Central Line Associated Bloodstream Infection, Urinary Tract Infection, and Pneumonia Prevention

ACH IP Course, 2022

Infection Prevention Training for ACH
Healthcare-Associated Infections Program
Center for Health Care Quality California
Department of Public Health

California Department of PublicHealth

CLABSI Prevention Objectives

- Describe the etiology and epidemiology of central line associated bloodstream infections (CLABSI)
- Identify patients at risk for CLABSI
- Review evidence-based CLABSI prevention care practices
- Discuss adherence monitoring and feedback

Central Line

- Intravascular catheter that terminates at or close to the heart or one of the great vessels
- Used for infusion, withdrawal of blood or hemodynamic monitoring
- Multiple types
  - Nontunneled (subclavian, jugular)
  - Peripherally inserted central catheters (PICCs)
  - Tunneled (Broviac, Hickman, Groshong)
  - Dialysis catheter (Quinton)
  - Implanted ports (Permacath)

NHSN Patient Safety Module, Chapter 4 (PDF)
(www.cdc.gov/nhsn/pdfs/pscmanual/pcsmanual_current.pdf)

CLABSI Pathogenesis

Common mechanisms

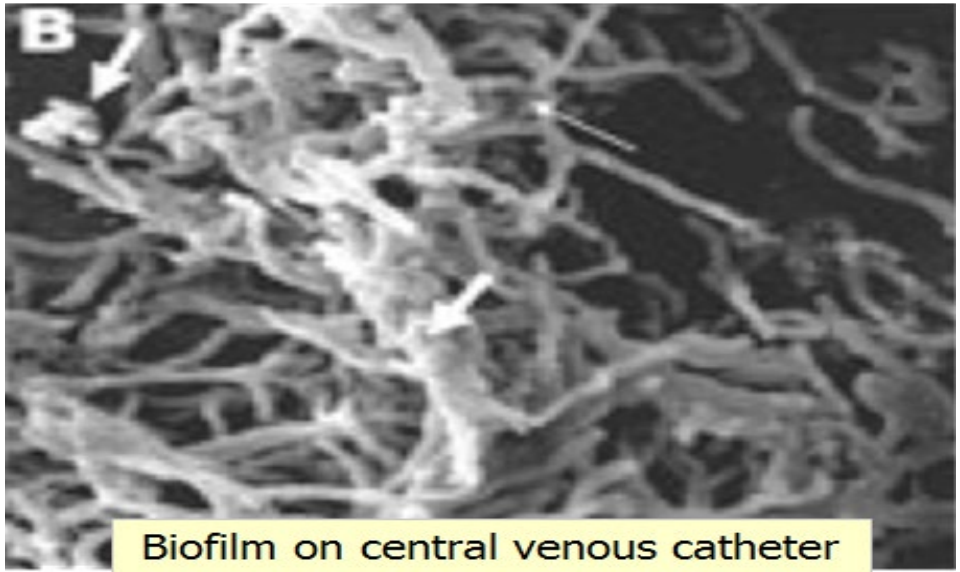
- Extraluminal contamination
  - Pathogens migrate on external surface of catheter
  - Introduce bacteria during insertion
- Intraluminal contamination
  - Pathogens migrate along internal surface
  - Access port contamination

Less common mechanisms

- Seeding from another infection site source
- Contaminated infusates

Biofilms

- Complex aggregation of microorganisms growing on a solid substrate
- Form on catheter surfaces
- Contribute to CLABSI risk
- Of concern ”*C.auris*…has the capacity to form biofilms with enhanced virulence capacity”*



Biofilm on central venous catheter

Biofilm-Forming Capability of Highly Virulent, MDR *Candida auris* (wwwnc.cdc.gov/eid/article/23/2/16-1320_article)

Common CLABSI Pathogens

- Coagulase-negative Staphylococci 16%
- *Staphylococcus aureus* 13%
- *Klebsiella (pneumoniae/oxytoca)* 8%
- *Enterococcus faecalis* 8%
- *Enterococcus faecium* 7%
- *Candida albicans* 6%

CDC NHSN HAI Pathogens, 2011-2014, Table 3

(www.cdc.gov/nhsn/pdfs/datastat/2014-ar-data-summary-nhsn.pdf)

CLABSI Risk Factors

Higher Risk

- Multiple catheters ***(Modifiable)***
- Multiple lumen catheters ***(Modifiable)***
- Excessive line manipulation ***(Modifiable)***
- Emergency insertion
- Prolonged duration
- Prolonged hospital stay prior to line insertion
- Neutropenia
- Prematurity
- Total parenteral nutrition
- **Hemodialysis**

Lower Risk

- Single lumen catheters
- Elective insertion
- Remove lines promptly
- Specialized inserter
- Optimal site selection (subclavian)

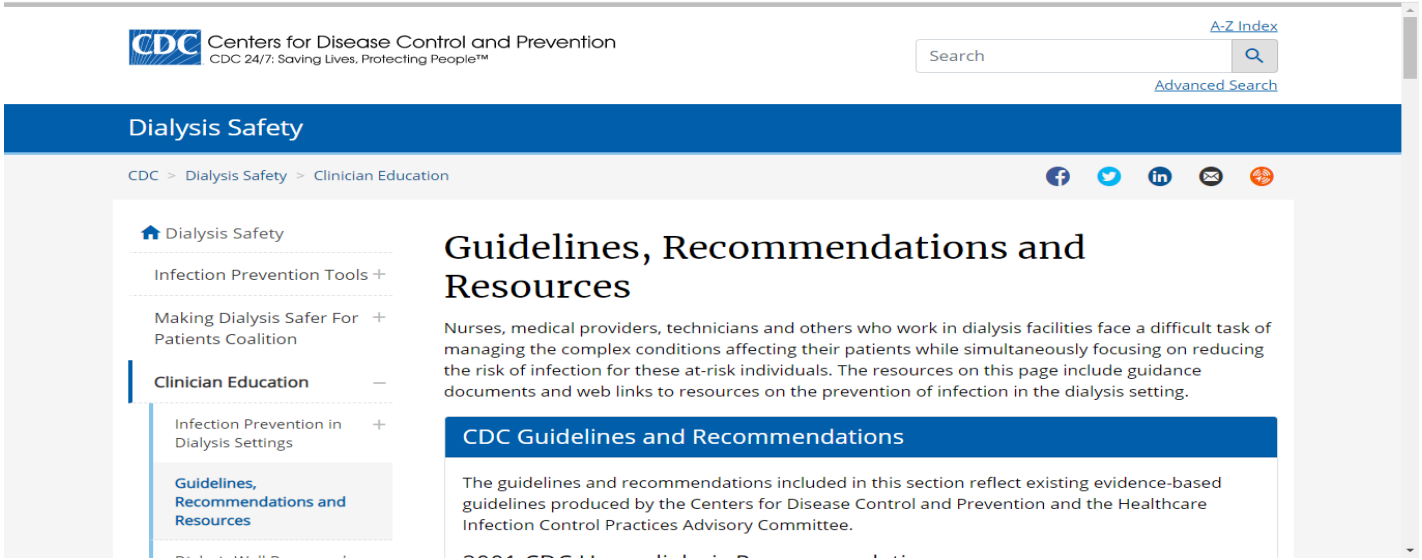
Hemodialysis

- Catheters (specifically, central lines) are the most common cause of BSI in dialysis patients
  - 7X higher CLABSI risk than arteriovenous fistulas or grafts

Vascular Access Type	Rate (per 100 patient-months)
AV fistula	0.26
AV graft	0.39
Other vascular access type	0.67
Central venous catheter	2.16

- Include hemodialysis providers **and contractors** in CLABSI prevention education and competency programs

Hemodialysis Resource



CDC Dialysis Safety webpage
(www.cdc.gov/dialysis/guidelines/index.html)

CDC Guideline, Preventing Infections in Dialysis, 2011 (updated October 2016)
(www.cdc.gov/infectioncontrol/guidelines/dialysis/index.html)

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CLABSI Prevention – What works?

Best sources for **evidence-based CLABSI prevention practice** recommendations

- **CDC Guidelines** for the Prevention of Intravascular Catheter-Related Infections, **2011** (updated July 2017)
  (www.cdc.gov/infectioncontrol/guidelines/bsi/index.html)
- CDC **Checklist** for CLABSI Prevention (PDF)
  (www.cdc.gov/hai/pdfs/bsi/checklist-for-clabsi.pdf)
- **SHEA, IDSA & APIC** Strategies to Prevent Central Line-Associated BSI Acute-Care Hospitals, **2022 Update** (PDF)
  (doi.org/10.1017/ice.2022.87)

CLABSI Prevention – What Works?

