Health economic model for estimating the direct cost impact of adopting an antimicrobial vascular access site dressing in oncology patients with central venous catheter in the UK

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1. Introduction & Objective

- Over 375,400 incident cancer cases present annually in the UK [incidence of 605/100,000 population – (average for period 2016-2018)].[1,2] Over 28% of patients receive chemotherapy as part of their curative/palliative primary treatment [all cancers/all persons/all ages average 2016-2018] which equates to over 106,600 incident chemotherapy patients annually.[1,2]
- Prevention of catheter-related bloodstream infection (CRBSI) is an ongoing challenge in the management of patients with intravascular (IV) catheters. Oncology patients are especially vulnerable, partly due to their underlying condition and treatments, often requiring a long-term IV access.[3]
- In a randomised controlled study of haemato-oncology patients, the use of an antimicrobial, chlorhexidine-containing (CHG) IV catheter securement dressing (3M™ Tegaderm™ CHG Chlorhexidine Gluconate I.V. Securement Dressings) demonstrated an efficacy of 49.8% in reducing CRBSI in non-tunnelled central venous catheters (CVC).[4]
- The aim of this budget impact model is to estimate the direct medical cost savings when replacing a non-antimicrobial IV catheter site dressing with an antimicrobial dressing in oncology patients with a CVC.

2. Methods

- A static decision tree model was used to estimate the budget impact of implementing a CHG-containing dressing from a UK hospital payer perspective. The model time horizon is one year.
- Model input parameters are given in **Table 1**. The input parameters are derived from a recent multicentre study of venous access in oncology patients in the UK, and the subsequent health technology assessment.[5,6]
- Parametric uncertainty was evaluated with a one-way sensitivity analysis.

Table 1 : Model Input Parameters*

Input Parameter	In-patient	Out-patient
Number of patients with CVC per year	388	36
Proportion of tunnelled CVC	49.7%	52.8%
Av. catheter dwell time (tunnelled), weeks	22.6	
Av. catheter dwell time (non-tunnelled), weeks	16.1	
CHG dressing efficacy reducing CRBSI and LSI risk[4]	49.8%	
	Tunnelled CVC$	**Non-tunnelled CVC§**
CRBSI incidence (per 1,000 catheter days)	1.40	0.53
LSI incidence (per 1,000 catheter days)	0.72	0.19
Proportion of catheters re-catheterized due to CRBSI	66%	60%
Proportion of catheters re-catheterized due to LSI	16%	0%
Cost Input Parameters		
Re-catheterisation costs[6]	£1,108	£510
Cost of CRBSI (per case)[7]	£7,790	
Cost of Local site infection (per case)[8]	£108	
Acquisition costs[9]	**Non-antimicrobial dressing**	**CHG-containing dressing**
Total once weekly cost of dressing replacement, per patient:	£2.10	£5.43
Cost of dressing	£1.00	£4.32
Cost of skin antiseptic	£0.81	£0.81
Cost of dressing pack	£0.30	£0.30

**Tunnelled and non-tunnelled CVC data derived from Hickman-type tunnelled catheters (Hickman) vs Peripherally inserted central catheters (PICC) study arm; $ Hickman; § PICC.*

3. Results

- In a hypothetical oncology centre with 424 patients and 57,424 catheter days a year, the implementation of a CHG-containing dressing technology potentially leads to the total direct medical cost savings of £226,646. (**Figure 1**).
- Use of CHG dressings was associated with a reduction in CRBSI from 59.6 to 29.9 events and LSI from 28.7 to 14.4 events annually, which translates to £231,187 and £1,549 savings in CRBSI and LSI treatment costs, respectively.
- The proportion of catheters that were replaced due to infectious complications reduced from 42 to 21, which leads to £21,146 savings in re-catheterisation costs annually (9.3% of total medical cost saving).

3. Results (*cont'd*)

- The intervention efficacy and cost of CRBSI were the most influential parameters identified in the one-way sensitivity analysis **(Figure 2).**
- Intervention cost of £918 per CRBSI avoided and the numbers needed to treat (NNT) = 14.3.

