

# Bundle Approach in the Prevention of Central Line Associated Blood Stream Infection (CLABSI)

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## Abstract:

**Background:** Central line-associated bloodstream infection (CLABSI) remains one of the most serious healthcare-associated infections, particularly in pediatric and critical care settings. The bundle approach has emerged as an evidence-based strategy aimed at reducing CLABSI rates through the implementation of multiple preventive measures applied collectively during catheter insertion and maintenance. This approach integrates standardized protocols including strict hand hygiene, maximal barrier precautions, chlorhexidine skin antisepsis, optimal catheter site selection, daily assessment for catheter removal, aseptic maintenance practices, and standardized dressing and tubing changes. Evidence suggests that implementing these practices together significantly reduces infection rates compared with isolated interventions.

**Keywords:** CLABSI; Central line bundle; Insertion bundle; Maintenance bundle; Infection control; Hand hygiene; Chlorhexidine antisepsis; Pediatric intensive care.

## Introduction:

The bundle approach for preventing central line-associated bloodstream infections (CLABSI) involves a set of evidence-based practices implemented together during and after central line insertion to improve patient outcomes (1).

This typically includes an "insertion bundle" (hand hygiene, maximal barrier precautions, chlorhexidine skin antisepsis, optimal site selection, and daily assessment for removal) and a "maintenance bundle" (hand hygiene before accessing, antiseptic scrubbing of ports, and aseptic technique for dressing changes and tubing replacement). Implementing these collective practices significantly reduces infection rates compared to performing them individually (2).



**Figure (1):** Bundle approach in the prevention of central line associated blood stream infection (CLABSI) (3).

**Insertion bundle:**

 **Hand hygiene:**

The healthcare provider performs proper hand hygiene before touching the patient or equipment. Wash hands or use an alcohol-based, waterless hand cleaner when caring for central lines:

- Before and after palpating the catheter insertion site.
- Before and after inserting, replacing, adjusting or dressing the site.
- During palpation of the insertion site and after application of antiseptic and only if full asepsis is maintained (4).

 **Maximal barrier precautions:**

The patient is covered with a full-body sterile drape, and the provider wears a cap, mask, sterile gown, and sterile gloves during insertion (1).

 **Chlorhexidine antiseptics:**

Prepare skin with 2% chlorhexidine in 70% alcohol using swabs and a friction scrub for at least 30 seconds. Do not wipe or blow dry and allow to dry completely before skin puncture:

- 30 s for a dry site.
- 2 min for a moist site (especially femoral) (5).

 **Optimal catheter site selection:**

- In adult patients, there is some evidence that the subclavian site has a lower risk of catheter-related blood stream infections. However, there is usually more experience with the internal jugular site. The subclavian and internal jugulars are the preferred sites for infection- control purposes.
- Use of sterile, single-use jelly.
- Use sterile, single-use jelly for ultrasound-guided insertions (4).

 **Daily assessment for removal:**


The line is assessed daily for the necessity of its continued use, with unnecessary lines being removed promptly (2).

**Maintenance bundle:**

 **Hand hygiene:**

**Practice hand hygiene at five moments:**

- Before touching a patient.
- Before clean/aseptic procedures.
- After body-fluid exposure/risk.
- After touching a patient.
- After touching patient surroundings (1).

 **Antiseptic scrubbing:**

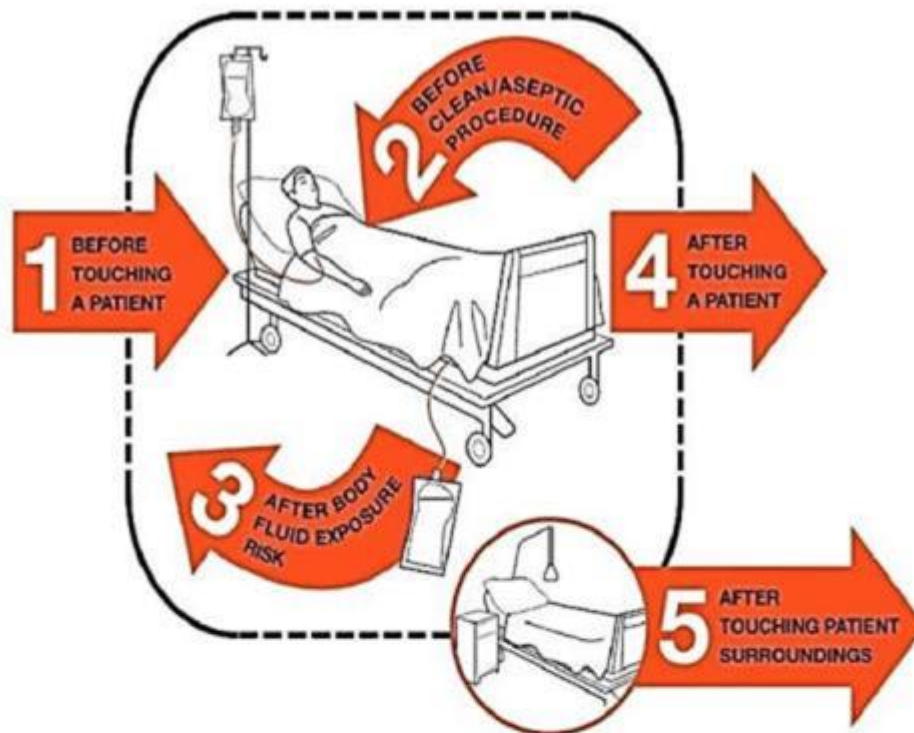
The access port is scrubbed with an appropriate antiseptic (like a 70% alcohol pad) and allowed to dry completely before each use (4).

