**CLABSI Module:**

**Central Venous Catheter Removal**

| **Facilitator Guide** | **Slide Number and Image** |
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| This module, titled Central Venous Catheter Removal, is part of the Agency for Healthcare Research and Quality’s Safety Program for intensive care units (ICUs). The module addresses central line-associated bloodstream infections, also known as CLABSIs.  This module will review strategies for prompt removal of unnecessary central venous catheters (CVC) and overcome challenges that can impact removal of unnecessary central venous catheters.  By providing information on when a central venous catheter should be in place and resources that can help with these decisions, this module may help your team avoid CLABSIs. | Slide 1 |
| Let’s start this module by discussing two case scenarios. Each case study highlights events that may occur in your ICU that impact CVC removal. Our first case involves Mr. Rigo, who was admitted to the ICU for severe sepsis 3 days ago. He required a central venous catheter for invasive monitoring and vasopressor therapy. He is now hemodynamically stable, breathing room air, and ready for transfer to the medical floor. He has an 18-gauge peripheral IV (intravenous line) in his right arm and has a central venous catheter in his left subclavian vein.  So the question for you to consider is: should his central venous catheter be removed? If this was your hospital, who on the team would be asking this question before he leaves the intensive care unit?  This case scenario suggests that no patient should leave an ICU without a review of necessity of CVC by the nursing and medical staff. If the central venous line is deemed not necessary, then it should be removed and a peripheral IV can be placed prior to discontinuing the central venous line. In this scenario, the patient is hemodynamically stable and on oral antibiotics, but he does have a peripheral IV in place, so there is no other obvious reason that Mr. Rigo should still require a central line. Hence, the answer to the question is – Yes – the central venous catheter should be removed at this time. | Slide 2 |

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| The second case involves Ms. Lopez, who was admitted to the ICU with pneumonia. IV access was difficult to obtain on her, so she underwent placement of a peripherally inserted central catheter, which is also called a PICC line. She had the PICC placed on day 2 so the staff would have access for blood draws and IV antibiotic treatment. Ms. Lopez’s status improved by hospital day 4, and she is now breathing room air. The primary team thinks she will likely go home tomorrow and does not need IV antibiotics after discharge, but she is being held for observation for one more day.  Should her PICC line be removed today? In this case, who in your hospital would be asking this question?  It is important to remember that PICC lines are central lines. Do you have a mechanism in your hospital that helps your nursing and medical staff assess daily need for a central line?  Similar to the first case, it is important that the team review whether this patient needs to have a central venous catheter. In the case of Ms. Lopez, she no longer needs IV antibiotics or the PICC line. So, removal is indicated and decreases likelihood of a line-associated infection. | Slide 3 |
| The third case is Mr. Smith. He is a 65 year-old man who underwent emergency aortic aneurysm repair 4 days ago. He had a pulmonary artery (PA) catheter for hemodynamic monitoring until postoperative day (POD) 2. He is now hemodynamically stabile and is off vasopressors. The PA catheter was converted to a central venous catheter for fluids. He has weaned off the ventilator and is breathing on 2L oxygen. He is now much improved, and on POD 4 he currently has the CVC and two peripheral IVs in place. He is mobilizing out of bed and he is only on a daily diuretic to improve pulmonary edema.  Should the CVC be removed today? The catheter no longer meets the criteria for the original reason it was inserted, hemodynamic measurement and use of vasopressors.  Do all patients on diuretics need a CVC?  Patients on diuretics from pulmonary edema do not all need a central line—diuretics are not caustic.  In your unit, who would be asking the questions about removal, and who would be making the decision? Keep in mind that the decision should be a joint decision, arrived at by a team member raising the issue of awareness of the catheter and risk of CLABSI. | Slide 4 |
| So what do these three cases have in common?  None of the patients meets the indications for a central venous catheter or a PICC, so the line can be removed.  As we stated in the prior slides, the PICC line is a central line and has been shown in studies to be just as likely to cause CLABSI as a short-term central venous catheter such as an internal jugular or a subclavian central venous catheter in the inpatient setting.  In the next few slides we will review strategies to help prompt the removal of central venous catheters. This includes using indications for line necessity, which are covered in detail in the module titled “[Avoiding Placement of Central Venous Catheters: Indications and Alternatives](http://www.ahrq.gov/hai/tools/clabsi-cauti-icu/implement/prevention-modules.html).” We will also review some strategies to help your team overcome challenges and prompt removal of catheters when they are no longer necessary. | Slide 5 |
| One way to think about catheter insertion is to consider the lifecycle of a central venous catheter. We have used this image in other modules so you will have a way to visually describe the different steps that have an impact on CLABSI prevention in your ICU. In this module, we are interested in the last step of the lifecycle.  The last step is step 3, which addresses prompt removal of unnecessary catheters. If a central venous catheter can be removed before an infection develops, then you may prevent a CLABSI. | Slide 6 |