- Proper line insertion practices (CLIP)
- Proper line maintenance
- Clinical staff that has been trained and had competency verified (return demonstration)
- Adherence monitoring and feedback of prevention care practices

Prevention "Bundle"

- A group of practices with high-level clinical evidence of effectiveness
- When applied together, improvements are synergistically greater
- Benefits of bundle adoption
  - Minimize practice variation among health care providers
  - Adherence to a set of recommendations is enhanced
  - Able to measure adherence

The whole is greater than the sum of its parts!

Central Line Insertion Practices (CLIP) Bundle

- Hand hygiene performed
- Appropriate skin prep
  - Chlorhexidine gluconate (CHG) for most patients
  - Povidone iodine, alcohol or CHG for children <60 days old
- Skin prep agent has completely dried before insertion
- All **5** maximal sterile barriers used
  - Sterile gloves, sterile gown, cap, mask worn, and large sterile drape (covers patient's entire body)

All providers should be empowered to stop the insertion if improper insertion practice observed

CDC CLIP Bundle, NHSN Jan 2021 (PDF)
(www.cdc.gov/nhsn/pdfs/pscmanual/5psc_clipcurrent.pdf)

Preparing for Central Line Insertion (CLIP)

- All-inclusive catheter cart/kit
- Optimal catheter site selection
  - Lower risk insertion site if possible
  - Avoid femoral site
  - Subclavian vein preferred for non-tunneled catheters in adults

CLIP – Hand Hygiene

- Hand hygiene performed prior to central line insertion

CLIP - Maximum Sterile Barriers

Line inserter and assistant

- Cap
- Mask
- Sterile gown
- Sterile gloves

Patient

- Large sterile drape
- Should cover patient from head to toe
- Small opening for insertion site

CLIP – Appropriate Skin Antisepsis

- Skin antisepsis should be performed just prior to line insertion
- **Chlorhexidine gluconate (CHG)** for patients ≥ 60 days old unless there is a documented contraindication to CHG
- Povidone iodine, alcohol, CHG* or other specified for children < 60 days old

*FDA has labeled CHG to be used with care in premature infants and infants less than 2 months of age

CLIP – Skin Antisepsis Completely Dried Before Insertion

- The skin antisepsis agent needs to be allowed to dry completely before puncturing site
- Insertion site should not be palpated after the antiseptic has been applied unless aseptic technique can be maintained

Central Line Dressing

- Sterile gauze dressing or a sterile, transparent, semipermeable dressing should be placed over the insertion site
- For patients 18 years of age or older a CHG impregnated dressing (FDA approved for CLABSI prevention) should be used unless the facility has demonstrated success at preventing CLABSI with basic prevention practices

Daily Review of Line Necessity

- Perform daily review of central line necessity (and document in patient record)
  - Appropriate use examples include chemotherapy, extended antibiotic course, hemodialysis, total parenteral nutrition
- Promptly remove unnecessary lines
  - Risk of infection increases with duration of line

Adopt a Central Line Maintenance Bundle

- Hand hygiene prior to replacing, accessing, repairing, or dressing a catheter
- Hub and access port disinfected before each access
- Only sterile devices to access catheters
- Wet, soiled, or dislodged dressings immediately replaced
- Clean or sterile gloves used to maintain aseptic technique
- Gauze dressings changed at least every 2 days; semipermeable dressings at least every 7 days
- Administration sets changed no more frequently than every 4 days

Daily Bathing with Chlorhexidine

- Perform daily chlorhexidine bathing (2% solution) in select populations
  - ICU patients
  - Hospital units with continued CLABSI
  - SNF residents with a central line (shown to reduce MDRO)
- CHG bathing lowers microbial burden on patient's skin and the hands of healthcare workers
- Systematic review of 25 published studies concluded “CHG bathing of patients is associated with a consistent, clinically important, and statistically significant reduction in risk of healthcare-associated BSIs”*

*Musuuza JS, BMC Inf Dis 2019

Additional CLABSI Prevention Practices

If facility has ensured high adherence to basic CLABSI prevention practices and CLABSI continue:

- Consider using antimicrobial-impregnated catheter if line is expected to be in >5 days
- Cover insertion site with chlorhexidine-impregnated dressings
  - Decrease CLABSI rates in some studies, not in others
- Antiseptic impregnated caps for access ports

Blood Cultures and Central Lines

- Draw blood from peripheral site if possible
  - Drawing from central line may result in a false positive and unnecessary antibiotics
  - Best is one from peripheral site, and one from central line
- Disinfect the tops of the culture bottles before injecting
  - Under the cap is not sterile!
- Disinfect the peripheral site and allow to dry
- Do Not draw blood cultures at the same time
  - If ordered 15 mins apart, for example, wait for 15 min!
- Culturing catheter tip NOT accurate marker for CLABSI

Collecting Cultures, CDC Antibiotic Use for Healthcare webpage
(www.cdc.gov/antibiotic-use/core-elements/collecting-cultures.html)

Measuring Prevention

Requires monitoring for:

- Adherence with practices known to reduce infections

  = **Process** measure

- Change in CLABSI incidence

  = **Outcome** measure

Facility Role in CLABSI Prevention

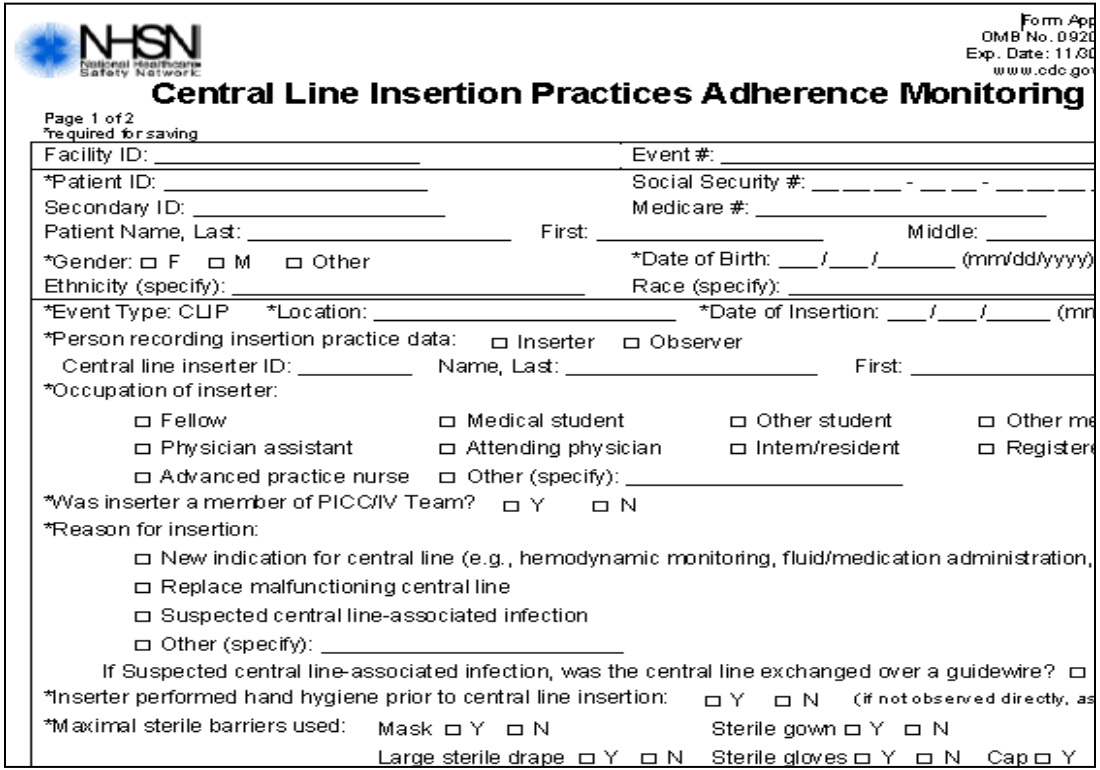
- Ensure policies and practices reflect current evidence based recommendations
  - CDC and SHEA/IDSA guidelines
- Ensure staff competency upon hire and at least annually
  - New hire orientation
  - Annual skills fair
  - Return demonstration to ensure competency
- Monitor adherence to prevention practices and provide feedback

