Budget Impact (BI) of the adoption of a Central Lines-associated Bloodstream Infections (CLABSI) prevention approach in ICU patients, consisting of antimicrobial I.V. dressing and disinfecting caps in UK, France and Germany

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BACKGROUND

- Bloodstream Infection is a devastating condition, considerably prolonging hospital stay, namely in ICU, creating long-term disability, and promoting resistance to antibiotics. It results into additional financial burden for health care system, generate high costs for patients and their family, and cause deaths
- Central Line Associated Bloodstream Infection (CLABSI) is a primary laboratory confirmed Bloodstream Infection in a patient with central line within 48 hours before the onset of the infection. The estimated CLABSI incidence rate in Europe is 32 per 100,000 population and CLABSI attributable mortality is 14.8%¹
- CLABSI is associated with short-term and long-term severe complications such as sepsis syndrome (SIRS), septic shock, physical and/or cognitive impairment and chronic renal failure^{2,3}
- Guidelines for Healthcare Associated Infections (HAI) prevention emphasize the importance of new technologies to reduce further the risk on BSI linked to intravascular catheters
- By addressing risk factors for both extra-luminal and intra-luminal catheter contamination and colonization, the 3M bundle of antimicrobial solutions (Figure 1) can contribute to the eradication of CLABSI in ICU

METHOD

- A static decision tree model (Figure 2) was used to estimate the budget impact of 3M vascular access bundle from a hospital payer perspective⁴
- 3M bundle of antimicrobial solutions consisting of CHG (Chlorhexidine Gluconate) containing dressings and disinfecting caps is compared to current practice scenario consisting of standard dressings and current practice for hub disinfection (disinfection with alcohol containing solution and use of non-disinfecting cap).
- The model time horizon is one year and all outcomes are reported at annual basis
- A hypothetical ICU consisting of 10 beds and having a 95% bed occupancy was assumed in the base case analysis. An average length of stay in the ICU was assumed to be 6 days.⁵
- Model's input parameters are presented in Table 1.
- Cost data is inflated and reported in 2018 Euros
- Parametric uncertainty was evaluated with a one-way sensitivity analyses

Table 1: Model's input parameters

	UK ^{8,9}	France ^{6,10}	Germany ^{11,12}	ALL
CLABSI, rate per 1,000 catheter days	1.48	2.30	1.30	-
CLABSI attributable costs	€14,082	€13,382	€21,390	-
Efficacy 3M CHG-dressing to reduce CLABSI (RCT) ⁶	-	-	-	63.3%
Efficacy of 3M disinfecting caps to reduce CLABSI (Meta-Analysis) ⁷	-	-	-	34%
Average dressing unit cost (Current practice vs. 3M)	-	-	-	€0.35 vs.€5.70
Average hub disinfection unit cost (Current practice vs. 3M)	-	-	-	€0.05 and €0.20
Risk of local site infection per patient	-	-	-	14%

RESULTS

In an ICU consisting of 10 beds the annual total savings were €59,449 in the UK (75% cost decrease), €91,303 in France (81% cost decrease), and € 81,776 in Germany (80% cost decrease) when 3M vascular access antimicrobial bundle is compared to current practice (Figures 3-5).

The number of CLABSI decreased from 4.9 to 0.1 in the UK, from 7.6 to 0.2 in France and from 4.3 to 0.1 in Germany. The number of local site infection decreased from 76.9 to 28.2 in the three countries.

Rate of CLABSI, cost of CLABSI and intervention efficacy were the most influential parameters identified in the one-way sensitivity analysis.

LIMITATIONS

The cost saving estimated by the model is based on a plausible assumption that efficacies of the two elements of the bundle are accretive, since each bundle element addresses independent risk factors. The accretive efficacy of the two bundle elements has not been evaluated in the experimental studies. This assumption should be confirmed in a clinical study.

CONCLUSION & DISCUSSION

The 3M vascular access antimicrobial bundle is potentially a cost saving intervention in a routine use in ICU setting in UK, France and Germany. Difference in budget impact results between countries are mainly explained by the variation in local epidemiology and CLABSI attributable costs (Table 1).

REFERENCES

1. Cassini A, Plachouras D, Eckmanns T, Abu Sin M, Blank H-P, Ducomble T, et al. (2016) Burden of Six Healthcare-Associated Infections on European Population Health: Estimating Incidence-Based Disability-Adjusted Life Years through a Population Prevalence-Based Modelling Study. PLoS Med 13(10): e1002150. doi:10.1371/journal.pmed.1002150.

2. Martin, G, Sepsis, severe sepsis and septic shock: changes in incidence, pathogens and outcomes, Expert Rev Anti Infect Ther. 2012 Jun;10(6):701-6. doi: 10.1586/eri.12.50.

3. Muna Abu Sin, Hans-Peter Blank, Tanja Ducomble et al., Burden of Healthcare Associated Infection (BHAi) - evidence-based and comorbidity adjusted outcome trees for estimation of burden of disease, Robert Koch Institute Report, 8 April 2016.

4. Palka-Santini M, Topachevskiy. O, Health economic model for estimating the direct cost impact of adopting a vascular access antimicrobial bundle of solutions in ICU settings in Germany, Value in Health, 2018, presented at ISPOR 23rd annual international meeting in Baltimore.

5. Zimmerman JE et al. Intensive care unit length of stay: Benchmarking based on Acute Physiology and Chronic Health Evaluation (APACHE) IV. Crit Care Med. 2006 Oct;34(10):2517-29.

6. Timsit JF, Mimoz O, Mourvillier B, Souweine B, Garrouste-Orgeas M et al., Randomized Controlled Trial of Chlorhexidine Dressing and Highly Adhesive Dressing for Preventing Catheter-related Infections in Critically Ill Adults, American Journal of Respiratory and Critical Care Medicine, 2012;186(12):1272-1278.

7. Voor et al., Antiseptic barrier cap effective in reducing central line-associated bloodstream infections: A systematic review and meta-analysis, International Journal of Nursing Studies 69 (2017) 34–40.

8. NICE Costing Template: NICE medical technology guidance [MTG25] Published date: July 2015.

9. Jenks et al., Tegaderm CHG IV Securement Dressing for Central Venous and Arterial Catheter Insertion Sites: A NICE Medical Technology Guidance. ,2015, Appl Health Econ Health Policy. doi: 10.1007/s40258-015-0202-5.

10. Maunoury F, Motrunich A, Palka-Santini M, Bernatchez S F, Ruckly S, Timsit J-F, PLoS One 2015;Jun 18;10(6):e0130439

11. KISS GE Surveillance 2012

12. Leistner et al., Costs and prolonged length of stay of central venous catheter-associated bloodstream infections (CVC BSI): a matched prospective cohort study, Infection (2014) 42:31–36.

OBJECTIVE

Estimate the direct medical cost savings of replacing traditionally used dressings and catheter hub disinfection current practice, with 3M Vascular Access antimicrobial bundle consisting of CHG-dressing and disinfecting caps for catheter hubs in the UK, France and Germany.

Figure 1: The 3M bundle of antimicrobial solutions

Figure 2: Decision tree

Figure 3: Results, annual costs, UK

Figure 4: Results, annual costs, France

Figure 5: Results, annual costs, Germany