Planning for the Dissemination of Research Findings

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Central line-associated bloodstream infections (CLABSIs) remain an important patient-safety concern because they contribute to preventable morbidity, mortality, prolonged hospitalization, and additional healthcare costs (Denkel et al., 2023). Nurses perform daily bathing and most of the ongoing care associated with central venous access devices (CVADs), placing nursing practice at the center of many CLABSI-prevention efforts in the clinical setting. This paper disseminates quantitative evidence from Denkel et al. (2023) concerning daily 2% chlorhexidine gluconate (CHG) bathing. It examines the study's design, results, methodological strengths and limitations, and potential application to clinical nursing practice.

PICOT Question

The selected clinical nursing practice problem is CLABSI rates among hospitalized adults with CVADs. Microorganisms present on a patient's skin may serve as a source of contamination and infection. Therefore, consistent antiseptic bathing is a nurse-sensitive prevention strategy (Denkel et al., 2023). The developed PICOT (Population, Intervention, Comparison, Outcome, Time) question is: In hospitalized adult patients with central venous access devices (CVADs), how does implementing a standardized daily 2% chlorhexidine gluconate (CHG) bathing protocol, compared with usual bathing practices without CHG, affect the central line-associated bloodstream infection (CLABSI) rate per 1,000 central line-days over six months?

The literature search strategy involved a search of the Chamberlain University Library using the following search string: chlorhexidine gluconate central line-associated bloodstream infection. Publications considered were only those published from 2021 to 2026. No other filters were used. The search yielded 71 results. Results were organized into an Excel spreadsheet.

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Titles and available synopses were screened for publication type, quantitative design, adult acute-care population, intervention, comparison, outcome, timeframe, and alignment with the PICOT question. Denkel et al. (2023), listed as result #25, was retained because its evaluation of daily 2% CHG bathing and CLABSI rates strongly aligned with the PICOT intervention and outcome.

Research Evidence Design

Denkel et al. (2023) conducted a post-hoc before–after analysis of data from the CLIP-ID multicenter cluster-randomized controlled trial. The original trial assigned 72 adult intensive care units (ICUs) in 68 German and Austrian hospitals to one of three daily bathing regimens: 2% CHG-impregnated cloths, 0.08% octenidine wash mitts, or nonantiseptic soap and water as routine care. The post-hoc analysis compared each group's 12-month intervention period with its own preceding 12-month baseline period, during which all participating ICUs used soap-and-water bathing. This design supported the PICOT by directly evaluating the relationship between standardized daily 2% CHG bathing and CLABSI rates. Although Denkel et al. (2023) used a 12-month intervention period, the PICOT proposes evaluation over six months.

The analysis included aggregated data from 76,139 patients during baseline and 76,815 patients during the intervention period. Each study group contained 24 ICUs; the intervention-period groups included 22,897 patients receiving CHG bathing, 25,127 receiving octenidine bathing, and 28,791 receiving routine care. Trained nurses and physicians collected anonymous unit-level surveillance data through ICU-KISS, the German national surveillance system for nosocomial infections. Collected measures included patient-days, central line-days, device use, length of stay, mechanical ventilation, and ICU-attributable CLABSI. Product consumption

records and random onsite visits were used to monitor implementation of the assigned bathing procedures (Denkel et al., 2023).

CLABSI incidence density was calculated as newly acquired infections per 1,000 central line-days. The researchers used exact Poisson confidence intervals and unadjusted Poisson regression to compare baseline and intervention incidence rates. Generalized estimating equation models with a negative binomial distribution accounted for clustering and used central line-days as an offset. Adjusted analyses considered mechanical ventilation and length of stay, and sensitivity analyses incorporated additional potential risk factors to evaluate the robustness of the findings. Statistical significance was established at $p < .05$ (Denkel et al., 2023).

Research Evidence Results and Discussion

Daily 2% CHG bathing was associated with a statistically significant reduction in ICU-attributable CLABSI. In the CHG group, incidence density decreased from 1.48 during baseline to 0.90 infections per 1,000 central line-days during the intervention. The adjusted incidence rate ratio (aIRR) was 0.63 (95% CI [0.46, 0.87], $p = .0172$), which represents an approximately 37% lower adjusted CLABSI rate during the intervention period relative to baseline. Neither octenidine nor routine soap-and-water bathing produced a significant reduction. The protective effect of CHG was primarily associated with Gram-positive pathogens, particularly coagulase-negative staphylococci, and was observed in ICUs with higher rather than lower baseline CLABSI rates (Denkel et al., 2023).

Table 1

CLABSI Rates Before and During the Daily Bathing Interventions

Study group	Baseline rate	Intervention rate	aIRR (95% CI)	*p*
2% CHG	1.48	0.90	0.63 [0.46, 0.87]	.0172
0.08% octenidine	1.26	1.47	1.17 [0.79, 1.72]	.5111
Routine care	1.20	1.17	0.98 [0.60, 1.58]	.9190

Note. Rates are CLABSIs per 1,000 central line-days. aIRR = adjusted incidence rate ratio; CHG = chlorhexidine gluconate; CI = confidence interval. Data from Denkel et al. (2023).