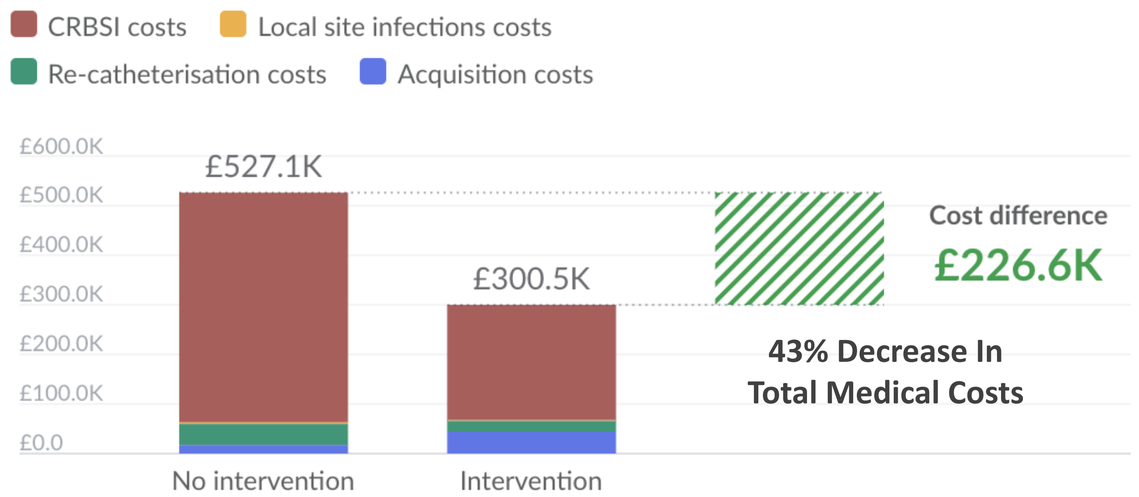

Figure 1 : Net Cost Savings

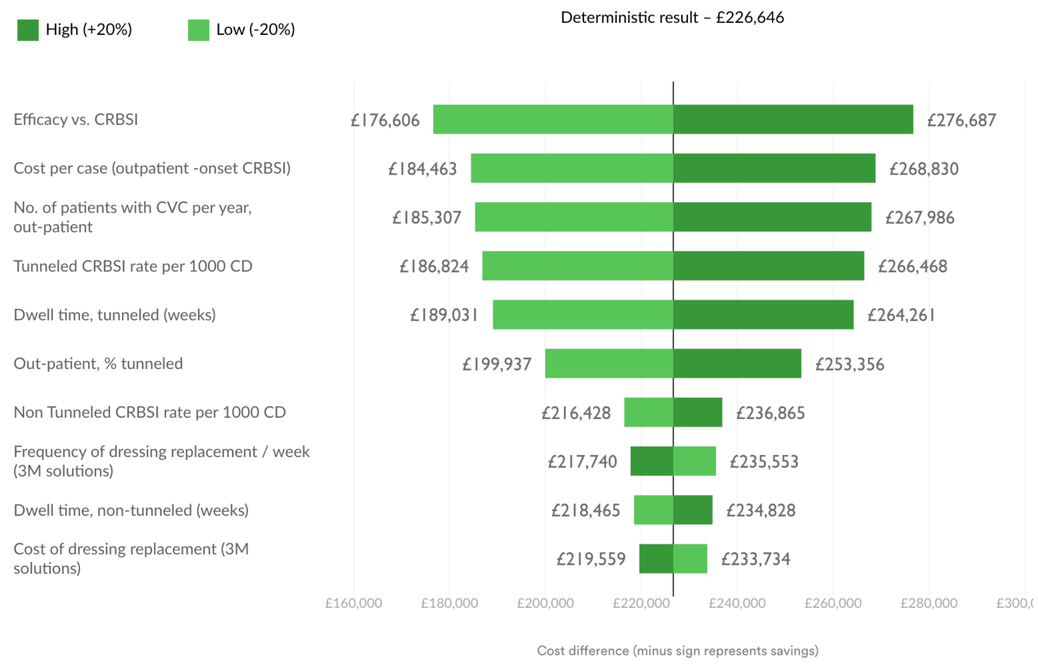

Figure 2 : One-Way Sensitivity Analysis

4. Discussion

- Reduction in costs of infectious complications and associated re-catheterisations significantly outweigh [factor >8] the increased acquisition cost of antimicrobial IV dressing technology. The model reports a 43% decrease in total costs that may be realised when implementing CHG - dressings in the management of oncology patients with IV catheters.
- Clinical evidence from studies in ICU report a higher efficacy for CHG-containing dressing in reducing CRBSI than utilized in this calculation. Re-calibration of the model with a 60% efficacy rate in ICU patients[10] gives potential annual cost savings of over £278K and almost 53% decrease in total cost.

Limitations of the model

- The model considers only acute care costs and excludes costs of additional clinical staff time and longer term social and societal consequences of CRBSI complications.
- Due to the paucity of published reference costs available to differentiate the two patient pathways, the same costs are utilised for onset of infectious complications in both inpatient and outpatient populations.
- Uncertainties are addressed by one-way sensitivity analysis; however, the budget impact estimations presented should be carefully considered and the model re-calibrated with hospital-specific data for incidence rates and cost of complications.

5. Conclusions

- The Implementation of a CHG-containing dressing for catheter site care in oncology patients is potentially a cost saving intervention and should be considered where infection rates are a concern.

6. References

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‡ The study results have been moderately revised after the abstract was submitted.