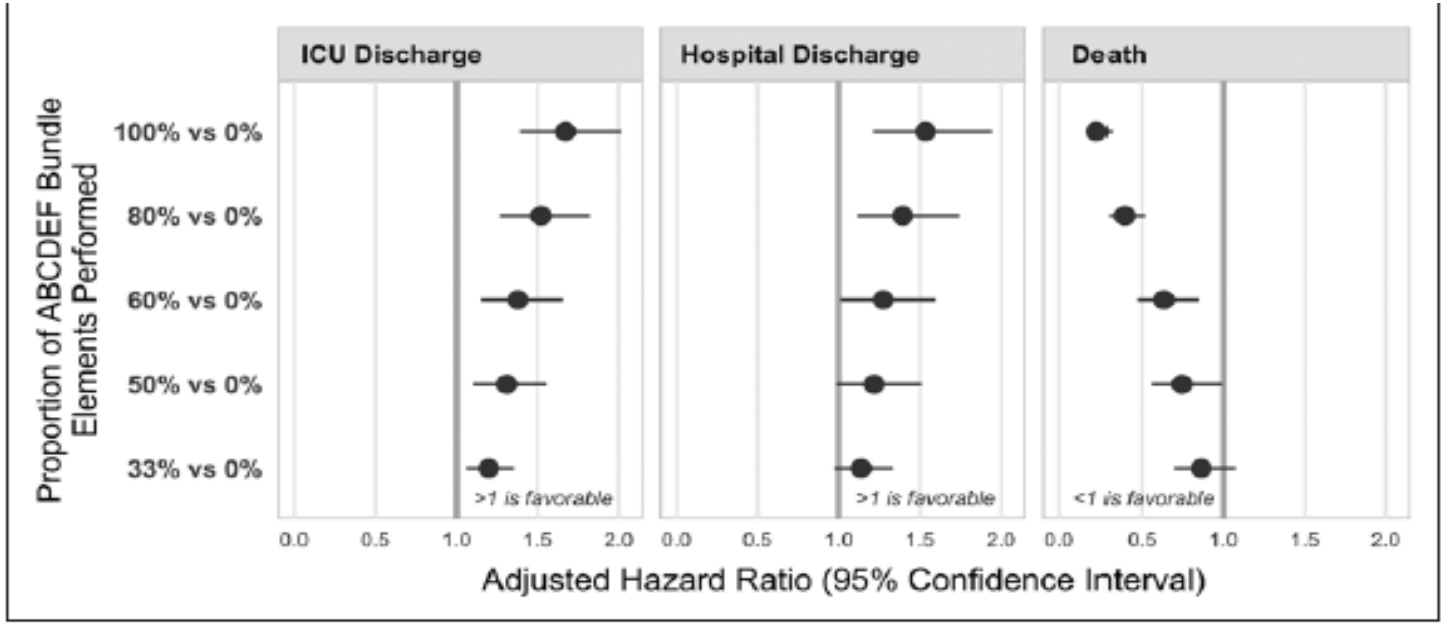




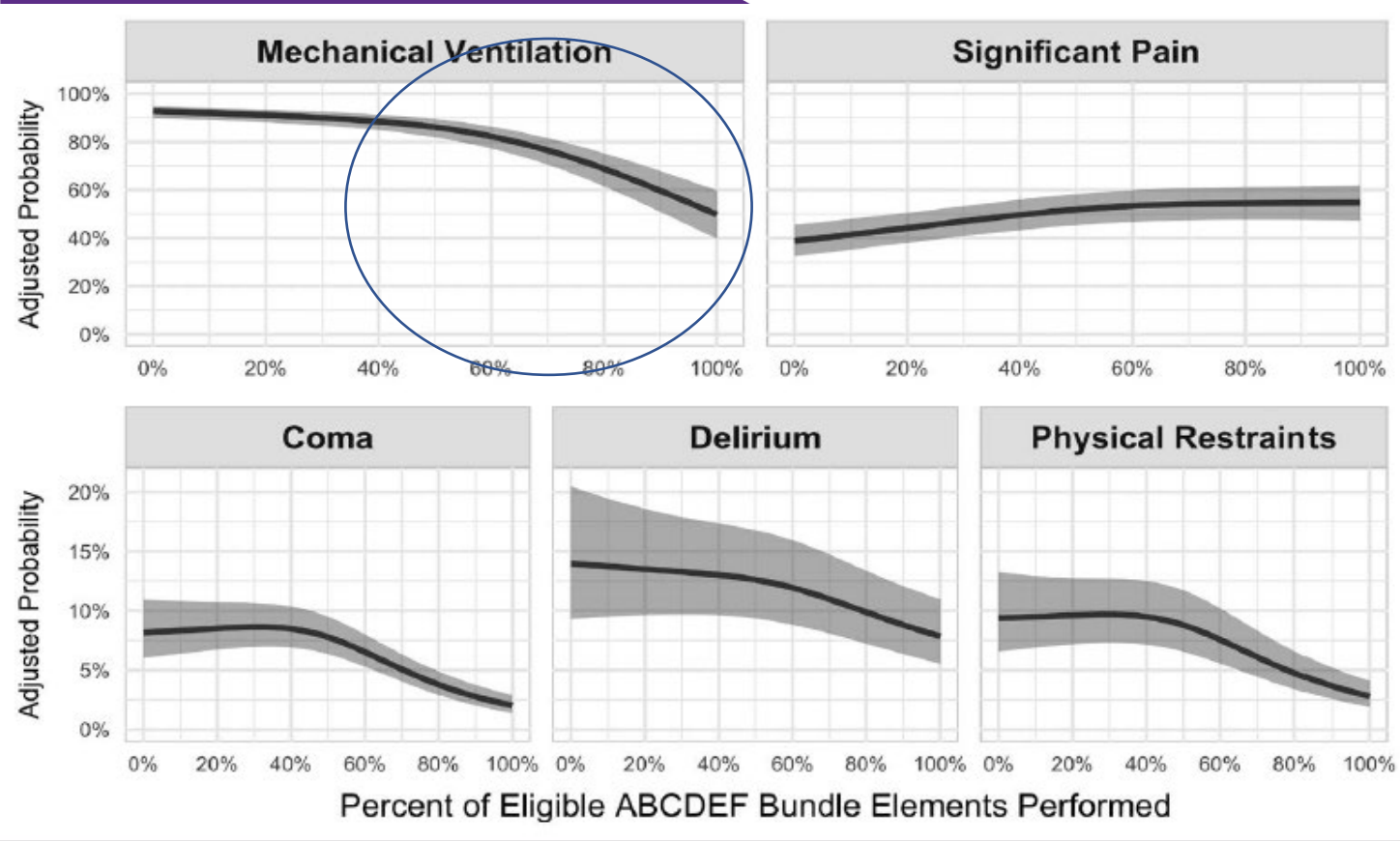
Barnes-Daly M A. et al. *Crit Care Med*, 2018

ICU Liberation Collaborative

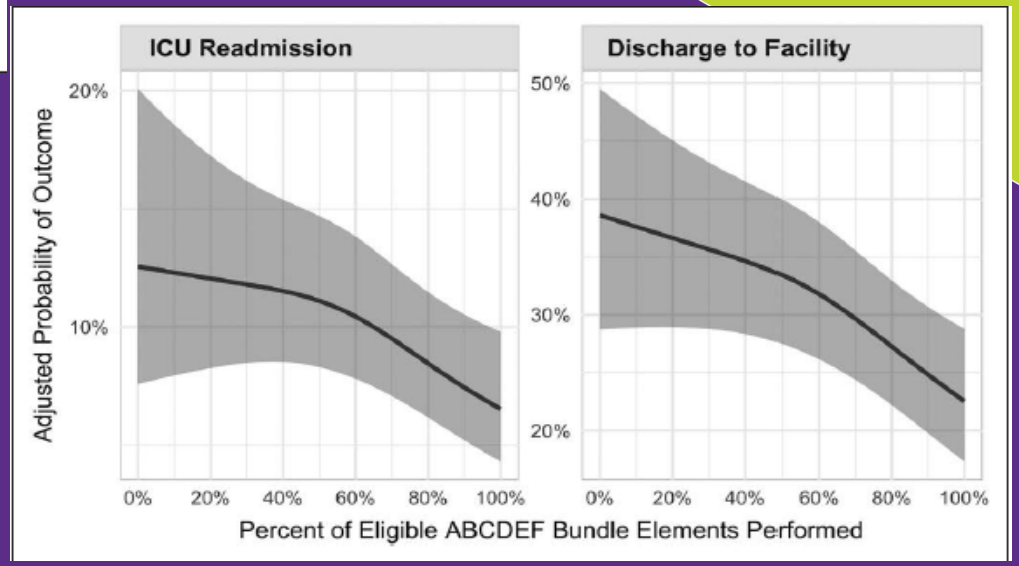
- Prospective, multicenter, cohort study of national collaborative
- 68 academic, community and federal ICU's collected data-20 months
- Measure complete and proportional bundle performance against 3 groups of outcomes, patient related, symptom related and system related