Denkel et al.'s (2023) findings answer the PICOT question by indicating that standardized daily 2% CHG bathing can reduce CLABSI rates compared with a unit's prior soap-and-water practice. The minimal change in the routine-care control group's CLABSI rate between the baseline and intervention periods strengthens the interpretation that the decline in the CHG group was associated with the intervention rather than simply showing a general time trend. Nevertheless, the study provides qualified rather than universally applicable support because the benefits were concentrated in ICUs with higher baseline CLABSI rates. The study evaluated outcomes over 12 months, whereas the PICOT proposes six months; this difference should be considered when planning monitoring and evaluation.

Critique of Evidence

Overall, the study provides useful evidence supporting daily 2% CHG bathing. A major strength was its large, multicenter sample: 72 adult ICUs across 68 hospitals contributed aggregated data for more than 150,000 patients across baseline and intervention periods. Cluster randomization in the underlying trial reduced contamination across bathing practices, while standardized protocols, staff education, product-use monitoring, and national ICU-KISS surveillance strengthened intervention consistency and outcome measurement. The researchers

standardized infection rates by central line-days, accounted for clustering and relevant covariates, and conducted sensitivity analyses that produced stable results. The unchanged CLABSI rate in the routine-care group also provided a useful temporal comparison (Denkel et al., 2023).

The principal limitation is that the reported benefit emerged from a post-hoc before–after analysis rather than the trial's prespecified comparison among randomized groups. The original study's a priori analysis found no significant difference between groups during the intervention period, and no sample-size calculation was performed for the post-hoc analysis. The CHG group also began with a nonsignificantly higher baseline CLABSI rate, creating greater opportunity for improvement and possible regression toward the mean. Although the models addressed several confounders, they did not measure central-line insertion site and ultrasound guidance. Aggregated unit-level surveillance further limited examination of individual patient characteristics and responses (Denkel et al., 2023).

Generalizability is also limited. Participating units were adult ICUs in Germany and Austria, and recruitment favored ICUs with historically elevated infection rates; therefore, results may not transfer fully to all adult acute-care units or facilities with low baseline rates. The preventive effect was primarily associated with gram-positive organisms and was not detected consistently below several baseline CLABSI thresholds. Denkel et al. (2023) evaluated the intervention over 12 months, whereas the PICOT specifies six months. A six-month implementation can still apply the intervention, with ongoing monitoring of central line-days, adherence, and CLABSI events to assess emerging trends.

Application to Practice

Denkel et al. (2023) contributes to the existing body of knowledge by demonstrating that baseline infection rates and pathogen type may influence the observed effectiveness of CHG bathing. The study expands the underlying cluster-randomized trial by including preintervention rates and suggests that daily 2% CHG bathing may be most beneficial in adult ICUs with higher CLABSI incidence. It also shows that antiseptic products should not be treated as interchangeable because octenidine did not produce the same outcome as CHG (Denkel et al., 2023).

Implementation challenges may include product cost and availability, staff education, correct application, documentation workload, inconsistent adherence, patient refusal, skin sensitivity, and the need to avoid incompatible skin products. Units with low baseline CLABSI rates may expend resources without detecting a meaningful reduction during an initial six-month evaluation; therefore, early findings should be interpreted as emerging rather than definitive. Differences between ICU patients and patients on other acute-care units also require caution. Long-term routine CHG use warrants monitoring for adverse skin effects and reduced microbial susceptibility (Denkel et al., 2023).

A reasonable practice recommendation is to assess baseline CLABSI incidence and existing bathing processes before implementation, then pilot standardized daily 2% CHG bathing in an adult unit with sufficient central line utilization and infection risk. The protocol should define eligibility, contraindications, bathing technique, compatible products, required documentation, and procedures for responding to adverse reactions. Nurses should receive education and competency validation, while leaders monitor CHG adherence, central line-days, CLABSI rates per 1,000 central line-days, pathogen patterns, skin reactions, and supply use.

Findings should be reviewed at regular intervals so the protocol can be refined before wider dissemination.

Conclusion

The post-hoc analysis by Denkel et al. (2023) provides clinically relevant quantitative evidence that standardized daily bathing with 2% CHG-impregnated cloths may reduce ICU-associated CLABSI, particularly in units with higher baseline infection rates and for infections caused by Gram-positive organisms. The large multicenter sample, standardized surveillance, adjusted analyses, and stable sensitivity findings support the evidence. Several methodological constraints—including the post-hoc design, baseline imbalances, potential unmeasured confounders, and the ICU-only setting—temper the direct applicability of the study's results to the PICOT question. Although Denkel et al. evaluated the intervention over 12 months and the PICOT specifies six months, a carefully monitored six-month pilot could assess feasibility, adherence, and emerging CLABSI trends within a specific adult acute-care setting.

References

Denkel, L. A., Schwab, F., Clausmeyer, J., Behnke, M., Golembus, J., Wolke, S., Gastmeier, P., & Geffers, C. (2023). Central-line associated bloodstream infections in intensive care units before and after implementation of daily antiseptic bathing with chlorhexidine or octenidine: A post-hoc analysis of a cluster-randomised controlled trial. *Antimicrobial Resistance & Infection Control, 12*(1), Article 55. https://doi.org/10.1186/s13756-023-01260-w https://chamberlain.primo.exlibrisgroup.com/permalink/01CUCON_INST/14th4q6/cdi_crossref_primary_10_1186_s13756_023_01260_w