

# **Rationale and Next Steps for CLABSI prevention**

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**International Infection Control Program**

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# Objectives

- By the end of this presentation, participants will
  - Know the main features of the Keystone ICU landmark study for CLABSI prevention
    - Provonost et al, NEJM 2006
  - Understand how CLABSI prevention can be achieved across a network of hospitals
  - Identify how lessons learned from the Keystone ICU study can be adapted to the network

# Keystone ICU study background

- In United States, CLABSIs seen as significant public health issue
  - Cause significant morbidity and mortality
    - ~80,000 CLABSIs in ICUs in 2006
    - ~28,000 CLABSI deaths in ICUs in 2006
  - Incur significant costs to health facilities and patients
    - Estimated 2.3 billion USD in 2006
- Study question
  - How many CLABSIs are preventable across a network of hospitals?
- Study objective
  - Determine the extent to which CLABSIs could be reduced using evidence-based prevention practices across ICUs in multiple facilities

## Study design

- Setting: 103 ICUs in the U.S. state of Michigan
  - All performed standardized CLABSI surveillance
- Intervention: 5 evidence-based procedures identified as having the greatest effect on CLABSI incidence
  - Handwashing
  - Using full barrier precautions during insertion
  - Cleaning the skin with chlorhexidine
  - Avoiding the femoral site if possible
  - Removing unnecessary central venous catheters
- Intervention implemented from Mar 2004 – Sep 2005
  - Pre- and post-implementation CLABSI rates were measured

## Study results

- 1,625 beds in multiple types of ICUs represented
  - Medical
  - Surgical
  - Neurological
  - Trauma
  - Pediatric
- Captured 85% of all ICU beds in Michigan
- Denominators for final analysis
  - 1,981 ICU-months
  - 375,757 catheter days

## Study results

Study Period	No. of ICUs	No. of Bloodstream Infections per 1000 Catheter-Days				
		Overall	Teaching Hospital	Nonteaching Hospital	<200 Beds	≥200 Beds
<i>median (interquartile range)</i>						
Baseline	55	2.7 (0.6–4.8)	2.7 (1.3–4.7)	2.6 (0–4.9)	2.1 (0–3.0)	2.7 (1.3–4.8)
During implementation	96	1.6 (0–4.4)†	1.7 (0–4.5)	0 (0–3.5)	0 (0–5.8)	1.7 (0–4.3)†
After implementation						
0–3 mo	96	0 (0–3.0)‡	1.3 (0–3.1)†	0 (0–1.6)†	0 (0–2.7)	1.1 (0–3.1)‡
4–6 mo	96	0 (0–2.7)‡	1.1 (0–3.6)†	0 (0–0)‡	0 (0–0)†	0 (0–3.2)‡
7–9 mo	95	0 (0–2.1)‡	0.8 (0–2.4)‡	0 (0–0)‡	0 (0–0)†	0 (0–2.2)‡
10–12 mo	90	0 (0–1.9)‡	0 (0–2.3)‡	0 (0–1.5)‡	0 (0–0)†	0.2 (0–2.3)‡
13–15 mo	85	0 (0–1.6)‡	0 (0–2.2)‡	0 (0–0)‡	0 (0–0)†	0 (0–2.0)‡
16–18 mo	70	0 (0–2.4)‡	0 (0–2.7)‡	0 (0–1.2)†	0 (0–0)†	0 (0–2.6)‡

\* Because the ICUs implemented the study intervention at different times, the total number of ICUs contributing data for each period varies. Of the 103 participating ICUs, 48 did not contribute baseline data. P values were calculated by the two-sample Wilcoxon rank-sum test.

† P≤0.05 for the comparison with the baseline (preimplementation) period.

‡ P≤0.002 for the comparison with the baseline (preimplementation) period.