**Aseptic technique:**

Dressing changes and the replacement of administration sets and tubing are performed using sterile, aseptic techniques (6).

**Limiting access:**

Limiting the number of times the line is accessed helps prevent contamination (2).



<b>1</b>	<b>BEFORE TOUCHING A PATIENT</b>	<b>WHEN?</b> Clean your hands before touching a patient when approaching him/her. <b>WHY?</b> To protect the patient against harmful germs carried on your hands.
<b>2</b>	<b>BEFORE CLEAN/ASEPTIC PROCEDURE</b>	<b>WHEN?</b> Clean your hands immediately before performing a clean/aseptic procedure. <b>WHY?</b> To protect the patient against harmful germs, including the patient's own, from entering his/her body.
<b>3</b>	<b>AFTER BODY FLUID EXPOSURE RISK</b>	<b>WHEN?</b> Clean your hands immediately after an exposure risk to body fluids (and after glove removal). <b>WHY?</b> To protect yourself and the health-care environment from harmful patient germs.
<b>4</b>	<b>AFTER TOUCHING A PATIENT</b>	<b>WHEN?</b> Clean your hands after touching a patient and her/his immediate surroundings, when leaving the patient's side. <b>WHY?</b> To protect yourself and the health-care environment from harmful patient germs.
<b>5</b>	<b>AFTER TOUCHING PATIENT SURROUNDINGS</b>	<b>WHEN?</b> Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving – even if the patient has not been touched. <b>WHY?</b> To protect yourself and the health-care environment from harmful patient germs.



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**Figure (2):** Five moments of hand hygiene by World Health Organisation (WHO)(7)

 **Appropriate dressing changes:**

Dressings are changed at recommended intervals to maintain a clean insertion site **(5)**.

 **Standardized tubing change:**

Intravenous medication administration tubing should be changed as per the recommendation in the local organizations policy **(2)**.

 **Daily review of catheter necessity:**

Daily review of line necessity during rounds so that the necessity of the lines can be determined and unnecessary lines removed **(6)**.

**References:**

1. Wasserman, S., & Messina, A. (2018). Bundles in infection prevention and safety. Guide to infection control in the healthcare setting [Internet]. ISID-International Society for Infectious Diseases.
2. Lee, D. (2024). HiQuiPs Patient Safety Fundamentals: Reducing Central Line-Associated Bloodstream Infections. Available at: <https://canadiem.org/hiquips-patient-safety-fundamentals-reducing-central-line-associated-bloodstream-infections/> Accessed at: 10/10/2025.
3. Gupta, P., Thomas, M., Patel, A., George, R., Mathews, L., Alex, S., ... & El Hassan, M. (2021). Bundle approach used to achieve zero central line-associated bloodstream infections in an adult coronary intensive care unit. *BMJ Open Quality*, 10(1).
4. Simoneaux, C., & Guerra, P. (2022). Implementation of evidence-based maintenance bundles to reduce central line-associated bloodstream infection (CLABSI) and catheter-associated urinary tract infection (CAUTI) rates. *American Journal of Infection Control*, 50(7), S34.
5. Modi, P. D., Kumar, P., Solanki, R., Modi, J., Chandramani, S., & Gill, N. (2017). Hand hygiene practices among Indian medical undergraduates: a questionnaire-based survey. *Cureus*, 9(7).