

Effect of a Disinfecting Cap for an IV Access Point on CVC-Associated Bloodstream Infections[‡]

Yuefeng Hou, PhD; Leah Griffin, MS; Stéphanie F. Bernatchez, PhD; Tarja Kärpänen, PhD, RGN; Maria Palka-Santini, PhD, MSc HEcon 3M (USA and Germany)

Background

- Central venous catheters (CVCs) are critical in medical care. However, they can lead to serious complications when bloodstream infections (BSI) occur. Preventative approaches are available to lower the risk of BSI.
- Previously published meta-analyses concluded that the use of an antiseptic barrier cap was associated with a lower incidence of central line-associated BSI.¹⁻³

Purpose

- This study compared the use of a disinfecting cap* to the standard practice of scrubbing the hub on the rate of central venous catheter-associated BSI, hospital length of stay (LOS), and hospitalization costs.

Methods

- ICD-10 procedure and CPT codes were used to identify 522,863 CVC inpatient cases using the Premier Healthcare Database[†] (Q1 2019 to Q3 2020).
- Of these, 19,435 cases received a disinfecting cap for an IV access point.
- 1:1 propensity score matching on patient and facility risk factors of BSI was used to create a control cohort of n = 19,435 CVC cases without any access point protector.
- BSI was identified with ICD-10 T80.211.
- BSI rates, LOS, and hospitalization costs were compared between the matched cohorts using chi-square, Poisson regression, and t-test respectively.
- Multiple regression models were created for each outcome (BSI, LOS, cost) to control for outstanding variances after matching. Differences in least square means were used to compare BSI rates, LOS, and hospitalization costs between the two cohorts.
- BSI regression model: intervention, propensity score, facility region, and Charlson Comorbidity index (CCI).
- LOS and Cost regression models: intervention, propensity score, gender, age, race, CCI, teaching hospital, number of beds, cost type, facility region, ICU stay

Results

- For the disinfecting cap cohort, 47.7% were 65 years of age or older, 52.8% female, and 51.5% white. 16.9% had a CCI of 0 and 37.8% had a CCI of 5 or more. (Table 1) .

Table 1. Demographics

		Disinfecting Cap N=19,435
Age, n(%)	<18	506 (2.6%)
	18-35	2,027 (10.4%)
	36-50	2,562 (13.2%)
	51-64	5,065 (26.1%)
	≥65	9,275 (47.7%)
Gender, n(%)	Female	10,254 (52.8%)
	Male	9,181 (47.2%)
Race, n(%)	White	10,010 (51.5%)
	Black	6,088 (31.3%)
	Other	3,337 (17.2%)
CCI, n(%)	CCI=0	3,277 (16.9%)
	CCI=1	2,799 (14.4%)
	CCI=2	2,309 (11.9%)
	CCI=3	1,991 (10.2%)
	CCI=4	1,706 (8.8%)
	CCI≥5	7,353 (37.8%)

CCI: Charlson Comorbidity Index

BSI

- The difference in BSI rates was not statistically significant between the two cohorts (p= 0.1236) (Figure 1).
- After multiple regression to control for outstanding variances after matching, a 42% decrease in BSI rates was statistically significant (p= 0.0275) with an adjusted BSI rate of 0.21% in the no-disinfecting cap cohort compared to 0.12% in the disinfecting cap cohort (Figure 1).

Results (Cont'd)