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## Study implications

- Landmark U.S. study that demonstrated that CLABSI prevention can be achieved across a network of ICUs in multiple hospitals
- Significant reductions in CLABSI incidence were achieved and sustained through simple evidence-based prevention practices with low barrier to implementation
- Adherence to prevention practices was not measured due to resource constraints
  - Did adherence to insertion or maintenance practices drive CLABSI reduction?

## Adapting study implications

- A focused prevention program can be implemented to reduce CLABSIs across the network
- Prevention practices should be simple and with low barrier to implementation across all network sites
- Measuring adherence to prevention practices helps to better describe how reductions in CLABSIs can be achieved in the Indian context

# You have measured CLABSIs. Can you prevent them?

- Network sites reported 778 CLABSIs during May 2017 – June 2018
- A percentage of these CLABSIs could have been prevented by optimizing adherence to insertion and maintenance bundles
- As a network, what percentage reduction in CLABSIs can be achieved in the next year?
  - 25% reduction?
  - 50% reduction?
  - >50% reduction?
- As a network, what will it to achieve the targeted reduction in CLABSIs in the next year?

# Thanks

For more information, contact CDC  
1-800-CDC-INFO (232-4636)  
TTY: 1-888-232-6348 [www.cdc.gov](http://www.cdc.gov)

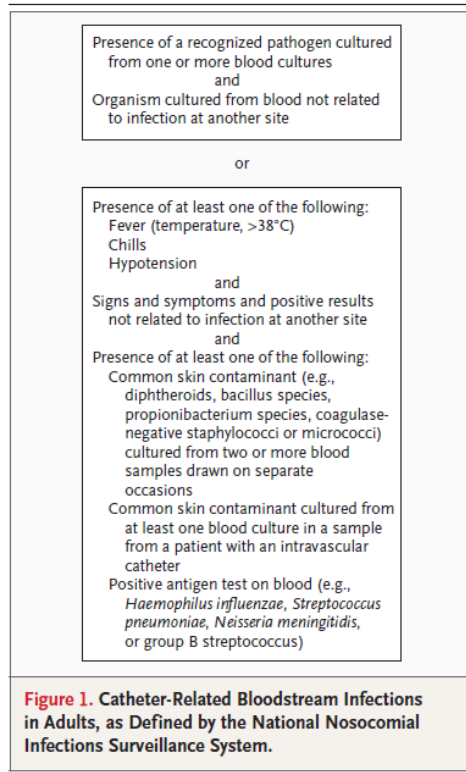
The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



## Notes on implementation

- Implementing intervention involved the following activities
  - clinician education about CLABSI
  - central line cart with necessary supplies
  - checklist to ensure adherence to infection control practices
  - central line removal discussed at daily round
  - feedback on CLABSI rates given at monthly and quarterly meetings

# Case definition



## Description of prevention tools

- Tool for monitoring adherence to insertion practices
- Checklist for daily reminders of maintenance practices
- Job aid for accessing ports on central lines before use





- 1. Tool for monitoring adherence to central line insertion practices**
- 2. Checklist for central line maintenance practices**

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## Central Line Insertion Practices Adherence Monitoring Form

<b>Section A. General information</b>				
Facility ID: _____		Surveillance ID: _____		
Patient ID: _____				
Date of insertion: ___ / ___ / ___ (DD/MM/YYYY)		Event #: _____		
Name of observer: _____				
Occupation of inserter:				
<input type="checkbox"/> Medical student <input type="checkbox"/> Intern/resident <input type="checkbox"/> Consultant physician <input type="checkbox"/> Other medical staff				
Reason for insertion:				
<input type="checkbox"/> New indication for central line (e.g., hemodynamic monitoring, fluid/medication administration, etc.)				
<input type="checkbox"/> Replace malfunctioning central line <input type="checkbox"/> Other (specify): _____				
<input type="checkbox"/> Suspected central line-associated infection				
<b>Section B. Summary of insertion practices</b>				
Inserter performed hand hygiene prior to central line insertion? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Which of the following sterile barriers were used:				
Mask	Sterile gown	Sterile gloves	Cap	Full body sterile drape
<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
<input type="checkbox"/> No	<input type="checkbox"/> No	<input type="checkbox"/> No	<input type="checkbox"/> No	<input type="checkbox"/> No
Skin preparation (check all that apply) <input type="checkbox"/> Chlorhexidine gluconate <input type="checkbox"/> Povidone iodine <input type="checkbox"/> Alcohol				
Was skin prep agent completely dry at time of first skin puncture? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Insertion site: <input type="checkbox"/> Femoral <input type="checkbox"/> Jugular <input type="checkbox"/> Subclavian <input type="checkbox"/> Umbilical <input type="checkbox"/> Other				

