Health economic model for estimating the cost impact of optimised peripheral intravascular catheter insertion and post-insertion catheter care in multiple European healthcare settings.

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1. Introduction and objective

- Peripheral intravascular catheters (PIVC) are extensively used in European healthcare practice. Up to 70% of patients receive a PIVC during their hospital stay.[1] Annually, over 87.7 million hospital admissions in the European Union equate to over 61.4 million patients with PIVC.[2]
- However, an estimated half of the PIVC inserted fail prematurely before completion of therapy, leading to additional burden to the healthcare system and risk to patient safety and comfort.[3-6]
- Numerous technologies are available to support PIVC care optimisation, and to prevent premature PIVC failure. These may include, for example, change from active to passive intravascular (IV) access point disinfection^ to drive improved compliance to care protocols, enhanced patient care delivery with the reduction of unscheduled dressing replacements, and improved patient outcomes by reducing the risk of infection and other complications.
- Recently published cost evaluations focus on PIVC (re-)insertions and reduction of PIVC failure.[7,8] This study evaluates the cost impact of implementing a standard IV dressing to an advanced securement IV dressing and changing from active to passive IV hub disinfection to improve compliance to PIVC care protocols.

2. Methods

- A cost minimisation model estimated supplies and staff costs associated with PIVC insertion, dressing replacement and catheter hub disinfection in hypothetical hospital scenarios from four different countries. The model input parameters are given in Tables 1 & 2. The model time horizon was one year. A micro-costing approach was used to determine the supplies cost for PIVC insertion, dressing replacement, and hub disinfection specific to each geography in accordance with local clinical practice.
- Parametric uncertainty was evaluated with a one-way sensitivity analysis (OWSA).

Tables 1 & 2: Model Input Parameters (Pre= current practice; Post= optimised care).

Input Parameter	Pre	Post
Number of patient admissions (annual)	35,000	
PIVC utilisation rate	75%	
No. of PIVC, per patient	2	1
No. of dressing replacements, per patient	1	1
No. of IV hub disinfection events, per patient per day	6	6
Staff time for PIVC insertion	20 minutes	
Staff time per dressing replacement	10 minutes	
Staff time for IV hub disinfection, per procedure	30 seconds	5 seconds

	UK		France		Italy		Sweden	
Input Parameter	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Labour cost per hour*	£22.62		€32.94		€13.41		384.76 SEK	
Supplies cost per PIVC insertion§	£3.10	£3.50	€2.10	€2.46	€2.51	€2.65	22.63 SEK	25.58 SEK
Supplies cost per dressing replacement§	£0.81	£0.99	€0.93	€1.09	€1.28	€1.37	2.94 SEK	5.10 SEK
Supplies cost for IV hub disinfection per patient (6x daily, for 5 days)§	£0.60	£7.20	€0.60	€6.60	€4.32	€6.00	21.00 SEK	44.70 SEK

*UK scenario based on the mean full-time equivalent basic salary for UK Agenda for Change (AfC) band 5 of the May 2019/April 2020 NHS staff earnings estimates for nurses. Band 5 salary and salary on-cost data from labour cost for UK sourced from Unit Costs of Health and Social Care 2020 www.pssru.ac.uk/pub/uc/uc2020/4-hospitalHCstaff
French scenario based on CLEAN3 study[9], Italian – National Collective Labour Agreement; Swedish salary based on the average monthly salary including general payroll tax (31,42%) https://www.scb.se/lonestatistik/Sjukskoterska/.
§ UK scenario, cost of supplies based on UK NHS Catalogue price (2022), French scenario from CLEAN3 study[9], Italian scenario – data on file (sourced from major Italian hospital), Swedish scenarios from Varuförsörjningen supplies pricing (https://varuforsorjningen.se/).

3. Results and discussion

- In the hypothetical scenarios, a total of 14,219 hours of clinical time were saved in the intervention group.
- The potential total cost savings range between 25.4% to 41.6% in these hypothetical scenarios from four different European healthcare settings.
- Number of daily catheter hub disinfection procedures, cost of disinfection procedures, average number of dressing replacements and labour costs were the most influential parameters identified in the sensitivity analysis.
- The various model scenarios demonstrate that optimising PIVC care with technologies that are higher in price may lead to overall cost savings due to saved staff time.

3. Results and discussion (*cont'd*)

- Procedure times and the cost of staff time, especially when staff shortages are frequently reported should increasingly be considered in the assessment of medical technology adoption.

