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Central Line-Associated Bloodstream Infection (CLABSI) Road Map

Minnesota Hospital Association

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Central Line-Associated Bloodstream Infection (CLABSI) Road Map

MHA’s road maps provide hospitals and health systems with evidence-based recommendations and standards for the development of topic-specific prevention and quality improvement programs, and are intended to align process improvements with outcome data. Road maps reflect published literature and guidance from relevant professional organizations and regulatory agencies, as well as identified proven practices. MHA quality and patient safety committees provide expert guidance and oversight to the various road maps.

Each road map is tiered into fundamental and advanced strategies:

- **Fundamental strategies** should be prioritized for implementation, and generally have a strong evidence base in published literature in addition to being supported by multiple professional bodies and regulatory agencies.
- **Advanced strategies** should be considered in addition to fundamental strategies when there is evidence the fundamental strategies are being implemented and adhered to consistently and there is evidence that rates are not decreasing and/or the pathogenesis (morbidity/mortality among patients) has changed.

Operational definitions are included to assist facility teams with road map auditing and identifying whether current work meets the intention behind each road map element.

Resources linked within the road map include journal articles, expert recommendations, electronic order sets and other pertinent tools which organizations need to assist in implementation of best practices.

Road map sections	Road map questions (if not present at your hospital or answering no, please see next column for suggested resources)	If specific road map element is missing, consider the following resources:
Patient & family education	<p>FUNDAMENTAL (check each box if “yes”)</p> <p><input type="checkbox"/> The facility has a process in place to educate the patient/family about their central line [1,2].</p> <ul style="list-style-type: none"> - Include topics such as what a central line-associated bloodstream infection is, what the health care personnel (HCP) and prescribers are doing to prevent an infection, and what the patient can do to help prevent an infection. - Encourage patients to report any new changes or discomfort in their catheter site [3]. <p><input type="checkbox"/> The facility has a process in place to educate patients being discharged with a central line in place [1,2].</p> <ul style="list-style-type: none"> - Topics include catheter care and symptoms of infection. - Teach back methods can be utilized to ensure patient understanding. 	<p>Consider the following examples of patient education when developing teaching materials:</p> <ul style="list-style-type: none"> • MHA Checking CLABSI patient education sheet • Centers for Disease Control fact sheet • The Ohio State University Wexner Medical Center CVC sterile dressing change patient education <p>The Institute for Healthcare Improvement (IHI) “Always use teach back!” tools were developed to assist in confirming patient understanding of care instructions.</p>

