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Letter to the Editor

Implementation of an initial specimen blood culture diversion device to reduce blood culture contamination: lessons learned

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To the Editor

Blood culture contamination (BCxC) leads to unnecessary antibiotic exposure, laboratory studies, prolonged hospital stay, and increased hospital cost.[1] The likelihood of BCxC varies widely with higher rates observed in emergency departments (EDs) and intensive care units.[2] The Clinical and Laboratory Standards Institute (CLSI) recently lowered the BCxC benchmark to <1%, but many institutions have difficulty achieving this threshold.[3] Use of an initial specimen diversion device (ISDD) can reduce BCxC[4,5] by discarding the initial aliquot of blood that may contain cutaneous organisms. There are two FDA-approved ISDDs: Steripath® (Magnolia Medical Technologies, Seattle, WA) and Kurin Lock® (Kurin Inc, San Diego, CA). Most published studies involve the Steripath® ISDD. The Kurin Lock® discards a smaller volume of blood. We implemented the Kurin Lock® ISDD in three acute care hospitals ((Rhode Island Hospital [RIH]—a 714-bed tertiary care teaching hospital, The Miriam Hospital [TMH]—a 247-bed community teaching hospital, and Newport Hospital [NH]—a 129-bed community hospital). within our Lifespan healthcare system beginning October 2022 and assessed the impact on BCxC and vancomycin utilization in adult EDs, intensive care unit, and step-down units (ICU/SDUs). Blood cultures were obtained by nurses (all 3 hospitals) and phlebotomists (NH) after training by the manufacturer. Blood culture technique was followed per protocol, and growth was monitored using the BioMérieux VIRTUO system. No changes in phlebotomy, laboratory practices, or antimicrobial stewardship interventions were implemented during the study period.

BCxC rates were calculated dividing the number of contaminated cultures (per CDC NHSN commensal list) over the total number of blood cultures/month. The pre-implementation period was defined as the 6 months prior, and the post-implementation period were the months following implementation through December 2023, excluding the month of implementation. Mean BCxC rates prior to Kurin Lock® implementation and after implementation were compared using the Wilcoxon rank sum test. An interrupted time-series analysis was performed using binomial regression models; implementation dates were standardized as "Day 0." Vancomycin days of therapy (DOT) by order entry indication of "bacteremia" was analyzed using a generalized linear model (Stata/MP 18.0; College Station, TX).

The mean (SD) BCxC rate for all three hospitals and locations declined by 37% [from 3.0% (2.1) to 1.9% (1.4) after the ISDD implementation ($P = 0.009$)]). The mean number of blood cultures per month was similar during the pre- and post-Kurin period. In time-series analysis, we observed an abrupt 65% decline in BCxC following education and implementation of the Kurin Lock® ISDD at all three hospitals and locations ($P = 0.04$; Figure 1A). Post-Kurin BCxC rates remained lower than pre-Kurin rates at 400 days after implementation; however, increasing BCxC rates were observed post-implementation, particularly in the EDs (Figure 1B). TMH and NPH ED BCxC rates were already declining pre-Kurin Lock® implementation. Nonetheless, rates of contamination only reached 1% or less after the ISDD was implemented. We did not observe any significant change in mean vancomycin DOT for bacteremia up to 200 days after Kurin implementation in ICU/SDUs (Figure 1D).

Our results are consistent with prior publications and adds to the limited literature using this ISDD.[6–9] Although lower BCxC rates were sustained with time, the abrupt decline in rates and intermittent spikes resulting in an upward trend highlights the critical value of continuous quality improvement efforts focusing on best practices paired with the device implementation. An independent review of blood culture collection practices by the manufacturer noted: (1) occasional blood draws from existing intravascular catheters; (2) inconsistent skin preparation; (3) placement of blood culture bottles on patient's beds; (4) inconsistent stocking of supplies; and (5) new staff unawareness of allowing lock side channel blood flow to stop before accessing the blood culture bottles. In addition, ED staff were not utilizing peripheral IV sets with an attached extension (PV-18) designed to reduce contamination from touch points. Based on our findings, some action items we suggest are critical when implementing an ISDD include: hands-on education when onboarding new staff, emphasizing the importance of drawing blood from fresh venipuncture and not from previously inserted peripheral IVs, establishing PAR levels for all blood culture collection items, stocking enough