Adherence Monitoring and Feedback

- Perform **CLABSI surveillance** using standardized methods
- Perform **adherence monitoring** of CLABSI prevention care practices using standardized tools
  - For example, monitor adherence to
    - Central line insertion practices (CLIP)
    - Daily review of line necessity
    - Prompt removal of central lines
    - Accessing the line using “scrub-the-hub” practices
    - Catheter site care and dressing practices
- Provide **feedback** to frontline staff and leaders
  - Present adherence results with CLABSI data to each unit

Monitoring Central Line Insertion

- If patient develops CLABSI, within 7-10 days after insertion, assess CLIP adherence
- If high CLABSI, monitor CLIP in all locations where lines are inserted, including OR and interventional radiology



NHSN National Healthcare Safety Network

Form App
OMB No. 0920
Exp. Date: 11/30
www.cdc.gov

Central Line Insertion Practices Adherence Monitoring

Page 1 of 2
*required for saving

Facility ID: _____ Event #: _____

*Patient ID: _____ Social Security #: ___ ___ ___ - ___ ___ - ___ ___ ___ ___

Secondary ID: _____ Medicare #: _____

Patient Name, Last: _____ First: _____ Middle: _____

*Gender: ☐ F ☐ M ☐ Other *Date of Birth: ___/___/_____ (mm/dd/yyyy)

Ethnicity (specify): _____ Race (specify): _____

*Event Type: CLIP *Location: _____ *Date of Insertion: ___/___/_____ (mm

*Person recording insertion practice data: ☐ Inserter ☐ Observer

Central line inserter ID: _____ Name, Last: _____ First: _____

*Occupation of inserter:

☐ Fellow ☐ Medical student ☐ Other student ☐ Other me
☐ Physician assistant ☐ Attending physician ☐ Intern/resident ☐ Register
☐ Advanced practice nurse ☐ Other (specify): _____

*Was inserter a member of PICC/IV Team? ☐ Y ☐ N

*Reason for insertion:

☐ New indication for central line (e.g., hemodynamic monitoring, fluid/medication administration,
☐ Replace malfunctioning central line
☐ Suspected central line-associated infection
☐ Other (specify): _____

If Suspected central line-associated infection, was the central line exchanged over a guidewire? ☐

*Inserter performed hand hygiene prior to central line insertion: ☐ Y ☐ N (if not observed directly, as

*Maximal sterile barriers used: Mask ☐ Y ☐ N Sterile gown ☐ Y ☐ N

Large sterile drape ☐ Y ☐ N Sterile gloves ☐ Y ☐ N Cap ☐ Y

[NHSN CLIP Checklist form](www.cdc.gov/nhsn/forms/57.125_CLIP_BLANK.pdf)

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Monitoring Central Line Access Maintenance

Observation	Patient 1		Patient 2		Adherence by Task # Yes	Adherence by Task # Obs
Supply kit is used for central line dressing changes.	(Yes)	No	(Yes)	No	2	2
Hand hygiene performed before **and** after manipulating the catheter (regardless of glove use).	Yes	(No)	Yes	(No)	0	2
Wet, soiled, or dislodged dressings are changed promptly.	(Yes)	No	(Yes)	No	2	2
Need for line assessed daily by a practitioner, with prompt removal of unnecessary lines.	(Yes)	No	Yes	(No)	1	2
Scrubbing method is used during dressing change when applying CHG to the insertion site.	(Yes)	No	Yes	No	1	1
Dressing is changed with aseptic technique, using clean gloves to remove the old dressing and sterile gloves when applying the new dressing.	(Yes)	No	Yes	No	1	1
The access port or hub is scrubbed immediately prior to each use with the appropriate antiseptic.	Yes	No	(Yes)	No	1	1
Antiseptic-containing protector caps are utilized for all line connectors if it is facility policy.	Yes	No	Yes	No	Not Policy	
The catheter is accessed with only sterile devices.	Yes	No	(Yes)	No	1	1
Daily bathing with a 2% CHG solution is done if facility policy.	(Yes)	No	(Yes)	No	2	2
Total # Yes 11	Total # Observations 14		#Yes/#observations x 100= 79% Adherence			

CDPH Adherence Monitoring Tool webpage

(www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/MonitoringAdherenceToHCPractices ThatPreventInfection.aspx)

California Department of PublicHealth

Monitoring Central Line Dressing Maintenance

Central Line Maintenance Practices	Patient 1		Patient 2		Adherence by Task	
					# Yes	# Observed
Central line insertion date is documented.	Yes	No	Yes	No	2	2
Dressings wet, soiled, or dislodged are changed promptly.	Yes	No	Yes	No	2	2
Need for the line assessed daily by a practitioner, with prompt removal of unnecessary lines	Yes	No	Yes	No	0	2
Optimal site selected, avoid femoral site in adult patients.	Yes	No	Yes	No	2	2
Sterile gauze, sterile transparent or sterile semi-permeable dressing used to cover the catheter site is in place for ≤ 7 days (Mark "No" if no date on the dressing.)	Yes	No	Yes	No	0	2
Antiseptic-containing protector caps are utilized for all line connectors if facility policy.	Yes	No	Yes	No	2	2
A CHG-impregnated sponge applied at insertion site	Yes	No	Yes	No	2	2
Tubing and administration set have been in place for ≤ 7 days. (Mark "No" if no date on dressing.)	Yes	No	Yes	No	0	2
TPN/Lipids: tubing dated to ensure change every 24 hours.	Yes	No	Yes	No	None	Today
Daily bathing with a 2% CHG solution is done if facility policy.	Yes	No	Yes	No	1	2

Total # Yes 11 Total # Observations 18 #Yes/#observations x 100= 61 % Adherence

CLABSI Practice Observations

57 Hospitals with High CLABSI Rates, 2015-2017		
	# Observations	Adherence
Line Insertion	12	90%
Line Maintenance	39	
Insertion Date Documented		83%
Hand Hygiene Before/After Even if Gloves Worn		78%
Clean, Dry, Intact Dressing		92%
Avoid Femoral Site		95%
CHG Sponge at Insertion Site		95%
Daily CHG Bath if Hospital Policy		63%

Educate Patients/Residents to Prevent CLABSI

Educate patients/residents to:

- Speak up about any concerns so that HCP are reminded to follow the best infection prevention practices
- Ask a healthcare provider if the central line is absolutely necessary. If so, ask them to help you understand the need for it and how long it will be in place
- Pay attention to the bandage and the area around it. If the bandage comes off or if the bandage or area around it is wet or dirty, tell HCP right away.
- Don’t get the central line or the central line insertion site wet

CDC CLABSI Resources webpage
(www.cdc.gov/hai/bsi/clabsi-resources.html)

Educate Patients/Residents prevent CLABSI - continued

- Tell HCP if the area around the catheter is sore or red or if the resident has a fever or chills
- Do not let any visitors touch the catheter or tubing
- The patient/resident should avoid touching the tubing as much as possible
- In addition, everyone visiting the patient/resident must wash their hands—before and after they visit

CLABSI Prevention Objectives

- HHS National 2020 Target Goal: Reduce CLABSI by 50% from 2015 baseline
  - Recommended for adoption in California hospitals by the CDPH HAI Advisory Committee
- Centers for Medicare and Medicaid Services (CMS) quality payment programs
  - Reduce payments for hospitals ranking among the lowest-performing (for example, high CLABSI)

National Action Plan for Prevention of HAI, 2013
(www.health.gov/our-work/health-care-quality/health-care-associated-infections)
CMS Hospital-Acquired Condition (HAC) Reduction Program webpage
(www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/HAC/Hospital-Acquired-Conditions)

CLABSI in California Hospitals in 2019

- 1750 CLABSI reported in 2019
- GOAL: **50% CLABSI** reduction from 2015 baseline of 1.0 = SIR 0.5 in 2020
- 2020 CLABSI data will be available in 2021

Year	2015	2016	2017	2018	2019
SIR	0.97	0.95	0.85	0.79	0.67

CDPH HAI in California Hospitals Annual Report January to December 2019

(www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/AnnualHAIReports.aspx)