Road map sections	Road map questions (if not present at your hospital or answering no, please see next column for suggested resources)	If specific road map element is missing, consider the following resources:
Insertion practices	<p>FUNDAMENTAL (check each box if “yes”)</p> <ul style="list-style-type: none"> <input type="checkbox"/> The facility has a policy for central line use including peripherally inserted central catheters (PICCs). <ul style="list-style-type: none"> - Hospital policy includes: <ul style="list-style-type: none"> o standardized indications for central line placement [4]. o use of a standardized insertion checklist [1-7]. <input type="checkbox"/> The facility utilizes a two-person system for central line placement where one person is designated as the observer [1,2,4,5]. <ul style="list-style-type: none"> - Includes all areas of the facility, such as anesthesia and vascular access teams. <input type="checkbox"/> The facility utilizes a standardized insertion checklist [1-7]. <ul style="list-style-type: none"> - Standardized insertion checklist elements include: <ul style="list-style-type: none"> o Use of ultrasound guidance to place central lines when possible, using sterile sleeve over ultrasound [1,3,4,7]. o Optimal catheter site selection, with avoidance of the femoral vein when possible, for central venous access in adult patients is reviewed prior to insertion [1-4,6,7]. o The avoidance of the subclavian site in hemodialysis patients and patients with advanced kidney disease, to prevent subclavian vein stenosis [2,3,7]. o Consider the use of a fistula or graft in patients with chronic renal failure instead of a central venous catheter for permanent access for dialysis [2,3,7]. o Use of a central venous catheter with the minimum number of ports of lumens to manage the patient [2,3]. o Hand hygiene using an antimicrobial soap or alcohol based hand sanitizer [1-7]. o Use of maximal staff barrier precautions by all staff directly involved including the use of sterile gloves, sterile gown, cap, mask and large sterile drape [1-7]. o Use of a 2% chlorhexidine (CHG) and isopropyl alcohol (IPA) skin antiseptic [1-7]. If there is a contradiction due to age or allergy use tincture of iodine, an iodophor or 70% alcohol [2,3,7]. o Application of antiseptic solution with scrub time, motion, and drying time according to manufacturer’s recommendations [3]. o Ensure that catheter is secured [1-3,7]. 	<p>Consider the following examples when developing or updating a facility policy for central line use:</p> <ul style="list-style-type: none"> • Hennepin County Medical Center central line policy • The Johns Hopkins Hospital Vascular Access Device Policy, Adult • Chopra V, Flanders SA, Saint S, et al; Michigan Appropriateness Guide for Intravenous Catheters (MAGIC) Panel. The Michigan Appropriateness Guide for Intravenous Catheters (MAGIC): Results From a Multispecialty Panel Using the RAND/UCLA Appropriateness Method. Ann Intern Med. 2015;163(6 Suppl):S1-40. Available at http://annals.org/aim/fullarticle/2436759/michigan-appropriateness-guide-intravenous-catheters-magic-results-from-multispecialty-panel. <p>Consider the following examples when developing a standardized central line insertion checklist:</p> <ul style="list-style-type: none"> • Hennepin County Healthcare insertion checklist • Johns Hopkins Central Line Insertion Checklist • Joint Commission Central Line Insertion Checklist Template • American Society of Anesthesiologists Task Force on Central Venous Access, Appendix 3: Central Line Insertion Standard Work & Safety (Bundle) Checklist for OR and CCU <p>The Agency for Healthcare Research and Quality Central Line Cart Inventory, when paired with the comprehensive unit-based safety program (CUSP) toolkit, supported a dramatic reduction in CLABSI rates in hospitals around the country.</p>

Road map sections	Road map questions (if not present at your hospital or answering no, please see next column for suggested resources)	If specific road map element is missing, consider the following resources:
Insertion practices, continued	<ul style="list-style-type: none"> ○ Use of sterile gauze, or sterile transparent, semi-permeable dressing to cover the catheter site [1-3,7]. ○ X-ray confirmation of site termination for patients admitted with a non-tunneled, temporary central line. ○ When catheters are inserted during a medical emergency in which adherence to aseptic technique cannot be ensured, replace the catheter within 48 hours when possible [2,3,5,7]. <input type="checkbox"/> The facility has standardized central line supplies [1-5]. <ul style="list-style-type: none"> - Central line kit variability is reduced as much as possible by maintaining consistent locations, standardized contents, and a stocking process for central line carts/containers/shelves. 	
	<p>ADVANCED (check each box if “yes”)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Chlorhexidine/silver sulfadiazine or minocycline/rifampin-impregnated central venous catheter is utilized in patients whose catheter is expected to remain in place >5 days [1-5]. <input type="checkbox"/> Prophylactic antimicrobial lock solution is utilized in patients with long-term catheters who have a history of multiple catheter-related bloodstream infection despite optimal maximal adherence to aseptic technique [3,4,7]. <input type="checkbox"/> A CHG-impregnated sponge dressing is utilized for temporary, short-term catheters in patients older than 2 months of age [1-5,7]. 	<p>Support articles for advanced strategies include:</p> <ul style="list-style-type: none"> ● Wang H, Huang T, Jing J, et al. Effectiveness of different central venous catheters for catheter-related infections: a network meta-analysis. J Hosp Infect. 2010;76(1):1-11. ● Veenstra DL, Saint S, Saha S, et al. Efficacy of antiseptic-impregnated central venous catheters in preventing catheter-related bloodstream infection: a meta-analysis. JAMA. 1999;281(3):261-267. ● Snaterse M, Ruger W, Scholte Op Reimer WJ, Lucas C. Antibiotic-based catheter lock solutions for prevention of catheter-related bloodstream infection: a systematic review of randomized controlled trials. J Hosp Infect. 2010;75(1):1-11. ● Labriola L, Crott R, Jadoul M. Preventing haemodialysis catheter-related bacteraemia with an antimicrobial lock solution: a meta-analysis of prospective randomized trials. Nephrol Dial Transplant. 2008;23(5):1666–1672. ● Yahav D, Rozen-Zvi B, Gafter-Gvili A, et al. Antimicrobial lock solutions for the prevention of infections associated with intravascular catheters in patients undergoing hemodialysis: systematic review and meta-analysis of randomized, controlled trials. Clin Infect Dis. 2008;47(1):83-93.