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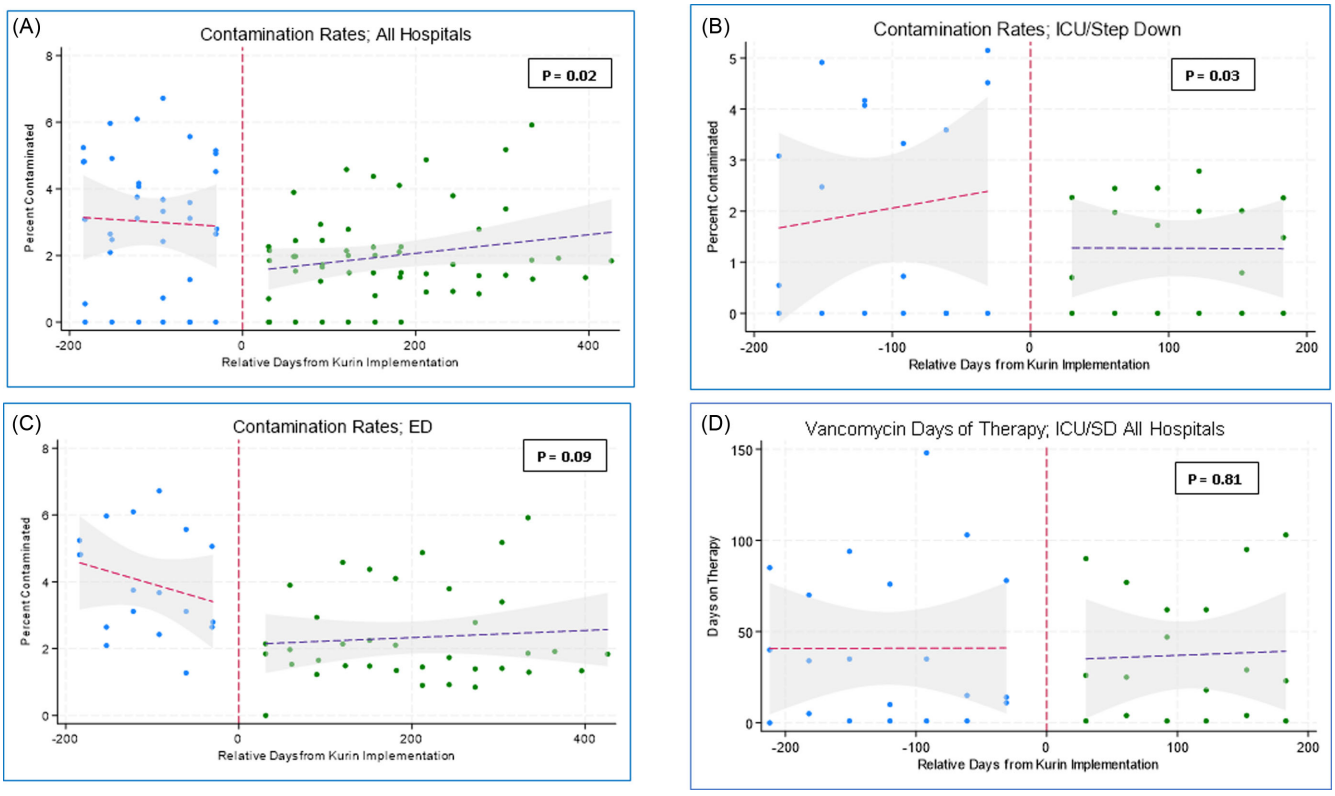

Figure 1. Time-series analysis. A: BCxC in all hospitals; B: BCxC in all ICU/SD; C: BCxC in all ED; D: Vancomycin DOT by bacteremia indication all ICU/SD. All *p*-values derived from binomial regression models including an interaction term for pre-post period by relative days.

supplies in IV carts, and provide targeted feedback to individual staff associated with high levels of blood culture contamination.

A limitation of our study is that we cannot differentiate the impact of education on blood culture acquisition and impact of ISDD use on BCxC without having a control group with education alone. In addition, a small proportion of blood cultures drawn at RIH (<1%) and at TMH (<1% in ED and 15%–25% in ICU/SDU) were drawn by phlebotomy staff who did not utilize the Kurin Lock® potentially affecting our results; however, the frequency of phlebotomy-drawn cultures before and after Kurin implementation did not change. Similar to other reports, we did not demonstrate a significant impact on vancomycin DOT for bacteremia after ISSD implementation.[10] Our study may have been underpowered for this outcome measure. In addition, we had limited pre-Kurin data for vancomycin use by indication.

Based on our experience, implementation of the Kurin Lock® ISDD lowered BCxC in large academic and community hospital settings. Continuous quality improvement efforts regarding best practices for blood collection through skill development and staff accountability are important to assure the efficacy and cost-effectiveness of this intervention.

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