



Central line utilization reduction via weekly prospective audit and feedback using a standardized audit tool

Ken Dekitani MD¹ , Meghan S. Madhusudhan MPH², Jonathan D. Grein MD³, Angelena R. Lopez MD¹, Isabel F. Pedraza MD¹ and Michael A. Ben-Aderet MD² 

¹Department of Pulmonary and Critical Care, Cedars-Sinai Medical Center, Los Angeles, CA, USA, ²Department of Hospital Epidemiology, Cedars-Sinai Medical Center, Los Angeles, CA, USA and ³Department of Infectious Diseases, Cedars-Sinai Medical Center, Los Angeles, CA, USA

To the Editor – Central line associated bloodstream infections (CLABSIs) are a preventable healthcare-associated infection (HAI) associated with increased morbidity, mortality, length of stay, and cost.¹ During the COVID-19 pandemic, significant challenges in infection control resulted in a dramatic rise in HAIs across the U.S., including at our institution.^{2–4} Studies have demonstrated that prompt removal of unnecessary central venous catheters (CVC) leads to a reduction in CVC days and CLABSIs.^{5–9} Here we present a quality improvement initiative targeting CVC utilization via weekly physician-led audits and feedback of CVC necessity via text message conducted in a medical ICU (MICU).

Methods

This prospective quality improvement intervention was conducted in a 24-bed MICU of a 915-bed, tertiary-care academic hospital from June 2023 to February 2024. Once weekly, 2 physicians consisting of a critical care fellow and an infectious diseases attending conducted an electronic medical record review of the necessity of all CVCs in patients admitted to the MICU. This was an additional process not integrated into existing stewardship practices. The definition of “necessity” was adapted based on current evidence and definitions utilized in similar studies.^{5–10} Clinical necessity was defined as requiring one or more of the following: irritant/vesicant medication use, hemodynamic monitoring, total parenteral nutrition, or inability to obtain peripheral access. When an unnecessary CVC was identified, the primary critical care fellow and attending taking care of the patient were sent a text message prior to morning rounds to recommend removal of the CVC; there was no involvement of nursing or other team members.

Data on patient demographics, CVC characteristics, CVC removal rates, and number of unnecessary CVC days were collected during the intervention from June 2023 to February 2024. In addition, CVC device utilization ratios (DUR) in CVC days per patient days was calculated retrospectively for the post-intervention period from July 2023 to December 2023 and compared to pre-intervention data from January 2022 to June 2023. Because CVCs used for hemodialysis in our institution are dedicated to that purpose and not routinely used for other indications, we excluded dialysis catheters from the line necessity analysis and DUR calculation. Throughout this time, the department of hospital epidemiology conducted routine surveillance for CLABSIs using

NHSN criteria, and each case was reviewed by nurse infection preventionists. We analyzed CLABSI rates as CLABSI per 1000 patient days, rather than device days, to account for the effect of removing CVCs.

Results

A total of 365 patients and 447 CVCs in the MICU were reviewed during the intervention period. 47 (11%) of the reviewed CVCs were unnecessary and removal was recommended. The characteristics of the unnecessary CVCs and the corresponding patients are listed in Table 1. 26 (55%) of the unnecessary lines were removed within 24 h of the recommendation being made. The reasons why a recommendation was not implemented were not assessed.

CVC DUR decreased significantly from 0.48 in the pre-intervention period to 0.38 in the post-intervention period, corresponding to a 20% relative reduction ($P < .0001$). 405 CVC days were avoided, based on 1474 line days and 3914 patient days in the post-intervention period. There was no significant change in the CLABSI rate (1.96 vs 1.79 CLABSI per 1000 patient days, $P = .87$).

Discussion

In this study, we demonstrate how a prospective, physician-led quality improvement initiative was associated with a significant reduction in CVC utilization in our MICU. This adds to the evidence of the value of necessity audits to decrease device utilization. Unlike other similar published work that utilized multidisciplinary teams and multifaceted interventions, our study demonstrated significant efficacy with a once weekly intervention conducted by 2 physicians alone directly texting the treatment team.^{5–9}

We observed that 11% of CVCs in the MICU were deemed unnecessary, and roughly half of these were removed within 24 h of recommendation. While we cannot determine exactly how many line-days were saved by removing these CVCs, the 20% reduction in DUR provides our best estimate, as it represents the cumulative line-days avoided. Given that the risk of CLABSI increases with each day a CVC remains in place, DUR is a better measure of impact than examining the catheter removal rate. In addition, other factors may have played a role in DUR reduction as well. There may have been observer effect from regular audits by physician colleagues, and it is probable that the audits likely prompted the treatment team to deliberate more carefully about device necessity before insertion.

Although evidence strongly supports that reducing CVC days decreases CLABSI risk, we did not observe a significant reduction in CLABSIs during the intervention.^{5–9} This was expected, as the

Corresponding author: Ken Dekitani; Email: ken.dekitani@cshs.org

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Table 1. Patient demographics, unnecessary central line characteristics, and removal rate of central lines that were deemed unnecessary by chart audit

Variable	Patients (N = 47)
Mean Age (years)—no. (range)	64 (28–100)
Female Sex—no. (%)	18 (38)
Race—no. (%)	
White	20 (43)
Black	7 (15)
Hispanic	9 (19)
Asian	3 (6)
Other/Not Reported	8 (17)
Central Line Site—no. (%)	
Peripheral Upper Extremity	8 (17)
Internal Jugular	22 (47)
Femoral	16 (34)
Subclavian	1(2)
Central Line Type—no. (%)	
Peripherally Inserted Central Catheter (PICC)	8 (17)
Triple Lumen	19 (40)
Quadruple Lumen	19 (40)
Single Lumen Introducer	1 (2)
Central Line Removed within 24 h of Recommendation—no. (%)	26 (55)
Mean Unnecessary Central Line Days—no. (range)	2.3 (1–8)

intervention period was too short to detect significance given the low baseline incidence of CLABSIs. Over time, a sustained 20% reduction in CVC DUR would likely reduce CLABSIs. It is also important to note that other evidence-based practices, such as aseptic technique during insertion and line maintenance bundles, were not included in this intervention and play critical roles in CLABSI prevention.

Our study underscores the effectiveness of a physician-led quality improvement initiative aimed at reducing CVC utilization in the MICU. This intervention, although modest in scope, signifies the importance and clinical implications of more careful

consideration of device necessity. While our findings highlight the efficacy of targeted interventions in device utilization, further research is warranted to explore their long-term impact on patient outcomes and relationships with other strategies for reducing CLABSI in the critical care setting.

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