

## Making Central Lines SAFER

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**Summary:** The “Making Central Lines SAFER” initiative is a comprehensive Health System-wide program to decrease complications, both mechanical and infectious, from resident-performed central venous access (CVA). This program was initiated in September 2016 in to address the need for consistent, uniform central venous access technique and training for our GME (Graduate Medical Education) programs. After only one year the Making Central Line SAFER program has had *dramatic* results, eliminating major procedural complications and drastically reducing central line associated blood stream infections (CLABSI). This program has standardized the techniques, equipment, and training for CVA, saving the health system financial resources and patient-complications. Thus far, this program has been accomplished with very little funding.

**Comprehensive Training:** All departments agreed on a single standardized technique for CVA. The didactic and hands-on training program that includes a cadaver-based procedural competency evaluation was based on this standardized technique. The didactic training was developed in conjunction with the Departments of Surgery (Steven Holsten, MD) and Epidemiology (Julie Hammond, RN), and consists of 3 parts: appropriate aseptic technique and CVA Bundle, ultrasound guidance for needle insertion, and best practices for CVA technique. The hands-on workshop covers each of these areas, reinforcing the mechanical aspects of these tasks. All residents and fellows who perform CVA are required to attend the comprehensive training and complete the hands-on workshop stations.

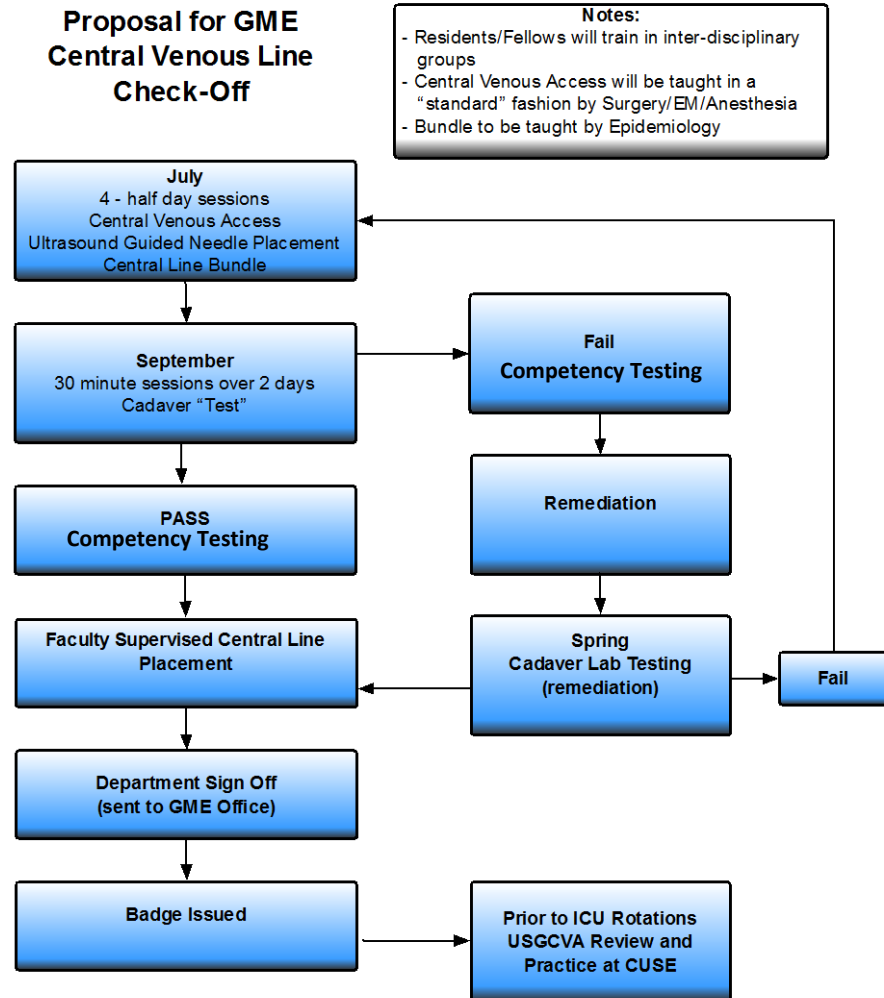


**Competency Testing:** Following completion of the training, residents participate in a CVA cadaver-based competency test. Residents perform the CVA procedure including the CVA bundle in conjunction with a certifying nurse (ED/ICU AUMC nurse). The resident performance is evaluated using a standardized grading rubric by a faculty physician. The grading rubric is divided into major tasks (failure of a major task results in failure of the competency testing) and minor tasks (a resident passes if he/she does not fail more than 3 minor tasks). Residents must pass the standardized competency evaluation prior to independent performance of CVA.