| One of the most well-known studies in prevention of CLABSI was the Keystone Study, conducted in the state of Michigan in 2003. In this study, one of the key elements in the bundle described by the authors was the use of daily reminders to review necessity of a central venous catheter and prompt removal when it was determined that the central venous catheter indications were no longer met.  The key message is that your unit should include assessment of central venous catheter necessity as part of your daily task list or in multi-professional rounds and remove any unnecessary catheters. Multiple studies have confirmed the longer the catheter is in place, the higher the rate of infection. There was a recent meta-analysis performed on the impact of bundle components. As one of the components, early removal was examined and determined to be an effective practice. The research team estimated the probability of a CLABSI was based on different catheter dwell times. The least chance of developing a CLASBI (1 in 100) was a catheter dwell time of less than 8 days. | Slide 7 |
| There are a variety of resources that hospital staff can use to assess when it is appropriate to remove a central venous catheter.  For example, the 2016 publication Infusion Therapy Standards of Practice by the Infusion Nurses Society recommend   * Assessing daily need for the line, * Documenting removal, * Using a standardized tool to consider whether line should be removed * Designating vascular nursing staff to conduct a daily assessment of whether the central venous catheter should be removed, and * Dedicating a unit-based nurse to this task if other strategies are unsuccessful.   The Healthcare Infection Control Practices Advisory Committee, or HICPAC, is a group of experts convened by the Centers for Disease Control and Prevention to help determine best practices for prevention of infection. This team published the Guidelines for Prevention of Intravascular Catheter-Related Infections in the journal Clinical Infectious Diseases in 2011. These guidelines focus on best practices for insertion and recommend not routinely replacing central venous catheters and promptly removing any central venous catheters when they are no longer essential. And remember, PICCs are also considered a central venous catheter.  The Michigan Appropriateness Guide for Intravascular Catheters, also known as MAGIC, was published in the Annals of Internal Medicine in 2015. This guide helps providers understand which catheter is best indicated, for which duration, type of patient, and infusate in a controlled line placement situation, and when removal would be considered appropriate. While these guidelines are mostly aimed at PICCs, they are the only set of guidelines that address this specific topic. A panel of experts reviewed different situations using an appropriateness methodology and defined scenarios in which PICCs should be removed and described how the removal process should go. The guidelines indicate a PICC should be removed when:   * A PICC is only being used for phlebotomy and other peripheral veins are available, * The patient has bacteremia with evidence of current line-related infection, and * There are symptoms of venous occlusion that persist despite therapeutic anticoagulation for 72-plus hours.   The guidelines also recommend training clinicians in PICC removal.  While not in guidelines, there are strong recommendations in multiple peer-reviewed publications that in the presence of a bacteremia, a CVC catheter should be removed if there is a strong suspicion of line infection. | Slide 8 |
| There are challenges to removing the CVC catheter that occur simply because of lack of awareness. In a study looking at two medical ICUs over a 28-day period, 81 patients had a catheter for a total of 614 days. Fifty percent of these patients had no indication for a catheter on a least one of the central line days. When all central line days were considered, 27 percent of patients had no indication.  In a multicenter study evaluating 990 patients and 1,881 clinician assessments of knowledge of catheter being present, 21.2 percent of physicians were unaware that their patients had a CVC. The awareness was greatest for patients with PICC lines. Interns and residents had greater awareness than attendings and hospitalists. Critical care doctors were more aware than general medicine physicians with 12.6 percent of critical care doctors being unaware of CVC presence compared to 26.2 percent of general medicine doctors. If physicians are not aware the line is in place, then they are not evaluating it for early removal.  Not all hospitals have incorporated the need to address daily evaluation of the necessity or appropriateness of the catheter into their policies. Organizations and unit-level activities like rounds or safety huddles often vary in including daily discussion of line necessity.  Lastly, without local champions there are significant challenges to removing catheters because there is lack of ownership for driving awareness, assessing appropriate indications, and conducting daily audits for removal. | Slide 9 |
| Thinking back to the case studies at the beginning of this module, let’s discuss what some of the possible challenges are to removing central venous catheters. In all of the cases the patient no longer met the clinical indications, but the central venous lines remained in place. One possible cause for this includes staff perception or fear that removing a catheter prematurely could lead to line reinsertion. Other challenges include a lack of staff support for consistent use of indications and removal checklists, lack of leadership support for prompt removal, lack of general awareness of guidelines for removal, and lack of awareness of impact of central venous catheter removal on infection rates. Availability of vein finder devices can also be a challenge. Several studies focused on reducing usage of CVCs or early removal of CVCs by using ultrasound guided peripheral line insertion. The use of ultrasound guidance for peripheral lines helps obtain access to veins that are unable to be visualized or palpated providing a viable route for infusion pre or post central line usage.  Units should assess their own local challenges and design improvement plans to implement strategies that will have the greatest impact. | Slide 10 |