Preventing CLABSI: The MOST Important Things

Prevent Early- and Late-Onset CLABSI

- ❑ **Provide list of indications** for central line
- ❑ **Educate** HCP inserting or caring for central lines
- ❑ **Bathe** ICU patients with CHG daily
- ❑ **Adhere** to infection prevention practices at insertion (CLIP)
- ❑ **Use all-inclusive** catheter cart/kit
- ❑ **Use Ultrasound** guidance for insertion
- ❑ Use **alcoholic CHG skin prep**
- ❑ **Ensure appropriate nurse patient ratio**
- ❑ **Disinfect hub** before accessing central line
- ❑ **Remove** nonessential catheters
- ❑ **Change** transparent dressings and site care with CHG every 5-7 days or if soiled
- ❑ **Replace** administration sets not used for blood product or lipids no longer than every 4 days (96 hours)
- ❑ **Use antimicrobial ointment** for hemodialysis catheter insertion sites
- ❑ **Perform CLABSI surveillance**

Urinary Tract Infection Prevention

ACH IP Course, 2022

Basics of Infection Prevention
Healthcare-Associated Infections Program
Center for Health Care Quality
California Department of Public Health

Objectives –Urinary Tract Infection Prevention

- Describe healthcare-associated urinary tract infections (UTI)
- Review evidence-based clinical practices shown to prevent catheter-associated urinary tract infections (CAUTI)
- Discuss strategies to reduce CAUTI incidence rates
- Discuss adherence monitoring and feedback

UTI in Hospitals

- Virtually all hospital associated UTI are caused by instrumentation of the urinary tract
- Commonly leads to secondary bloodstream infection
- 10% mortality rate
- Increases length of stay by 2-4 days
- Results in antimicrobial overuse and antimicrobial resistance

IHI Catheter-Associated Urinary Tract Infection
(www.ihi.org/topics/CAUTI/Pages/default.aspx)

What is Bacteriuria?

- Bacteria can be present in the bladder, not causing infection
  - Example: E. coli contamination from the rectal area
  - No symptoms of infection
- Bacteriuria alone does not affect survival and **does not require antibiotics!**
- Risk of bacteriuria with catheterization
  - 3%-10% each day
  - By day 30, 100% residents with a urinary catheter will have bacteria in urine

Urinary Catheter Use

- Use of indwelling urinary catheters high
  - 12-16% of inpatient adults
  - Medical surgical unit: 10-30% patients
  - ICU: 60-90% patients
  - Nursing home: 7-10% residents
- 40-50% patients with a urinary catheter in hospital non-ICU ward do not have a valid indication for placement
- Physicians frequently unaware of use

NHSN Patient Safety Manual, Chapter 7, UTI CDC: Catheter Associated UTI (www.cdc.gov/hai/ca_uti/uti.html)

CAUTI Etiology

- Pathogen source
  - Patient's GI or perineal bacteria
  - Bacteria on hands of healthcare personnel (HCP)
- Microbes enter bladder via one of two routes
  - On the external surface of the catheter
  - On the inside of the catheter

Maki D & Tambyah P. Engineering out risk of Infection with urinary catheters. Emerg Infect Dis, 2001

Common UTI Pathogens

- *Escherichia coli* 24%
- *Pseudomonas aeruginosa* 10%
- *Klebsiella pneumoniae/oxytoca* 10%
- *Enterococcus faecalis* 7%

CDC NHSN HAI Pathogens, 2011-2014, Table 3

(www.cdc.gov/nhsn/pdfs/datastat/2014-ar-data-summary-nhsn.pdf)

CAUTI Complications

- Cystitis
- Pyelonephritis
- Bacteremia
- Septic shock
- May result in
  - Functional decline
  - Decreased mobility
  - Hospital admission
  - Death

Preventing CAUTI

- **69%** CAUTI can be prevented with currently recommended infection prevention practices
  - 380,000 infections prevented annually – 40,000 in California
  - 9,000 lives saved - ~1,000 in California

CDC CAUTI Prevention guidelines 2009 (PDF)
(www.cdc.gov/hicpac/pdf/CAUTI/CAUTIguideline2009final.pdf)

CAUTI Prevention – What works?

Best sources for **evidence-based CAUTI prevention practice** recommendations

- **CDC/HICPAC** CAUTI Prevention Guideline**, 2009** (PDF)
  (www.cambridge.org/core/journals/infection-control-and-hospital-epidemiology/article/abs/guideline-for-prevention-of-catheterassociated-urinary-tract-infections-2009/B823CD4AB8B24925292E5B43758E3D41)
- **SHEA/IDSA** Strategies to Prevent Catheter-Associated Urinary Tract Infections in Acute Care Hospitals, **2014** (PDF)
  (www.icpsne.org/SHEA%202014%20Updated%20CAUTI%20Prevention%20Guidelines%20(1).pdf)

CAUTI Prevention Care Practices

CDC

- ❑ Insert catheters only for appropriate indications
- ❑ Leave in place only as long as needed
- ❑ Ensure only properly trained persons insert and maintain
- ❑ Perform hand hygiene
- ❑ Use aseptic technique and sterile equipment for insertion
- ❑ Maintain closed drainage system and unobstructed urine flow
- ❑ Use portable ultrasound devices to assess urinary retention, reduce unnecessary catheterizations (Category II)
- ❑ Implement improvement program to achieve appropriate use of catheters

CDC CAUTI Prevention guidelines 2009 (PDF)
(www.cdc.gov/hicpac/pdf/CAUTI/CAUTIguideline2009final.pdf)

CAUTI Prevention Care Practices - continued

APIC/SHEA

- ❑ Use smallest diameter catheter as possible
- ❑ Irrigate only if catheter is obstructed
- ❑ Keep collecting bag below the bladder
- ❑ Ensure adequate nutrition and hydration
- ❑ Consider alternatives to indwelling urinary catheters
  - External catheters
  - Intermittent catheterization

SHEA/APIC Guideline: Infection Prevention and Control in Long-Term Care, 2008

Appropriate Indications for Urinary Catheters

- Acute urinary retention or obstruction
- Prolonged immobilization due to unstable spine or pelvic fracture
- Assist healing of perineal and sacral wounds in incontinent patients
- Hospice (end of life), comfort care, palliative care
- Chronic indwelling urinary catheter on admission
  - Necessity must still be evaluated on admission

CDC CAUTI Prevention guidelines 2009 (PDF)
(www.cdc.gov/hicpac/pdf/CAUTI/CAUTIguideline2009final.pdf)

Leave Indwelling Catheter in Place Only as Long as Needed

- Implement a process to assess daily the need for the indwelling urinary catheter
  - Physician reminders
  - Electronic medical record prompts
- Consider alternatives to indwelling urinary catheter
  - External catheters
  - Intermittent catheterization

Ensure Only Properly Trained Persons Insert and Maintain Indwelling Urinary Catheters

- Train HCP, family members, or the patient (if appropriate)
  - Correct technique of aseptic catheter insertion
  - Maintenance of the catheter
- Train HCP upon hire and at least annually
- Make return demonstration part of the training to ensure competency

Perform Hand Hygiene

Perform hand hygiene:

- Immediately before and after catheter insertion
- Immediately before and after any catheter manipulation
  - Repositioning the catheter tubing or bag
  - Obtaining a specimen

Use Aseptic Technique and Sterile Equipment for Insertion of Indwelling Urinary Catheter

- Perform hand hygiene before and after procedure
- Ensure the following are used during insertion
  - Sterile gloves, drape, and sponges
  - Appropriate antiseptic or sterile solution for peri-urethral cleaning
  - A single use packet of lubricant jelly for insertion

Maintain Closed Drainage System and Unobstructed Urine Flow

A closed system prevents contamination and possible pathogens from entering the bladder

- Replace the catheter and collection system if breaks in aseptic technique during insertion, or disconnection, or leakage occurs
- Use urinary catheter systems with pre-connected, sealed catheter-tubing junctions
- Keep the catheter tubing below the bladder and free from kinking

CAUTI Prevention Bundle Examples

Insertion Bundle

- Verify need prior to insertion
- Insert urinary catheter using aseptic technique
- Maintain urinary catheter based on recommended guidelines

Maintenance Bundle

- Daily assessment of catheter need documented
- Tamper evident seal is intact
- Catheter secured to patient
- Hand hygiene performed before patient contact
- Daily meatal hygiene with soap and water
- Drainage bag emptied using a clean container
- Unobstructed flow maintained

APIC Preventing CAUTI, Patient-centered Approach 2012 (PDF)
(apic.org/Resource_/TinyMceFileManager/epublications/CAUTI_feature_PS_fall_12.pdf)

