Quantitative Synopsis and Appraisal

Studentfirstname Studentlastname

College of Nursing, Resurrection University

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Professor Carina Piccinini

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Quantitative Appraisal and Synopsis

The purpose of this paper is to summarize and appraise a research study testing the use of disinfectant caps on intravenous (IV lines) to reduce the rate of hospital associated bloodstream infections (BSI). The Centers for Disease Control and Prevention (CDC, 2019) reports that central line associated bloodstream infections (CLABSI) remain a major concern in hospital settings causing fatalities, increased length of stay, and increased costs. The CDC (2019) recommends proper maintenance of intravenous lines to reduce the risk of infection. Current research is still looking to define what proper maintenance should be, including whether disinfectant caps influence rates of infection for intravenous (IV) lines.

Commented [CP1]: This answers "Why is this important to study?" It's not just ensuring our patients do not get CLABSIs…it goes beyond that to fatalities, length of stay in hospitals, and healthcare costs.

The CDC and other healthcare related organizations are great sources of information on the importance of topics.

Summary of the Study

The CDC recommends that healthcare workers disinfect all needleless connectors for peripheral and central IVs prior to connection to reduce the risk of CLABSIs without further recommendation on the type or length of disinfections. The authors of this study note other studies have tested disinfecting caps and sought to confirm those results.

Commented [CP2]: What is known (recommendation to disinfect ports), not known (what specifically should be used), and gap in knowledge (confirmation of other study results).

This information is found in the introduction to every research article. DO NOT use the discussion/conclusions section of an article for this information! It will be WRONG.

Merrill et al. (2014) conducted a quasi-experimental study to identify if disinfectant caps reduce CLABSI incidence and the relationship between nursing compliance with the caps and CLABSI rates. This study was held in a single Trauma 1 hospital with 430 beds in the United States.

Commented [CP3]: Study being summarized/appraised is correctly cited.

Specific research design stated.

Setting of study stated.

The researchers obtained their sample through nonrandom convenience sampling by including all patients meeting inclusion criteria at the hospital starting January 2012. Participants were included if they had a central or peripheral intravenous line, of any age, and were admitted to 13 specific hospital floors. Subjects were excluded if they were on the following floors: emergency department; labor, delivery or post-partum; ambulatory care, surgical services; and

well-baby nursery. The study did not report any demographic information about participants, the number of participants, or attrition or loss to follow up.

The intervention involved applying a Curos brand disinfectant cap to all ports on peripheral lines, central lines, and IV tubing when not in use on patients. The nurses on the involved units were trained on the use of the disinfectant caps with a 1:1 follow up by the researchers. Nurses were then responsible for placing caps. The researchers intermittently observing nurses for compliance to the intervention and reporting compliance to nursing departments twice a week.

CLABSIs were defined as a positive blood culture drawn within 48 hours symptom onset, and CLABSI information was retrieved from medical record audits presumably, although the authors never explicitly state how they collected the data. CLABSI information was collected for 12 months prior to the intervention and during the 12 months following the intervention for comparison.

Commented [CP4]: Sampling method stated and explained.

Inclusion criteria listed.

Exclusion criteria listed.

Selected demographics/characteristics, sample size, and loss of sample size was not included in the article, but that is clearly stated in the paper.

Commented [CP5]: Description of the intervention for this experimental study.

Commented [CP6]: The variable for the study (CLABSI rate) defined and how it was measured is stated. The timeframe in which the variable was measured is also stated.

Appraisal

The sampling method for this study included all patients with peripheral or central lines, with data collection for CLABSIs both pre- and post-intervention. Given that a control versus experimental group design and sampling may have made it difficult to control for extraneous variables due to variations in patient conditions and the number of connector access attempts, the sampling method was appropriate. Inclusion and exclusion criteria were included in the report. The exclusion criteria eliminated areas with rapid turnover in patients who would not have IV lines placed at all or for very long. This adequately ensured that the CLABSI rate would not be skewed positively by short-term IV access. If these care areas had been included, the dwell time of the line, not the presence or absence of the Curos caps would logically be the primary cause of

Commented [CP7]: Appraisal of the sampling method with rationale for its appropriateness.

a low CLABSI rate.

Intervention fidelity was met through training the nurses and 1:1 follow-up. However, the mere fact that compliance rate was audited indicates that intervention fidelity, i.e. compliance with the intervention, was questionable. In addition, the authors did not include the actual compliance rate of the intervention in the article, which affects the credibility of the overall findings.

Although the measurement of CLABSIs using medical records has inherent bias, it was the only feasible way to obtain the data. Missing data in the medical record was not reported by the researchers, which affects the validity of the data. The researchers did not explain fully how they observed if the disinfectant caps were on all patients or how compliance was counted, leading to a reliability issue. In fact, the authors state that nurses complained that ports high on IV tubing were being counted against them as noncompliance when there is no research indicating whether caps should be placed on those ports. Therefore, measurement bias for cap application and compliance could be quite high for this study.

According to the results, the mean rate of CLABSIs was 1.5 for 12 months before implementation and 0.88 for 12 months after implementation, and the authors concluded that the use of disinfectant caps decreased the rate of CLABSIs. Of note, the difference in mean rates before and after the intervention was not tested for statistical significance. Using a different statistical method, the authors found that the incident rate ratio after implementation was statistically significant, causing a 40% drop in BSIs. The authors acknowledged that ongoing education about reducing BSIs and using central line bundles was given to nurses independent of the study protocol. This extraneous variable was not measured nor included in the results or conclusions of the study, leading to a large chance of bias in attributing the CLABSI decrease to

Commented [CP8]: Explanation of what the exclusion criteria was controlling for and appropriateness.

Commented [CP9]: How the intervention was kept consistent with analysis of its effectiveness.

Commented [CP10]: Analysis of validity and reliability of the measurement tools (medical records and observations).

Commented [CP11]: Analysis of the conclusions compared to the statistical results. Lack of statistical significance being calculated for the change in the CLABSI rates before and after the intervention is explained.

the disinfectant cap intervention alone.

Conclusion

This study indicates that disinfectant caps could reduce rates of bloodstream infections. However, given the fact that certain aspects of the study as explained in the appraisal may have influenced results in favor of disinfectant caps, more research with fewer extraneous variables interfering with results needs to be conducted.

Although the difference in CLABSIs before and after the intervention was not tested for significance, there is evidence of a reduction in BSIs in this study, and the CDC (2019) does recommend disinfection to BSIs in hospitals. Therefore, the implications of this and other research exploring the same issue is that nurses should be compliant with existing facility protocols for intravenous line maintenance, regardless of the method used. Nurses should also advocate for all patients by providing reminders and education to peers that do not adhere to protocols or best practices, as they are now defined. Nurses could also advocate and participate in hospital-based studies to test nursing interventions intended to decrease BSIs.

Commented [CP12]: Nursing implications of the study, taking into account the validity of the conclusions/results, limitations, statistical significance, and other research noted in the report.

References

Centers for Disease Control and Prevention. (2019). *Bloodstream infection event* [PDF file]. Retrieved from https://www.cdc.gov/nhsn/pdfs/pscmanual/4psc_clabscurrent.pdf

Merrill, K. C., Sumner, S., Linford, L., Taylor, C., & Macintosh, C. (2014). Impact of universal disinfectant cap implementation on central line–associated bloodstream infections. *American Journal of Infection Control, 42*(12), 1274–1277. https://doi.org/10.1016/j.ajic.2014.09.00