Road map sections	Road map questions (if not present at your hospital or answering no, please see next column for suggested resources)	If specific road map element is missing, consider the following resources:
Insertion practices, continued		<ul style="list-style-type: none"> Safdar N, Maki DG. https://academic.oup.com/cid/article/43/4/474/389399. Clin Infect Dis. 2006;43(4):474–484. Ullman AJ, Cooke ML, Mitchell M, et al. Dressings and securement devices for central venous catheters (CVC). Cochrane Database Syst Rev. 2015;9:CD010367. Safdar N, O’Horo JC, Ghufran A, et al. Chlorhexidine-impregnated dressing for prevention of catheter-related bloodstream infection: a meta-analysis. Crit Care Med. 2014;42(7):1703-1713.
Access/maintenance practices	<p>FUNDAMENTAL (check each box if “yes”)</p> <ul style="list-style-type: none"> <input type="checkbox"/> The facility has a process in place to review central line necessity daily and promptly remove unnecessary lines [1-7]. <input type="checkbox"/> The facility has standardized process in place for central line care and maintenance practices. <ul style="list-style-type: none"> - At least daily review of site for signs and symptoms of infection [3]. - Central line care and maintenance practices include: dressing check, cleaning access port (scrub the hub), assessing administration sets, and review of site for signs and symptoms of infection. <input type="checkbox"/> Replace primary and secondary continuous administration sets used to administer solutions other than lipid, blood or blood products, no more frequently than every 96 hours but at least every 7 days [1-4,7] <input type="checkbox"/> For intermittent infusions, change administration sets every 24 hours [2,3,7]. <input type="checkbox"/> For patients receiving blood, blood products, fat emulsions, replace tubing used to administer blood, blood products, or continuous infusions of propofol or Ativan, consult with pharmacy or blood bank for guidance on administration set change frequency. <input type="checkbox"/> The facility has a policy for standardized dressing changes [1,5] according to an accepted nursing skills procedure manual. 	<p>Central line care and maintenance is a critical component of CLABSI prevention. Consider the following examples when developing your central line care and maintenance processes:</p> <ul style="list-style-type: none"> The Joint Commission CVC Maintenance Bundles The Joint Commission Daily Central Line Maintenance Checklist Template IPRO Central Line Maintenance Bundle AHRQ Central Line Maintenance Audit Form Mayo Clinic PICC/Midline Orders Mayo Clinic line ownership grid <p>Consider the following published guidelines when developing standardized practices and indications for obtaining blood specimens:</p> <ul style="list-style-type: none"> Doern, G. V., A Comprehensive Update on the Problem of Blood Culture Contamination and a Discussion of Methods for Addressing the Problem. American Society for Microbiology, January 2020 33(1). Gorski L, Hadaway L, Hagle ME, et al. Infusion therapy standards of practice. J Infus Nurs. 2016;39(suppl 1):S1-S159. Baron EJ, ed. Cumitech 1C: Blood Cultures IV. Washington, DC: American Society for Microbiology (ASM), 2005.