Not Recommended

No evidence that these practices prevent UTI

X Complex urinary drainage systems

X Routinely changing catheters or drainage bags

X Routine antimicrobial prophylaxis

X Cleaning the periurethral area with antiseptics

X Antimicrobial irrigation of the bladder

X Antiseptic / antimicrobial solutions instilled into drainage bags

X Routine screening or culturing

CDC CAUTI Prevention guidelines, 2009 (PDF)
(www.cdc.gov/hicpac/pdf/CAUTI/CAUTIguideline2009final.pdf)

Additional CAUTI Prevention Practices

Use when adherence to practices is high, but CAUTI still occur

- Consider alternatives to indwelling urinary catheters
- Use portable ultrasound devices to assess urinary retention, reduce unnecessary catheterizations
- Consider antimicrobial/antiseptic impregnated catheters

Facility Role in CAUTI Prevention

- Ensure policies and practice reflect current evidence-based recommendations, such as the CDC/HICPAC 2009 guidelines
- Ensure staff competency upon hire and at least annually
  - New hire orientation
  - Annual skills fair
  - Return demonstration to ensure competency
- Establish an adherence monitoring program for catheter care practices
  - Use standard tools to measure adherence
- Perform UTI surveillance
- Provide feedback to frontline staff and leaders
  - Present adherence results with UTI/CAUTI incidence

Infection (Outcome) Measure

Track infections:

- Perform UTI surveillance using standardized definitions and protocols
- Bacteria in urine alone is not an infection
  - Must evaluate for other UTI symptoms or have supporting laboratory data

NHSN Patient Safety Module: Chapter 7 Device-Associated Module, CAUTI

Adherence (Process) Measures

Measure catheter use:

- Days with Foley catheter ÷ patient days for the months (x100) = __% utilization rate
- Number of urinary catheter days ÷ number of predicted urinary catheter days = Standardize Utilization Ratio (SUR)

Measure health care provider adherence:

- Hand hygiene
- Documentation of catheter insertion and removal
- Daily assessment of indwelling urinary catheter
- Documentation of indications for use

Indwelling Urinary Catheter Adherence Monitoring Tool

Urinary Catheter Care Practices	Indwelling Urinary Catheter Patient/Resident 3		Indwelling Urinary Catheter Patient/Resident 3		Adherence by Task	
					# Yes	# Observed
The indwelling urinary catheter is being used for an appropriate indication	☐ Yes	☐ No	☐ Yes	☐ No	2	2
Necessity for continuing the indwelling urinary catheter is documented in the medical record	☐ Yes	☐ No	☐ Yes	☐ No	2	2
The seal between the catheter and collecting tubing is intact.	☐ Yes	☐ No	☐ Yes	☐ No	0	2
The catheter tubing is unobstructed and not twisted, kinked, or looped.	☐ Yes	☐ No	☐ Yes	☐ No	1	2
The urine collection bag is below the level of the bladder.	☐ Yes	☐ No	☐ Yes	☐ No	1	2
The catheter is secured to the patient/resident.	☐ Yes	☐ No	☐ Yes	☐ No	0	2

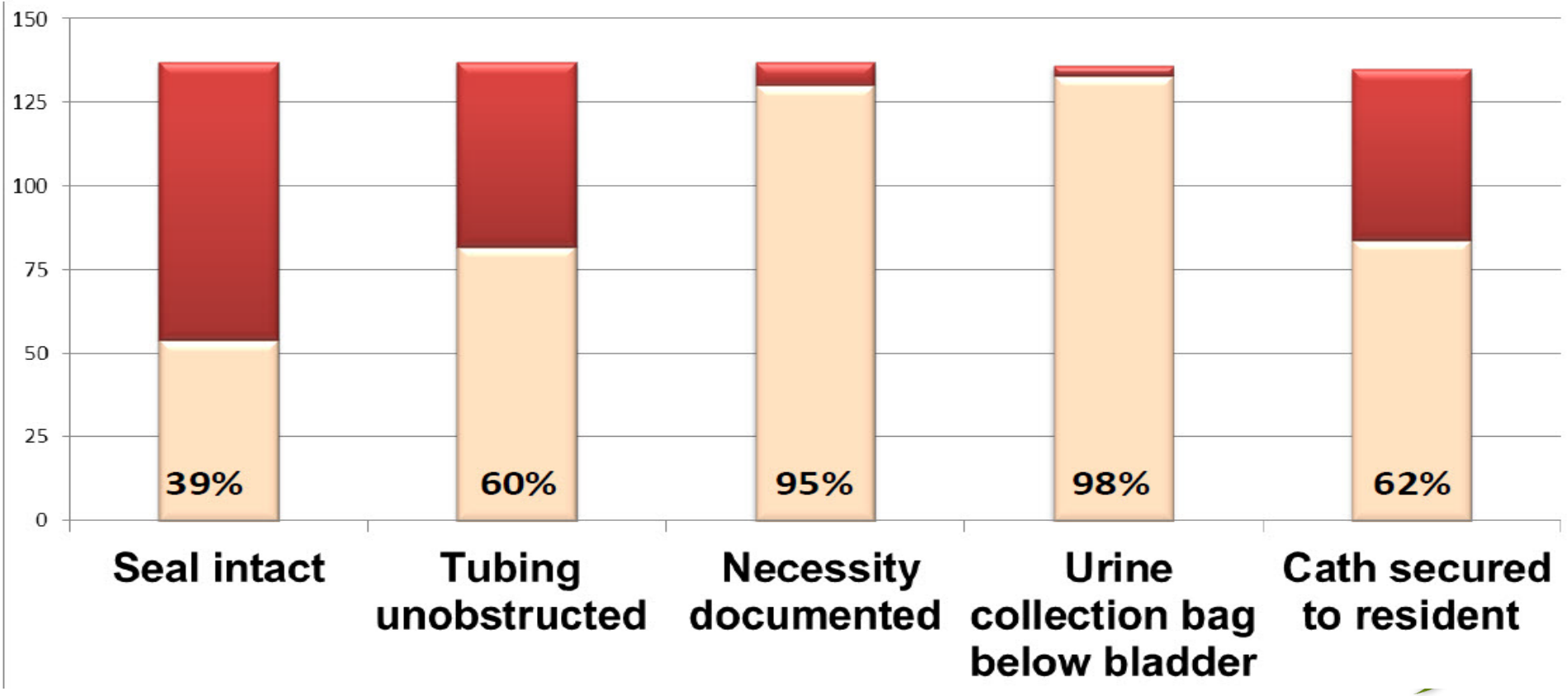
#Yes 6 Total # Observations 12 Total #Yes / Total # observations *100 = % 50% Adherence

CDPH Adherence Monitoring Tools

(www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/MonitoringAdherenceToHCPracticesThatPreventInfection.aspx)

California Department of PublicHealth

CDPH CAUTI Observations. 131 Facilities. 2016



Preventing CAUTI: The MOST Important Things

Prevent Catheter Associated UTI – Avoid Antibiotics

- ❑ Insert catheter only for appropriate indications
- ❑ Leave in place only as long as needed
- ❑ Ensure only properly trained persons insert and maintain
- ❑ Perform hand hygiene
- ❑ Use aseptic technique and sterile equipment for insertion
- ❑ Maintain closed drainage system and obstructed urine flow
- ❑ Implement improvement program to achieve appropriate use of catheters

Summary

- CAUTI can lead to bloodstream infections
- Adherence monitoring to evidence based care practices will reduce CAUTI incidence
- Feedback CAUTI incidence and adherence monitoring results to staff will improve outcomes

Additional CAUTI Prevention References and Resources

- APIC Preventing CAUTI: A patient-centered approach, 2012 (apic.org/Resource_/TinyMceFileManager/epublications/CAUTI_feature_PS_fall_12.pdf)
- IDSA Guidelines , *Clin Infect Dis* 50:625-63, 2010
- Lo, E., Nicolle, L.E., Coffin, S. E., Gould, C., Maragakis,L.L., Meddings, J., Pegues, D.A., Pettis, A.M., Saint, S.,Yokoe, D.S. Strategies to prevent catheter-associated urinary tract infections in acute care hospitals: 2014 Update. *ICHE*, Vol. 35, No. 5 (May 2014), pp. 464-479
- National Quality Forum (NQF) Safe Practices for Better Healthcare, 2010
- Smith, P.W., Bennett, G., Bradley, S., Drinka, P., Lautenbach, E., Marx, J., Mody, L., Nicolle, L., Stevenson, K. SHEA/APIC Guideline: Infection prevention and control in the long-term care facility. *ICHE*, 29(9), 785-814, July 2008

Pneumonia Prevention

ACH IP Course, 2022

Basics of Infection Prevention
Healthcare-Associated Infections Program
Center for Health Care Quality
California Department of Public Health