Figure 1. Bloodstream Infection Rates

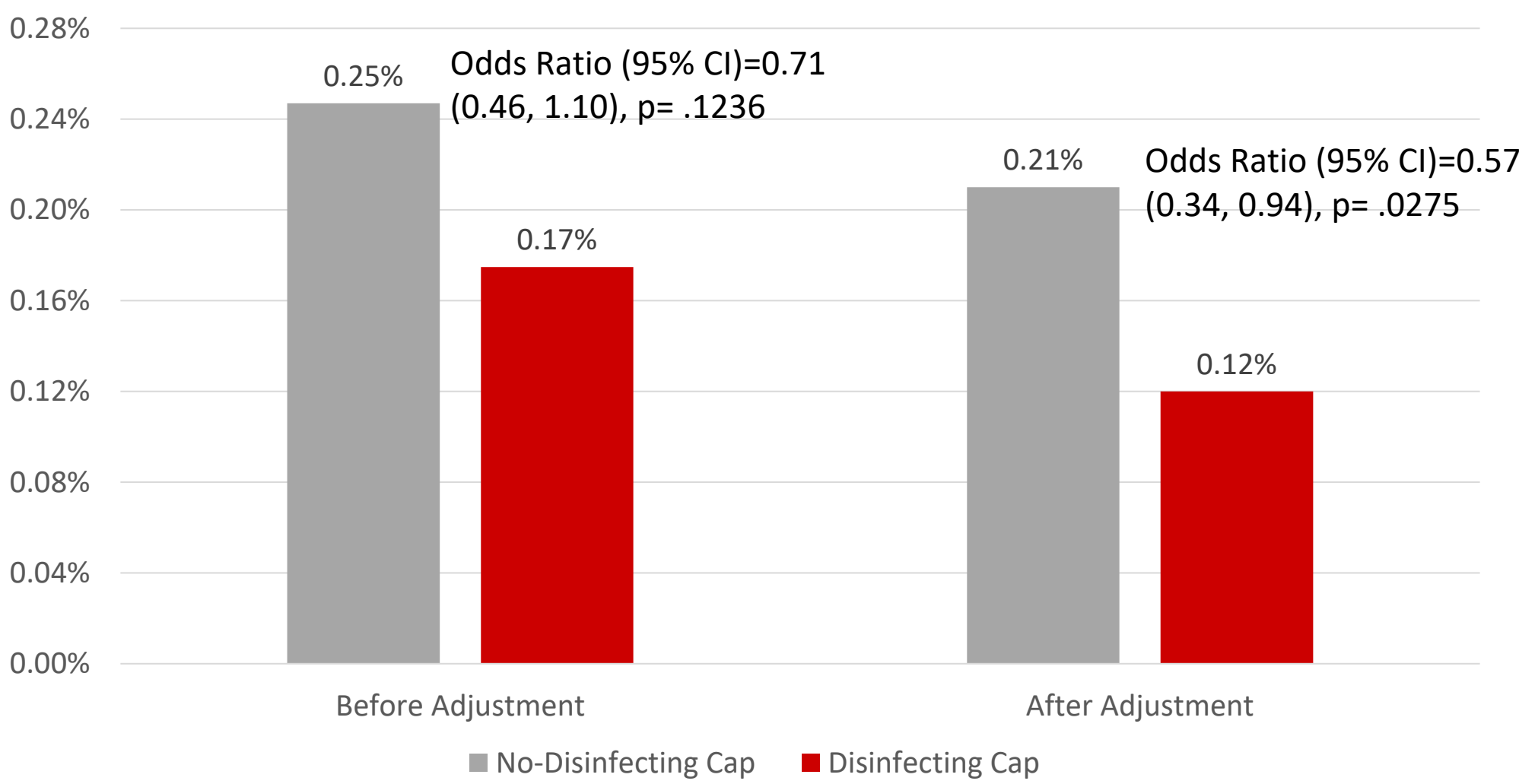


Figure 2. Hospital Length of Stay (days)