Road map sections	Road map questions (if not present at your hospital or answering no, please see next column for suggested resources)	If specific road map element is missing, consider the following resources:
Access/maintenance practices, continued	<ul style="list-style-type: none"> - The policy for standardized central line maintenance includes: <ul style="list-style-type: none"> ○ Defining dressing change frequency <ul style="list-style-type: none"> • Transparent dressing - change every 7 days, gauze dressing - change every 2 days [1-4,7]. • If possible, change central line when 2 or more unintended dressing disruptions occur [8]. ○ Dressing that is damp, loosened, or visibly soiled are replaced promptly [1-4,7]. ○ Expectations that the catheter or catheter site is not submerged in water (showering should be permitted if precautions can be taken to reduce the likelihood of introducing organisms) [3]. - Standardized access processes are used (e.g., scrub the hub for at least 10 seconds, alcohol impregnated caps, etc.). - Catheter hubs are cleaned (e.g., scrub the hub) with antiseptic (e.g., chlorhexidine or alcohol) before accessing the catheter [1-7]; scrub for at least 10 seconds with a 20 second dry time or per manufacturer instructions. - Ensure patency of central line by flushing after every central line use. A closed flush system is preferred. - Standardized central line removal protocol according to an accepted nursing skills procedure manual. <input type="checkbox"/> The facility has standardized dressing change kits [1]. <ul style="list-style-type: none"> - Dressing change supplies and equipment stored together and easily available, e.g., central line dressing kits, chlorhexidine dressings, IV fluid infusion bags and administration sets. <input type="checkbox"/> The facility has standardized practices and indications for obtaining blood specimens based on published guidelines. Consider appropriate indications, technique, skin preparation, collection methods, collection sites/sources, equipment, volume, etc. <input type="checkbox"/> The facility has a process in place to share critical central line information upon transfer to another unit or care setting. <ul style="list-style-type: none"> - Critical central line information includes: date of insertion, location of catheter, type of central venous catheter (temporary non-tunneled, tunneled, dialysis), whether inserted under sterile conditions, dressing change due date, and a copy of placement confirmation x-ray if available. 	<ul style="list-style-type: none"> • Mermel LA, Allon M, Bouza E, et al. Clinical practice guidelines for the diagnosis and management of intravascular catheter-related infection: 2009 update by the Infectious Diseases Society of America. Clin Infect Dis 2009; 49:1-45. • Clinical and Laboratory Standards Institute. Principles and Procedures for Blood Cultures: Approved Guideline. CLSI document M47-A. Wayne PA: Clinical and Laboratory Standards Institute, 2007. • Mermel LA, Allon M, Bouza E, et al. Clinical Practice Guidelines for the Diagnosis and Management of Intravascular Catheter-Related Infection: 2009 Update by the Infectious Diseases Society of America. Clinical Infectious Diseases. 2009;49(1):1-45. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4039170/pdf/nihms579455.pdf. • Septimus E. HCA Clinical Services Group. Clinician guide for collecting cultures. 2015. Available at https://www.cdc.gov/antibiotic-use/healthcare/implementation/clinicianguide.html. <p>Proper collection of a blood culture specimen is a critical step in accurate identification of organisms responsible for infectious disease. Consider the following resources when developing standardized practice and indications for specimen collection:</p> <ul style="list-style-type: none"> • Johns Hopkins Blood Specimen Guideline • Morgan DJ, Malani P, Diekema DJ. Diagnostic Stewardship—Leveraging the Laboratory to Improve Antimicrobial Use. JAMA. 2017;318(7):607-608. https://jamanetwork.com/journals/jama/article-abstract/2647071. • Madden G, Weinstein R, Sifri C. Diagnostic Stewardship for Healthcare-Associated Infections: Opportunities and Challenges to Safely Reduce Test Use. Infect Control Hosp Epidemiol. 2018;39(2):214-218. Available at https://www.cambridge.org/core/journals/infection-control-and-hospital-epidemiology/article/diagnostic-stewardship-for-healthcare-associated-infections-opportunities-and-challenges-to-safely-reduce-test-use/E2E185BF9CF7D0C9CAB0A8395ED5FEC9.