Objectives

- Describe the problem of healthcare-associated pneumonia in acute care facilities
- List evidence-based pneumonia prevention care practices
- Review healthcare-associated *Legionella* prevention
- Review influenza prevention strategies
- Describe adherence monitoring of prevention practices

Pathogenesis of HAI Pneumonia

Bacteria may invade the lower respiratory tract by

- Aspiration
  - Persons with abnormal swallowing
    - Depressed consciousness
    - Postoperative patients
    - Ventilator patients
- Inhalation of aerosols containing bacteria
- Hematogenous spread from a distant body site

Risk Factors for HAI Pneumonia

- Factors enhancing colonization of oropharynx or stomach
  - Antimicrobials
  - Admission to ICU
  - Underlying chronic lung disease
- Patients at risk for aspiration
  - Initial or repeat endotracheal intubation
  - Nasogastric tube insertion
  - Supine position, coma, post-surgery, immobilization
- Prolonged mechanical ventilation
- Host factor extremes
  - Age, malnutrition, severe underlying conditions

Hospital-Acquired Pneumonia

- Pneumonia accounts for 15% of all hospital HAI
  - 25% of HAI in medical ICUs
- Among hospitalized patients with HAI pneumonia, mortality as high as 33%

CDC/HICPAC Guidelines for Preventing Health-Care Associated Pneumonia, 2003

(www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm)

(Last reviewed 2015)

Pneumonia Prevention in Hospitals – What works?

Best sources for **evidence-based pneumonia prevention practice** recommendations

- **CDC/HICPAC** Pneumonia Prevention Guideline**, 2003**
- **SHEA/IDSA** Strategies to Prevent Healthcare Associated Pneumonia in Acute Care Hospitals, **2014**

Preventing Hospital-acquired Pneumonia

- Hospital staff educated about pneumonia prevention practices
- Patients encouraged in post operative coughing, deep breathing, and early ambulation
- Respiratory equipment and devices cleaned before sterilization or disinfection
  - Cleaned shortly after use
  - Appropriate rinsing, drying and packaging ensured
- Aspiration of secretions avoided
- Regular oral care with an antiseptic agent provided

CDC/HICPAC Guidelines for Preventing Health-Care Associated Pneumonia, 2003 (www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm)

Standard Precautions for Pneumonia Prevention

HCP must follow Standard precautions consistently!

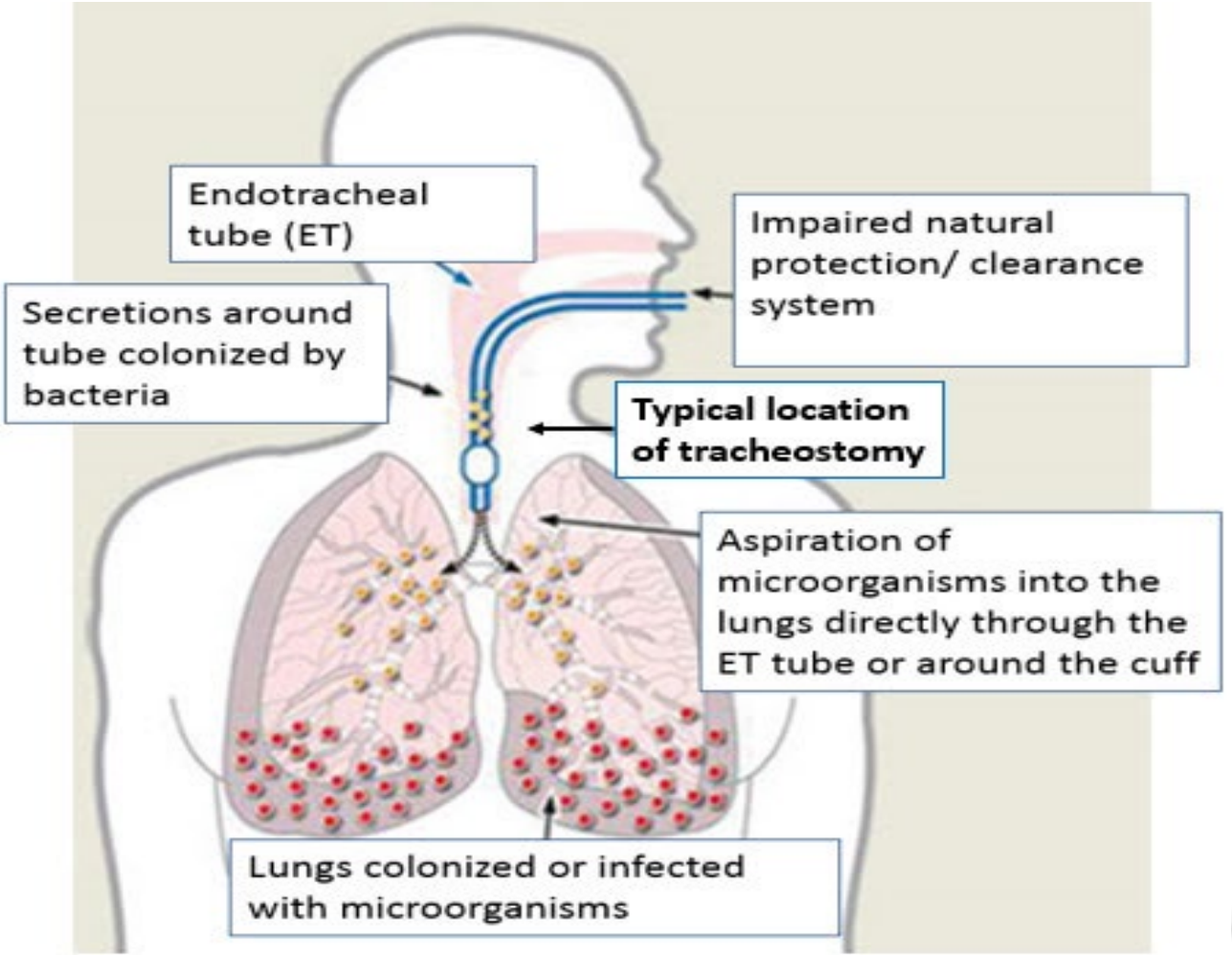
- Perform hand hygiene before and after patient care
- Wear gloves when handling respiratory secretions
- Change gloves and perform hand hygiene between patients and after touching contaminated equipment

CDC/HICPAC Guidelines for Preventing Health-Care Associated Pneumonia, 2003

(www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm)

Ventilator-Associated Pneumonia (VAP)

VAP Pathogenesis



Ventilator-Associated Pneumonia (VAP)

- Up to 46% of hospitalized patients with VAP die
  - Varies with patient population and organism type
  - Highest mortality in patients with severe illness

Institute for Healthcare Improvement (IHI) (2012)
(www.ihi.org/resources/Pages/Tools/HowtoGuidePreventVAP.aspx)

Etiology of Hospital-acquired VAP

Early onset

- Occurs in first four days of admission to an ICU or intubation for mechanical ventilation
- Usually associated with non-multidrug-resistant organisms such as *S. aureus* (most common), *E. coli, Klebsiella spp., Proteus spp., S. pneumoniae, and H. influenzae*

Late onset

- Occurs after 4 days in ICU stay
- Associated with Pseudomonas aeruginosa, MRSA, and Acinetobacter spp., strains that are usually multi-antibiotic-resistant

Guideline for the Prevention of Healthcare Associated Pneumonia, 2003 (PDF)
(www.cdc.gov/infectioncontrol/pdf/guidelines/healthcare-associated-pneumonia-H.pdf

VAP Prevention Challenges - Non-modifiable Risk Factors

In addition to being intubated and requiring mechanical ventilation, many patients have pre-existing conditions that put them at higher risk for VAP

- Head trauma
- Coma
- Nutritional deficiencies
- Immunocompromised
- Multi organ system failure
- Acidosis
- History of smoking or pulmonary disease

VAP Prevention: Modifiable Risk Factors

Some factors that put patients at risk for VAP **can be** minimized by evidence-based care practices

- Preventing aspiration of secretions
- Reducing duration of ventilation
- Reducing colonization of airway and digestive tract
- Preventing exposure to contaminated equipment

Prevent Aspiration of Secretions

- Maintain head of bed at 30-45 degrees elevation
- Avoid unplanned extubation and re-intubation
  - Accidental ETT dislodgement during care
  - Resident pulls at trach and tubing
- Use cuffed tube with in-line suctioning
- Encourage early mobilization with physical/occupational therapy
- Manage oral secretions