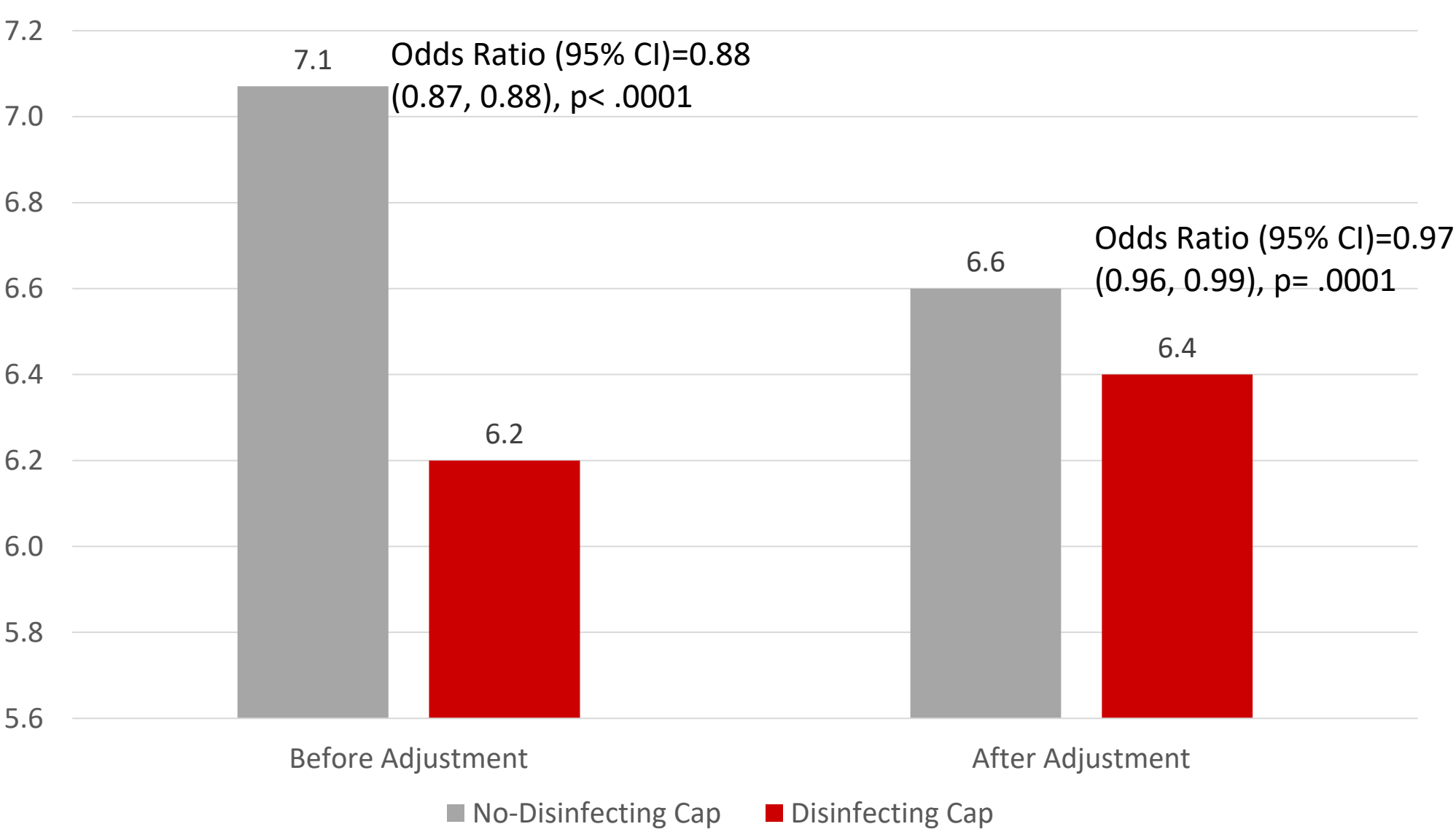
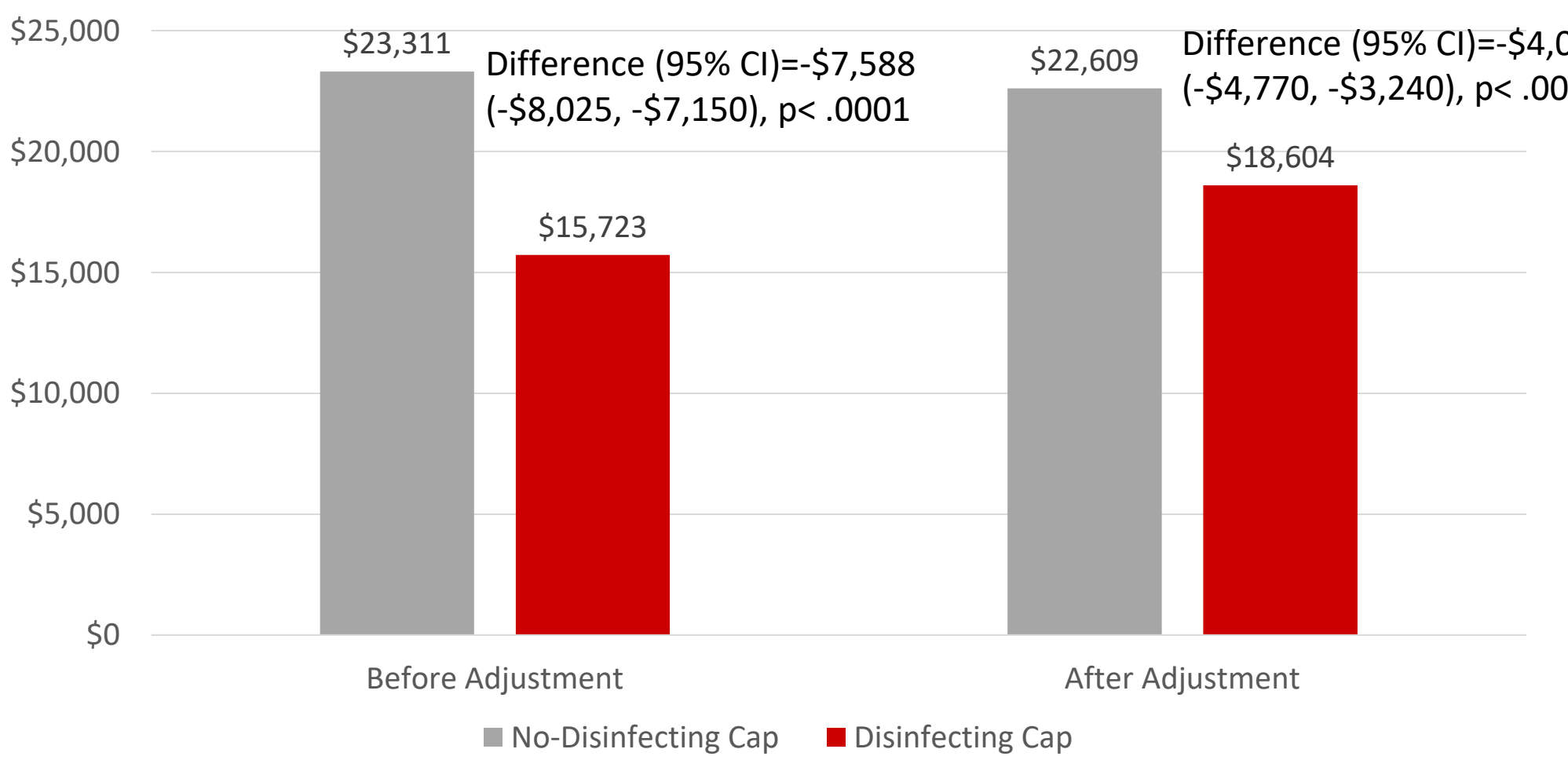