Data Field	Instructions
Facility ID	Required. Enter the number for the facility assigned by the network.
Surveillance ID	Required. Enter the number for the surveillance unit at the facility assigned by the network.
Patient ID	Required. Enter the alphanumeric patient ID number. This is the patient identifier assigned by the hospital and may consist of any combination of numbers and/or letters.
Date of insertion	Required. Enter the date of central line insertion (DD/MM/YYYY).
Event #	Required. Should be generated as follows:  Facility ID – Surveillance ID – Date of insertion (DDMMYYYY) – Serial number of insertion  Example: The third central line inserted on 1 December 2016 in an ICU with Surveillance ID 5 at a hospital with Facility ID 2 would be  2 – 5 – 01122016 – 3
Name of observer	Required. Record the first and last name of the person observing the central line insertion procedure.
Occupation of inserter	Required. Check the occupational category of the person inserting the central line.
Reason for insertion	Required. Check the primary reason for inserting the central line: New indication (e.g., hemodynamic monitoring, fluid/medication administration, etc.); Replace malfunctioning central line; Suspected central line associated infection. If Other, please specify.
Inserter performed hand hygiene prior to central line insertion	Required. Check Yes if the inserter appropriately performed hand hygiene prior to inserting central line; otherwise check No. Appropriate hand hygiene includes the use of alcohol-based hand rub or soap and water hand wash. If not observed directly, ask inserter.
Which of the following sterile barriers were used	Required. Indicate whether each of the 5 barriers was used appropriately, by checking Yes or No.  NOTE: If inserter wore either a mask <u>or</u> a mask with eye shield, the Yes box for Mask should be checked.
Skin preparation	Required. Check all that apply: Chlorhexidine gluconate; Povidone iodine; Alcohol.
Was skin preparation agent completely dry at time of first skin puncture?	Required. Check Yes if the skin prep agent was allowed to dry completely at the time of first skin puncture; otherwise select No. If not observed directly, ask inserter.
Insertion site	Required. Check the site of insertion of the central line.

# Monitoring adherence to central line insertion practices

- Who: infection control staff member
- When: Every insertion performed in unit performed CLABSI surveillance
- How: observer should monitor adherence from start to the end of insertion procedure
  - Hand hygiene
  - Skin preparation
  - Maximum sterile barrier use

## Daily Central Line Maintenance Checklist

### Section A. General information

Patient ID		Patient name		
Facility name	Surveillance unit	Date of admission to surveillance unit (dd/mm/yyyy)		

### Section B. Daily checks

Date (dd/mm/yyyy)	Central line day	Was the central line reviewed for necessity today?	Signature of treating physician	Was the dressing checked for soiling, dampening, and loosening today?	Signature of day shift nurse	Was the access port scrubbed with an antiseptic each time before use			
						During the day shift?	Signature of day shift nurse	During the night shift?	Signature of night shift nurse
		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	
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		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	
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		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	

# Daily checklist for maintenance practices

- Who:
  - Daily audit: treating physician
  - Dressing check: day shift nurse
  - Scrubbing the hub: day and night shift nurses
  