Reduce Duration of Ventilation

- Evaluate sedation with goal to improve mobility and wean off ventilation
  - Sedation vacation means reducing or stopping medications that sedate, such as opiates or diazepam
- Assess readiness to wean from ventilation daily depending on the underlying diagnosis
- Conduct spontaneous breathing trials with provider input

Some may not be feasible for patients requiring long term ventilator support

Reduce Colonization of Airway and Digestive Tract

- Use cuffed endotracheal tube or tracheostomy tube with inline suctioning
  - Minimizes secretions above cuff; reduces contamination of lower airway
- Avoid acid suppressive therapy for patients not at high risk for stress ulcer or stress gastritis
  - Increases colonization of the digestive tract-the acidity of the stomach kills bacteria

Reduce Colonization of Airway and Digestive Tract - Continued

- Perform regular oral care with an antiseptic agent
- Reduce the opportunities to introduce pathogens into the airway
  - Perform good hand hygiene
  - Use gloves for contact with respiratory secretions or contaminated objects; follow with hand hygiene
  - Educate staff to avoid contaminating the endotracheal or tracheostomy tube from patient mouth flora or HCP hands
  - Avoid introducing pathogens from patient's other body sites or the environment

Prevent Exposure to Contaminated Equipment

- Use sterile water to rinse reusable respiratory equipment
- Remove condensate from ventilatory circuits
- Change ventilatory circuit only when malfunctioning or visibly soiled
- Disinfect/sterilize and store respiratory equipment effectively
  - Avoid storing in places where the equipment can be contaminated

Hospital's Role in VAP Prevention

- California HAI public reporting laws do not require hospitals to track and report VAP to CDPH
- The law does require hospitals to implement VAP prevention guidelines and process measures
  - Process measures include monitoring adherence to VAP prevention practices

California Health and Safety Code 1288.9 (b)

Sample Adherence Monitoring Tool - VAP Prevention

Ventilator Pneumonia Prevention Observations	Pt 1		Pt 2		Adherence by Task	
					#Yes	# Obs
Head of bed 30-45 degrees	Yes	No	Yes	No	1	2
Sedation vacation documented	Yes	No	Yes	No	0	2
Readiness to wean documented	Yes	No	Yes	No	2	2
Oral care with an antiseptic agent is performed regularly (per policy)	Yes	No	Yes	No	0	2
Hand hygiene performed before providing care	Yes	No	Yes	No	0	2
Sterile water used to rinse reusable respiratory equipment	Yes	No	Yes	No	2	2
Condensate in ventilatory circuit is removed	Yes	No	Yes	No	1	2
Ventilatory circuit is changed only when malfunctioning or soiled	Yes	No	Yes	No	2	2
# Yes 8	# Observed 16		#Yes/#Observed = % Adherence		50 %	

Preventing Pneumonia Through Immunization

- Promote pneumococcal vaccine
  - Required by CMS
  - 13-valent pneumococcal conjugate vaccine (PCV13), 1 dose* OR
  - 23–Valent pneumococcal polysaccharide vaccine (PPSV23), 1-3 doses depending on indication*
- Promote annual SNF resident influenza vaccination
  - Required by CMS
  - Have an annual event to educate and promote vaccine
- Promote annual influenza vaccination for HCP and staff
  - Myths dispelled such as “I get sick from the flu shot”

*CDC Adult Immunization Schedule 2021 (www.cdc.gov/vaccines/schedules/easy-to-read/adult.html#schedule)

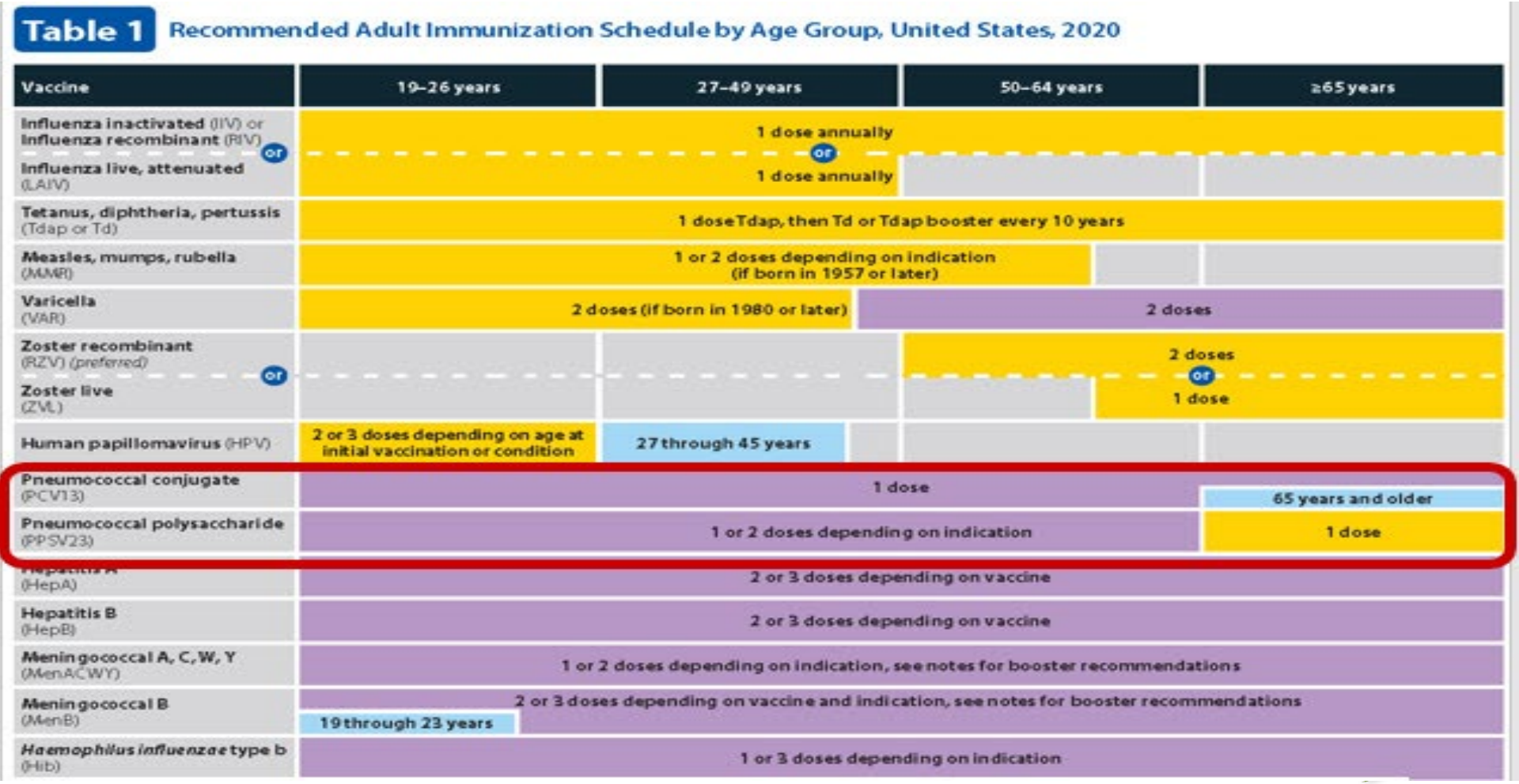


Table 1 Recommended Adult Immunization Schedule by Age Group, United States, 2020

Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
Influenza inactivated (IIV) or Influenza recombinant (RIV)	1 dose annually			
or				
Influenza live, attenuated (LAIV)	1 dose annually			
Tetanus, diphtheria, pertussis (Tdap or Td)	1 dose Tdap, then Td or Tdap booster every 10 years			
Measles, mumps, rubella (MMR)	1 or 2 doses depending on indication (if born in 1957 or later)			
Varicella (VAR)	2 doses (if born in 1980 or later)		2 doses	
Zoster recombinant (RZV) *(preferred)*			2 doses	
or			or	
Zoster live (ZVL)			1 dose	
Human papillomavirus (HPV)	2 or 3 doses depending on age at initial vaccination or condition	27 through 45 years		
Pneumococcal conjugate (PCV13)	1 dose			65 years and older
Pneumococcal polysaccharide (PPSV23)	1 or 2 doses depending on indication			1 dose
Hepatitis A (HepA)	2 or 3 doses depending on vaccine			
Hepatitis B (HepB)	2 or 3 doses depending on vaccine			
Meningococcal A, C, W, Y (MenACWY)	1 or 2 doses depending on indication, see notes for booster recommendations			
Meningococcal B (MenB)	2 or 3 doses depending on vaccine and indication, see notes for booster recommendations			
	19 through 23 years			
Haemophilus influenzae type b (Hib)	1 or 3 doses depending on indication			