Figure 3. Hospitalization Costs



Results (Cont'd)

LOS

- A 0.9 day shorter hospital stay was found between the cohorts with a mean LOS of 6.2 days for patients with the disinfecting cap and 7.1 days for those without (p< 0.0001) (Figure 2).
- After adjustment, there was a difference of 0.2 days between the two cohorts, with the disinfecting cap cohort saving 3% LOS (OR=0.97, 95%CI: 0.96-0.99, p= 0.0001) (Figure 2).

Cost

- The hospitalization costs were decreased by \$7,588 per admission. The mean hospitalization cost was \$15,723 for the disinfecting cap cohort and \$23,311 for the no-disinfecting cap cohort (p< 0.0001) (Figure 3).
- The adjusted mean costs were \$22,609 and \$18,604 for the disinfecting cap and no-disinfecting cap cohorts respectively, with a difference in cost of \$4,005 (p< 0.0001) per hospital stay (Figure 3).

BSI: Bloodstream Infection; LOS: Hospital Length of Stay; CI: Confidence Interval

Conclusions

This real-world evidence study indicates that using a disinfecting cap to protect an IV access point may help reduce the risk of infectious complications associated with CVCs in an inpatient setting and reduce excessive clinical utilization and costs in the healthcare system. Future research will have a focus on an economic model to capture specific savings from broad use of the disinfecting cap.

References

- Voor In 't Holt AF, Helder OK, Vos MC, et al. Antiseptic barrier cap effective in reducing central line-associated bloodstream infections: A systematic review and meta-analysis. *International journal of nursing studies*. 2017;69:34-40
- Voor In 't Holt AF, Helder OK, Vos MC, et al. Corrigendum to “Antiseptic barrier cap effective in reducing central line-associated bloodstream infections: A systematic review and meta-analysis” [*Int J Nurs Stud* 2017;69:34-40]. *International journal of nursing studies*. 2018;84:79-80
- Tejada S, Leal-Dos-Santos M, Pena-Lopez Y, et al. Antiseptic barrier caps in central line-associated bloodstream infections: A systematic review and meta-analysis. *Eur J Intern Med*. 2022;99:70-81