**Pathway to Independent Central Line Placement:** Comprehensive training and competency testing are components of the pathway to independent (I.e. without direct faculty supervision) performance of the procedure by a resident. The pathway is outlined below.

GME Pathway to Independent Central Line Placement – note all components not yet initiated.



**Outcomes:** In the fall of 2016, all of the GME complement underwent training (GME-wide Grand Rounds) and competency testing. Approximately 30% of the residents failed the competency testing. Those who failed the competency testing were not allowed to perform CVA without direct faculty supervision in the health system. There was an immediate decrease in mechanical complications and CLABSI in the 4<sup>th</sup> Quarter of 2016. While some of the residents did continue to perform the procedure despite failing the competency testing, *CLABSI rates in those who passed the competency testing went to zero by Q1 2017 and have remained zero. There have been no major arterial injuries due to CVA since Q4 2016.*

Table 1 depicts the CLABSI rate in a normalized fashion (CLABSI / 1000 line days) which is a standard format for reporting the CLABSI rate. The competency testing is indicated by the red dashed line. The mean CLABSI rate prior to competency testing was 0.48 / 1000 line days and after 0.09 / 1000 line days ( $p=0.003$ ). Table 2 depicts the actual occurrences of CLABSI based on the inserter's pass or fail in the competency testing.

Table 1: Normalized CLABSI Rate (red line indicated date of initial competency testing)

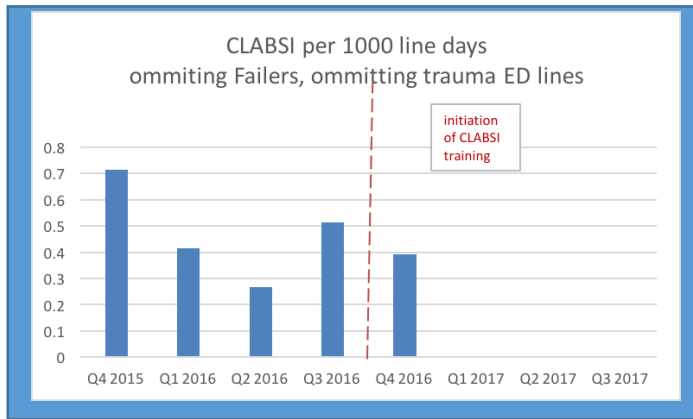
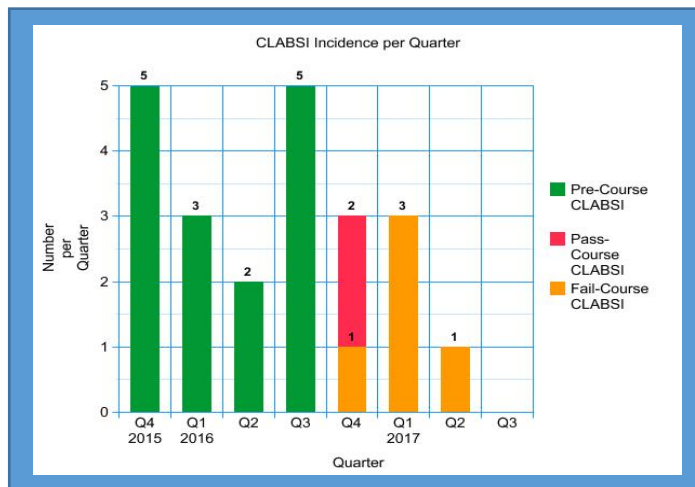


Table 2: CLABSI Occurrences (absolute instances) – including CLABSI occurrences by residents who failed the competency testing



**Cost Analysis:** In the 1-year period prior to the MCL SAFER initiative, the quarterly average for CLABSI was 3.75/quarter versus 0.5/quarter in the one year after (with zero CLABSI in the first 3 quarters of 2018). Further, there was 4 major arterial complications in the 12-month period prior to the initiative and zero in the 12-month period after. The AU Health system estimates the cost per infection at \$68,000. With these calculations, **the absolute reduction in cost to the system due to the initiative is \$884,000 in the year after the initiation of this program.**

Note: Goudie, et al. (Attributable Cost and Length of Stay for Central Line Associated Blood Stream Infections) estimates the mean attributable cost and LOS for CLABSI is \$55,646 in 2011 dollars, and 19 days increased LOS. AUMC uses a cost of \$68,000/CLABSI. No amount was assigned to the mechanical complication risk reduction.

**Conclusion:** CLABSI and major mechanical complications for CVA can be prevented through a standardized training and testing program. The MCL SAFER initiative has dramatically decreased the rates of CLABSI and mechanical complications saving nearly \$1 million in one year. This is highly cost effective program for the health system achieving significant improvement in quality.