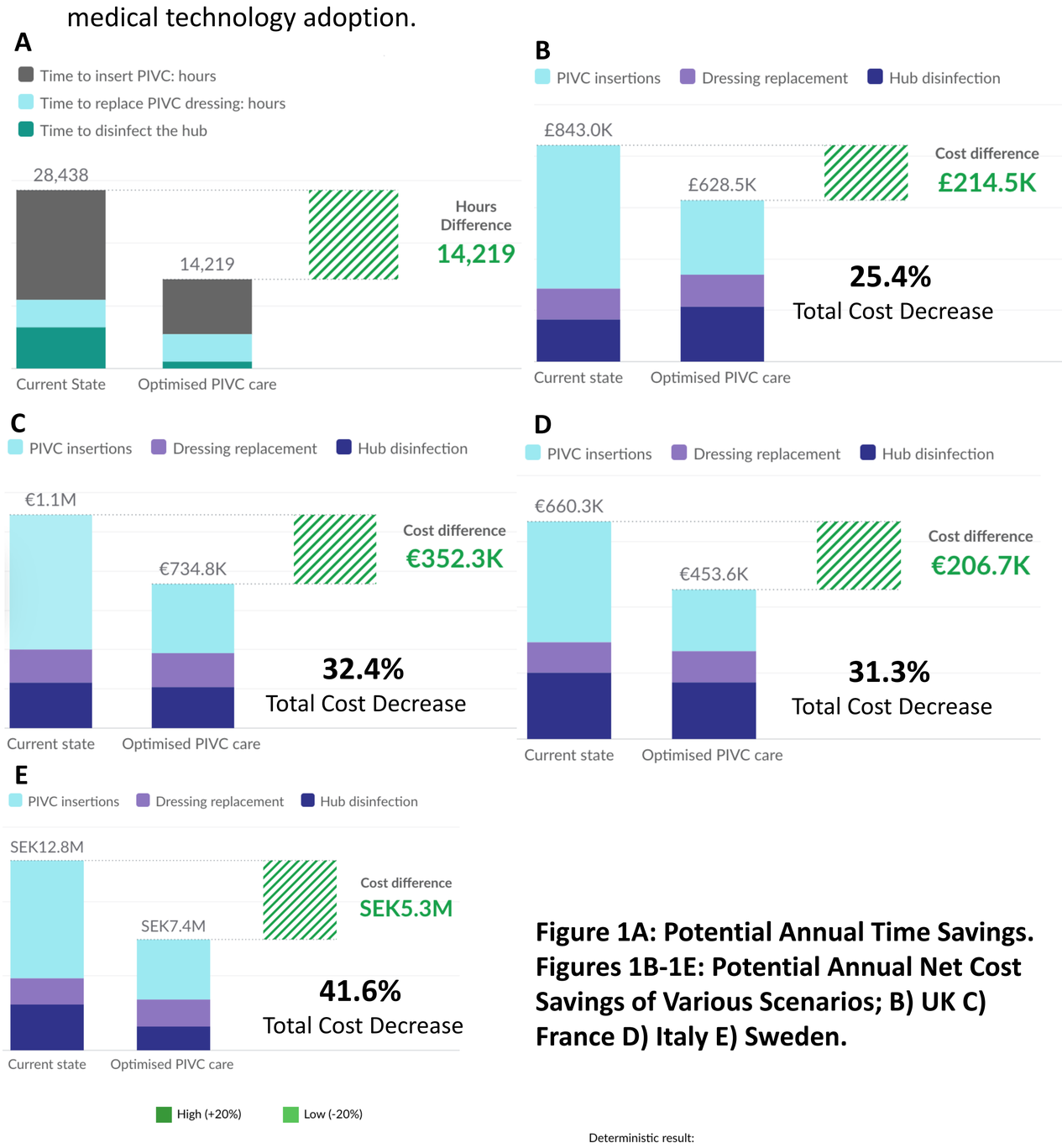

Figure 1A: Potential Annual Time Savings. Figures 1B-1E: Potential Annual Net Cost Savings of Various Scenarios; B) UK C) France D) Italy E) Sweden.

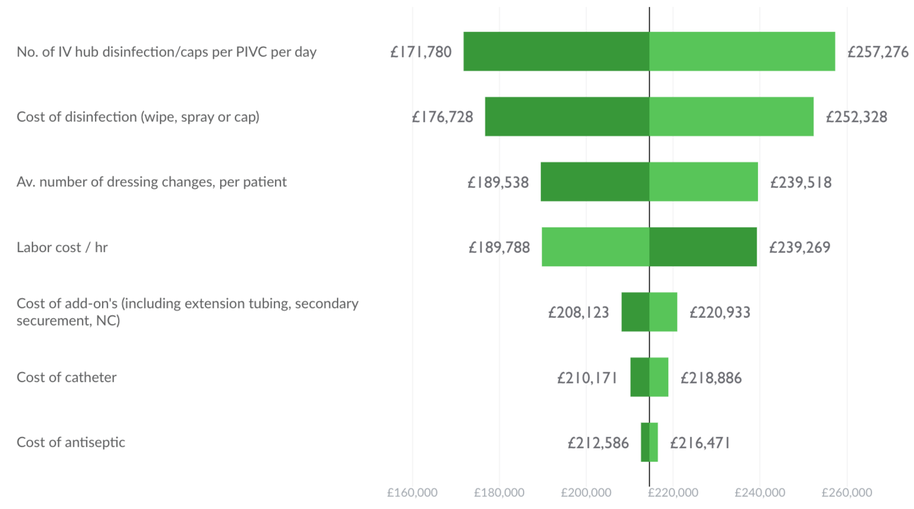

Figure 2 : One Way Sensitivity Analysis (UK scenario).

Limitations of the model

- The model does not take into consideration the rate and cost of complications, both in acute care costs or longer term social and societal consequences of complications.
- There are vast differences in the utilisation of vascular access devices and IV access management products that cannot be captured in a single scenario applicable to all clinical areas/institutions. However, the micro-costing reflective of typical PIVC insertion, maintenance practice, and labour costs in the specific geographies offer a standardised method of appraising the outputs of this model in different health economies.
- Uncertainties are addressed by one-way sensitivity analysis; however, the budget impact estimations presented herein should be carefully considered and the model recalibrated with hospital-specific data.

4. Conclusions

- Technologies to improve care protocol compliance and improved patient care quality can be cost saving. These hospital scenarios, optimising PIVC care with reduction in PIVC (re-)insertions, dressing replacements, and time spent on active hub disinfection, may achieve significant savings in staff time and cost of staff time and materials.

6. References

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‡ The study results have been moderately revised after the abstract was submitted.
^ Definitions : Active Hub disinfection : Manual disinfection process with antimicrobial impregnated wipes. Passive hub disinfection – use of a luer lock screw cap containing a sponge impregnated with antimicrobial agent.
NOTE: Specific indications, contraindications, warnings, precautions and safety information exist for these products and therapies. Please consult a clinician and product instructions for use prior to application. Rx only.