Pun BT, et al. Crit Care Med. 2019



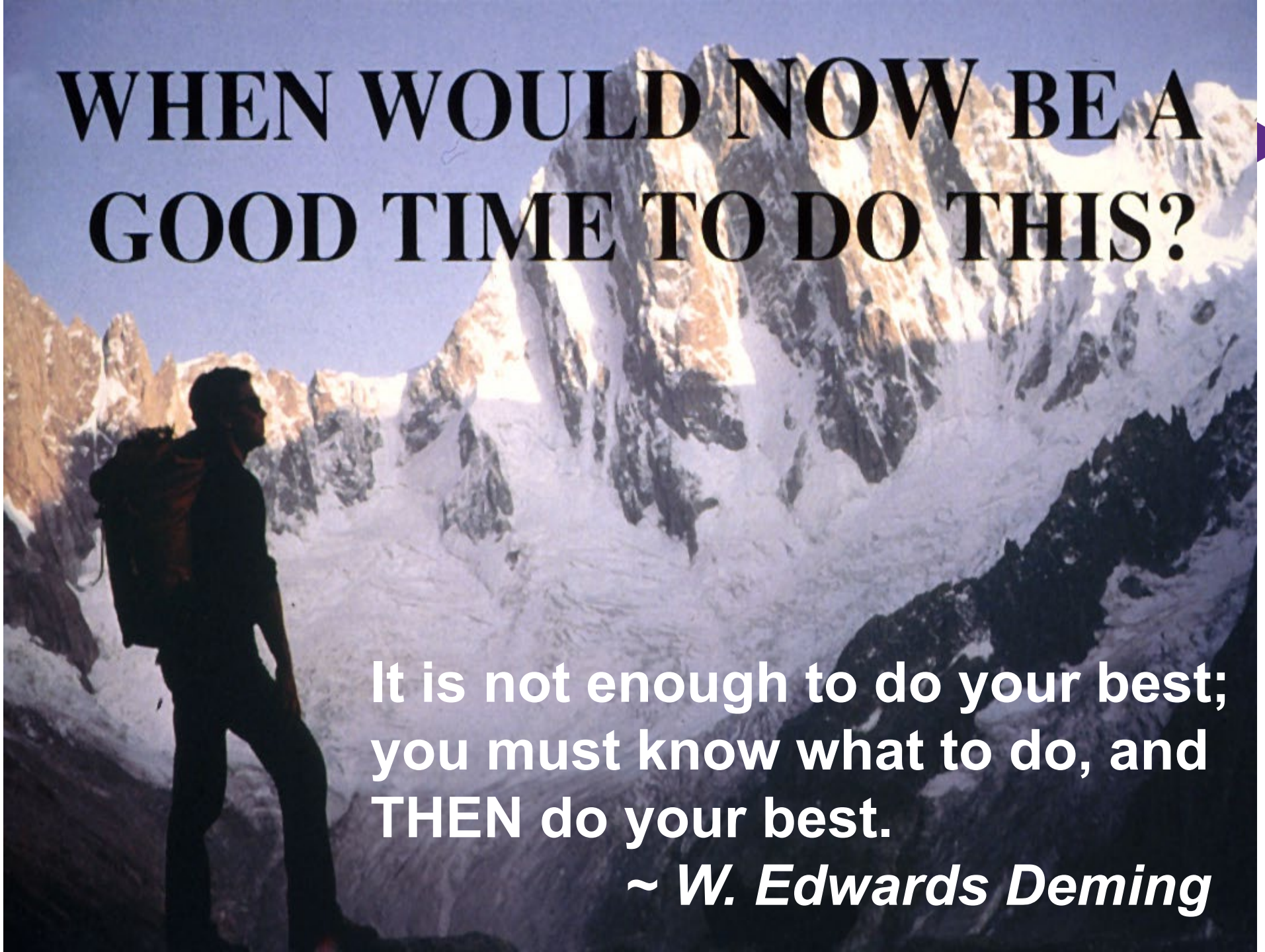
ICU Liberation Collaborative



Pun BT, et al. *Crit Care Med*. 2019

Integrating ABCDEF into ICU culture

- Talk about all the ABCDEF bundle as ONE.
- Utilize Change Champions in all aspects of integration
  - Demonstrate/Mentor staff
  - Ground Up
- Daily Rounds with Multidisciplinary Team
  - Expectation is for RN to speak the language
- Don’t start each intervention separate from the others
  - Group interventions together, demonstrate how they connect and evaluate together


WHEN WOULD NOW BE A GOOD TIME TO DO THIS?
It is not enough to do your best; you must know what to do, and THEN do your best.
~ W. Edwards Deming

Forbid yourself to be deterred by poor odds just because your mind has calculated that the opposition is too great. If it were easy, everyone would do it.

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ADVANCING NURSING THROUGH KNOWLEDGE & INNOVATION

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