Legionnaire's Disease

- Severe form of pneumonia
- Caused by inhaling or aspirating the bacteria *Legionella pneumophila* from legionella
  - Not transmitted person-to-person
- Often requires hospitalization
- Incubation period 2-10 days prior to onset of symptoms
- Fatal in 10% of cases overall and 25% of healthcare- associated cases

CDC What Clinicians Need to Know about Legionnaires' Disease (PDF)

(www.cdc.gov/legionella/downloads/fs-legionella-clinicians.pdf)

Legionella in California and the United States

California cases reported between 2015 – 2017

- Total Legionella cases – 1554
- Healthcare-associated – 125 (8%)
  - Hospital associated – 45(35%)
  - **SNF associated – 57(46%)**

U.S. Legionella outbreaks (2000–2014)

  - ~5,000 cases
  - **19% in LTC facilities**
  - Rate increased 286% from 2000–2014

Legionella

- Found naturally in freshwater
- Grows best in man-made water environments with temperatures 77°-107.6° F, stagnation, scale and sediment, and presence of certain aquatic amoebae
- Identified in healthcare facilities
  - Water used for showering (potable water)
  - Cooling towers (parts of large air conditioning systems)
  - Decorative fountains
  - Hot tubs

Risk Factors for *Legionella* Pneumonia

- Immunosuppressed hosts
- Solid organ transplant recipients
- Advanced age
- Male gender
- Cigarette smoking
- Alcohol abuse
- Chronic pulmonary disease
- Corticosteroid usage
- Renal failure

APIC Text 2018:
Healthcare Associated Pathogens and Diseases: *Legionella pneumonophila*

Laboratory Test for Legionella

- Urinary antigen test
  - Detects most common cause- L. pneumophilia serogroup 1
- Lower respiratory secretion, tissue, or pleural fluid culture
  - Detects other *Legionella* species
  - Ordered if urinary antigen test is negative, and *Legionella* is suspected

All positive Legionella cases must be reported to local public health and CDPH L&C District Office

Water Management Plan

- Perform Risk Assessment for facility to reduce risk of exposure to *Legionella* – **Required by CMS**
- Observe for areas that may be breeding grounds for *Legionella,* such as standing water sources, water fountains, hot tubs
- Culture cooling towers and water storage units regularly, and maintain HVAC systems to prevent air conditioning condensate to pool
  - Report to IP and Infection Prevention & Control Committee
  - Include what actions were taken if culture is positive
  - May need to flush plumbing of patient/resident rooms not used
  - Include these elements in facilities Policy and Procedure Manual

CDC Legionella Environmental Assessment Form (PDF)
(www.cdc.gov/legionella/downloads/legionella-environmental-assessment.pdf)

Influenza

- Caused by Influenza virus
  - Influenza A and B most common
- "Flu season" is late fall to early spring (October – March)
  - Varies from season to season depending on flu strain
  - Recommendation for vaccination before end of October
- Elderly are at highest risk for serious influenza complications
- Severe illness may lead to life-threatening pneumonia
  - 400-5,000 influenza deaths annually in California

CDPH Preventing HAI in California Skilled Nursing Facilities

(www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/PreventingHAI_in_LTC_Facilities.aspx)

Influenza Epidemiology

- Incubation period 1-4 days
- Highly contagious during first 3 days of illness
- Symptoms
  - Fever ≥100°F
  - Muscle aches
  - Headache
  - Non-productive cough
  - Sore throat
  - Runny nose
- SNF residents may have subtle changes in mental status and a temperature below normal
- Symptoms are like that of COVID-19 – **suspect BOTH**
  - COVID-19 will be discussed in a separate module

CDPH Preventing HAI in California Skilled Nursing Facilities (www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/PreventingHAI_in_LTC_Facilities.aspx)

Influenza Etiology

- Spread by viral particles' contact with the respiratory tract
  - Infected person coughs or sneezes
  - Uninfected person inhales the viral particles
- Can survive on surfaces for 24-48 hours
- Transmission can occur:
  - Person to person (droplets)
  - Person-object-person (direct or indirect contact)

CDPH Preventing HAI in California Skilled Nursing Facilities

(www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/PreventingHAI_in_LTC_Facilities.aspx)

Influenza Prevention in Healthcare Facilities

- Vaccination of **healthcare workers** and **patients/residents**
- "*Cover Your Cough*" signage
  - Patients, residents and visitors encouraged to practice respiratory hygiene and cough etiquette
- Visitor screening during flu season
- Visitation restrictions
- Work restrictions for ill employees
- HCP and staff adherence to hand hygiene
- Transmission-based precautions for suspect influenza immediately

Post-acute and LTC Facility Toolkit: Influenza Vaccination among HCP
(www.cdc.gov/flu/toolkit/long-term-care/index.htm)

CDPH Preventing HAI in California Skilled Nursing Facilities
(www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/PreventingHAI_in_LTC_Facilities.aspx)

Transmission-based Precautions for Influenza

- Droplet precautions
  - + Standard precautions
- Implement precautions for suspect and confirmed influenza for 7 days after illness onset or 24 hours after resolution of fever and respiratory symptoms, whichever is longer
  - Place ill patient in private room or cohort with other influenza residents
  - Keep symptomatic patients in the room; serve meals in their rooms

CDC Prevention Strategies for Seasonal Influenza in Healthcare Settings

(www.cdc.gov/flu/professionals/infectioncontrol/healthcaresettings.htm)

Facility Role in Respiratory Infection Prevention

- Ensure policies reflect current recommended practices
  - CDC guidelines
- Ensure staff competency upon hire and at least annually
  - New hire orientation
  - Annual skills fair
  - Return demonstration to ensure competency
- Establish an adherence monitoring program for measuring prevention care practices
  - Use tools to measure adherence
- Provide feedback to frontline staff and leaders
  - Present adherence results to each unit

Pneumonia Prevention: The Most Important Things

All Patients

- ❑ Promote patient and HCP influenza vaccination
- ❑ Promote pneumonia vaccine
- ❑ Ensure adequate nutrition and hydration
- ❑ Perform regular oral care
- ❑ Perform hand hygiene
- ❑ Ensure effective water management program
- ❑ Encourage early mobilization

Additional Practices for Patients on Mechanical Ventilation

- ❑ Maintain HOB 30-45 degrees
- ❑ Avoid gastric distention
- ❑ Assess readiness to wean
- ❑ Use cuffed ETT with inline suctioning
- ❑ Avoid acid suppressive therapy if possible
- ❑ Prevent exposure to contaminated equipment

Monitor adherence!

Summary

- Evidence-based prevention care practices can prevent healthcare-associated pneumonia in hospitals
- Pneumonia prevention includes programs to vaccinate health care providers
- Complications of ventilated patients are common, but many VAP are preventable
- A comprehensive water management program reduces risk for Legionnaire's disease
- Ensure a facility annual influenza plan
- Adherence monitoring of prevention care practices and providing feedback to frontline staff improves outcomes

References and Resources

- CMS Requirement to Reduce Legionella Risk in Healthcare Facility Water Systems to Prevent Cases and Outbreaks of Legionnaires' Disease (LD) (PDF) (www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertificationGenInfo/Downloads/Survey-and-Cert-Letter-17-30.pdf)
- Coffin, S, et al. Strategies to Prevent Ventilator-Associated Pneumonia in Acute Care Hospitals. *Infect Control Hosp Epidemiol* ,29:S31-S40, 2008
- Greene LR, Sposato K, Farber MR, Fulton TM, Garcia RA. Guide to the Elimination of Ventilator – Associated Pneumonia. Washington, D.C.: APIC, 2009
- How-to Guide: Prevent Ventilator-Associated Pneumonia, Institute for Healthcare Improvement (IHI) (www.ihi.org/resources/Pages/Tools/HowtoGuidePreventVAP.aspx)
- NHSN Patient Safety Module: Chapter 6 (PNEU/VAP) (PDF) (www.cdc.gov/nhsn/PDFs/pscManual/6pscVAPcurrent.pdf)

Questions?

For more information,

please contact

HAIProgram@cdph.ca.gov

Include “ACH IP Training Course” in the subject line

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