Road map sections	Road map questions (if not present at your hospital or answering no, please see next column for suggested resources)	If specific road map element is missing, consider the following resources:
Access/ maintenance practices, continued	<input type="checkbox"/> The facility has a process in place to conduct daily neck to toe bathing, avoiding mucous membranes, with 2% chlorhexidine for ICU patients with central lines [2,4].	
	<p>ADVANCED (check each box if “yes”)</p> <input type="checkbox"/> The facility has a process in place to conduct daily neck to toe bathing, avoiding mucous membranes, with 2% chlorhexidine for non-ICU patients with central lines [2].	
Performance improvement monitoring	<p>FUNDAMENTAL (check each box if “yes”)</p> <input type="checkbox"/> The facility’s medical record is designed to capture sufficient detail to allow for review of adherence to appropriate practices for central line use, insertion, maintenance, and removal. <ul style="list-style-type: none"> - Includes: indications for central line insertion, type of catheter and tip location, date/time of insertion/removal, daily review of continued need for central line use, ongoing central line maintenance including site inspection for signs of infection and dressing changes, daily 2% chlorhexidine bathing, date of last dressing change and/or next dressing change due, patient/family education provided, and names of all staff providing catheter care. <input type="checkbox"/> The facility’s medical record is designed to capture documented use of the central line insertion checklist. <input type="checkbox"/> Observation monitoring is conducted for every central line insertion using an insertion checklist [1-7]. <input type="checkbox"/> The facility has a process to measure and monitor CLABSI prevention processes and outcomes. <ul style="list-style-type: none"> - Monitoring includes the development of insertion and maintenance process measures [1-4]. <input type="checkbox"/> The facility has a process to communicate progress on outcome and process to staff and providers on a regular basis [1-7]. <input type="checkbox"/> The facility has a process to conduct an investigation of every CLABSI identified and provide feedback to staff [2,5]. <ul style="list-style-type: none"> - E.g., conduct a root cause analysis. 	<p>Establishing evidence-based protocols/standards is a critical step in CLABSI prevention. Consider these toolkits when developing CLABSI prevention processes and protocols.</p> <ul style="list-style-type: none"> • AHRQ CLABSI toolkit • Hennepin County Healthcare prevention tool kit • Hennepin County Healthcare daily checks for leaders tool • CDC Targeted Assessment for Prevention (TAP) Strategy: framework for quality improvement <p>Consider use of the NHSN Standardized Utilization Ratio (SUR) to further support internal improvement activities with an external comparison relative to catheter removal in addition to tracking number of device days.</p> <p>Consider the following example audit tools to support regular review of best practice implementation:</p> <ul style="list-style-type: none"> • Helen DeVos K-card: CLABSI • Abbott Northwestern Hospital Central Line Rounding Tool: ICU • Abbott Northwestern Hospital Central Line Rounding Tool: Med/Surg <p>The root cause analysis (RCA) process can be useful in examining the root cause of each CLABSI that occurs and identifying any key learning opportunities to prevent future events.</p> <ul style="list-style-type: none"> • Hennepin County Healthcare RCA tool • AHRQ CLABSI Investigation Letter • AHRQ CLABSI Event Report Template for Defect Analysis

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Staff education	<p>FUNDAMENTAL (check each box if “yes”)</p> <p><input type="checkbox"/> The facility has a process to ensure that the individual(s) inserting central venous catheters are qualified and trained in central line insertion [2-4,7].</p> <p><input type="checkbox"/> Education for staff caring for patients with central lines is provided at orientation [2-4,7] and annually.</p> <ul style="list-style-type: none"> - Education includes, at a minimum: appropriate adherence to aseptic technique, daily review and identification for removal of catheters that are no longer needed, adherence to hand hygiene, proper maintenance of catheters, proper removal of catheters, and teamwork/communication tools. 	<p>Provider skill in inserting a central venous catheter is a key component of safety and prevention of CLABSI. It is important to regularly educate and assess competency, as breach of technique may occur more commonly with inexperienced providers.</p> <ul style="list-style-type: none"> • Joint Commission educational delivery methods to reduce CLABSI • AHRQ CLABSI staff education fact sheet and slide set • Checking CLABSI staff education rounding tool

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