- When: on a daily basis
  
- How:
  - Daily audit: during rounds
  - Dressing check: at least one point during day shift
  - Scrubbing the hub: at end of day and night shifts

## Job aid for scrubbing the hub

- How:
  - Place at clinical care areas frequented by nursing staff
    - Near nursing station
    - In medical charts for patients with central lines

## Scrub the Hub!

Which hubs have to be scrubbed? Every port on the system, injection ports into bags or bottles, injection ports on administration sets, needless connectors, and the hub of a catheter itself are potential portals of entry for infection. Closed catheter access systems are preferred as they are associated with fewer central line–associated bloodstream infections (CLABSIs) than open systems. Stopcocks and injection ports should be capped when not being used.

### SCRUB THE HUB YOU ARE ACCESSING EVERY TIME YOU ACCESS IT!

If you continue to have a high rate of infections, consider using alcohol-impregnated port protectors, scrubbing devices, and needless neutral displacement connectors in addition to scrubbing the hub.

How do you scrub the hub? Adequately scrubbing the hub depends on the agent you use, appropriate contact and drying time, and—most important—friction.

#### To Scrub the Hub

1. Perform hand hygiene.
2. Don clean or sterile gloves.
3. Use a scrubbing device with an alcohol product such as chlorhexidine with alcohol or 70% alcohol to disinfect catheter hub and stopcocks. If you are using a pad, make sure you don't contaminate it before use and use only on one hub. Prep pads should NEVER be reused.
4. Rub for 10 to 15 seconds (unless directed otherwise by the manufacturer's instructions), generating friction by scrubbing in a twisting motion as if you were juicing an orange. Make sure you scrub the top of the hub well, not just the sides.
5. Allow the hub to dry. Prevent it from touching anything while drying.
6. Access the stopcock or injection port only with sterile devices.
7. Infuse medication or draw blood.
8. Discard gloves and perform hand hygiene.



## Follow proper insertion practices

- Perform hand hygiene before insertion.
- Adhere to aseptic technique.
- Use maximal sterile barrier precautions (i.e., mask, cap, gown, sterile gloves, and sterile full body drape).
- Choose the best insertion site to minimize infections and noninfectious complications based on individual patient characteristics.
  - Avoid femoral site in obese adult patients.
- Prepare the insertion site with >0.5% chlorhexidine with alcohol.
- Place a sterile gauze dressing or a sterile, transparent, semipermeable dressing over the insertion site.
- For patients 18 years of age or older, use a chlorhexidine impregnated dressing with an FDA cleared label that specifies a clinical indication for reducing CLABSI for short term non-tunneled catheters unless the facility is demonstrating success at preventing CLABSI with baseline prevention practices.

## Handle and maintain central lines appropriately

- Comply with hand hygiene requirements.
- Bathe ICU patients over 2 months of age with a chlorhexidine preparation on a daily basis.
- Scrub the access port or hub with friction immediately prior to each use with an appropriate antiseptic (chlorhexidine, povidone iodine, an iodophor, or 70% alcohol).
- Use only sterile devices to access catheters.
- Immediately replace dressings that are wet, soiled, or dislodged.
- Perform routine dressing changes using aseptic technique with clean or sterile gloves.
  - Change gauze dressings at least every two days or semipermeable dressings at least every seven days.
  - For patients 18 years of age or older, use a chlorhexidine impregnated dressing with an FDA cleared label that specifies a clinical indication for reducing CLABSI for short-term non-tunneled catheters unless the facility is demonstrating success at preventing CLABSI with baseline prevention practices.
- Change administrations sets for continuous infusions no more frequently than every 4 days, but at least every 7 days.
  - If blood or blood products or fat emulsions are administered change tubing every 24 hours.
  - If propofol is administered, change tubing every 6-12 hours or when the vial is changed.

## Promptly remove unnecessary central lines

- Perform daily audits to assess whether each central line is still needed.