| There are several strategies to help promote prompt removal of unnecessary central venous catheters. The strategies can be simple or multifaceted and units may consider using several different approaches. They center around methodologies used to assess need or indication when evaluating whether removal can occur.  Both the Joint Commission and the Society for Healthcare Epidemiology of America Compendium include multidisciplinary rounds that address line removal as a strategy for CLABSI prevention. A multidisciplinary team should assess the patient’s status daily (using a checklist) and decide if the patient continues to meet indication criteria or not. Multidisciplinary teams may include the medical director of the unit, resident physicians, physician champions or physicians, nurse leader, bedside nurse, respiratory therapy, physical therapy, infection preventionist, and more. More information on multidisciplinary rounding can be found in the [Making It Work Tip Sheet: Multidisciplinary Rounding For Patient Safety](http://www.ahrq.gov/sites/default/files/wysiwyg/hai/tools/clabsi-cauti-icu/multidisciplinary-rounding.pdf).  Inclusion of line necessity in daily huddles or other types of daily management systems keeps the clinicians aware of patients who have lines and allows another opportunity to discuss need.  Leverage the electronic health record (EHR) to help identify patients with central lines. Most EHRs have the capacity to create columns on the patient list that identifies patients with central lines and the length of time the line has been in place.  A strategy of daily audits is an effective mechanism to address need and indications.  Reminders in the patient record and/or computer alerts can be useful to ensure that clinicians are aware that the device is in place and should be assessed for continued need. | Slide 11 |
| Bundling best practices and using checklists are an effective way to help units organize essential steps or components of central venous catheter care. Removal should be included as a step in the maintenance bundle and part of the prompts in the EHR. Units are encouraged to review their own maintenance policies and checklists and include a multidisciplinary assessment for clinical indications and removal if the device is no longer indicated. One communication strategy to raise awareness and address daily need is to include this information in physician and nursing structured handoffs. | Slide 12 |
| Units may also conduct periodic audits to determine if catheters are being routinely removed. Audits can provide valuable data to help in quality improvement efforts, and results should be shared with the frontline staff in real time.  Audit tools can be designed to assess for different criteria including “idle” catheters or catheters that remain in place despite not meeting appropriate clinical indications. One study created audit criteria to assess for idle central venous catheters and were able to identify almost a third of central lines including PICCs that were idle. When using audits, units should determine the criteria which to measure, who the results will be shared with, and how the results will be used for quality improvement. | Slide 13 |
| Vascular access teams (VAT) are being formed in organizations to address a number of issues around placement and removal of peripheral and central catheters.  VATs reduce the number of people making decisions about the type of line being placed and can evaluate indications based on guidelines. Their skill level is high on placement of midlines and ultrasound guided peripheral IV catheters which can prevent insertion of some central catheters or facilitate removal by placement of other types of catheters.  VATs round daily on the lines they place, facilitating a routine way for evaluation of removal of CVCs.  In one study evaluating the impact of VAT team, a 45 percent reduction in CVC utilization days resulted from stopping placement or early removal. They were also able to see a decrease in CLABSI. | Slide 14 |
| A multipronged approach should be used to overcome the challenges we have discussed in this module. Here is a summary of some of the most impactful ones:  Effective strategies include educating staff on appropriate indications for removal and use, and discussing benefits of using alternatives to CVCs.  Identifying CLABSI physician and nursing champions to help educate and maintain awareness of the issue is also important.  In one program to reduce CLABSI, researchers used nurse quality leaders to conduct rounds and provide just-in-time education to maintain the competency of the staff. This was done as part of a multimodal strategies initiative to reduce CLABSI/CAUTIs, which resulted in a successful outcome.  Units can also engage leadership to support policies and interventions that promote appropriate use and prompt removal of unnecessary central venous catheters.  Finally, staff can encourage daily assessments for line removal as well as documentation of line necessity during multidisciplinary rounds. | Slide 15 |
| Remember, reinforcing the opportunity to talk about line removal on a daily basis through rounds or documentation is a way to ensure this is being thought about daily.  Educate staff on appropriate indications for removal and use, and benefits of alternatives to central venous catheters (such as placing peripheral IVs with ultrasound or a vein finder). This will ensure staff feel comfortable removing a line if it is appropriate.  To overcome challenges in your unit, identify CLABSI physician and nursing champions and engage leadership. You can also use clinical guidelines like the ones highlighted in this course to help decide if a central venous catheter can be removed. | Slide 16 |
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