Economic Value Of Antibiotic-Impregnated External Ventricular Drain Catheters In Cerebrospinal Fluid Diversion Procedures

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Objectives

- An external ventricular drain (EVD) is the first-line, interim intervention in a variety of acute brain injuries requiring cerebrospinal fluid (CSF) diversion.
- EVD catheters pose a considerable risk of CSF infection, forcing replacement of the contaminated catheter, systemic antibiotics treatment, and prolonged hospitalisation.[1,2]
- Reducing systemic antibiotics use and the emergence of antibiotic-resistant bacteria is a focus of many healthcare systems.[3]
- Antibiotic-impregnated EVDs can be used to reduce the duration of systemic antibiotics use (1 vs 10.6 days[1]) and reduce the infection risk.
- The present model estimated the cost impact of transitioning to antibiotic-impregnated EVDs in France, Germany, Italy, and the United Kingdom (UK).

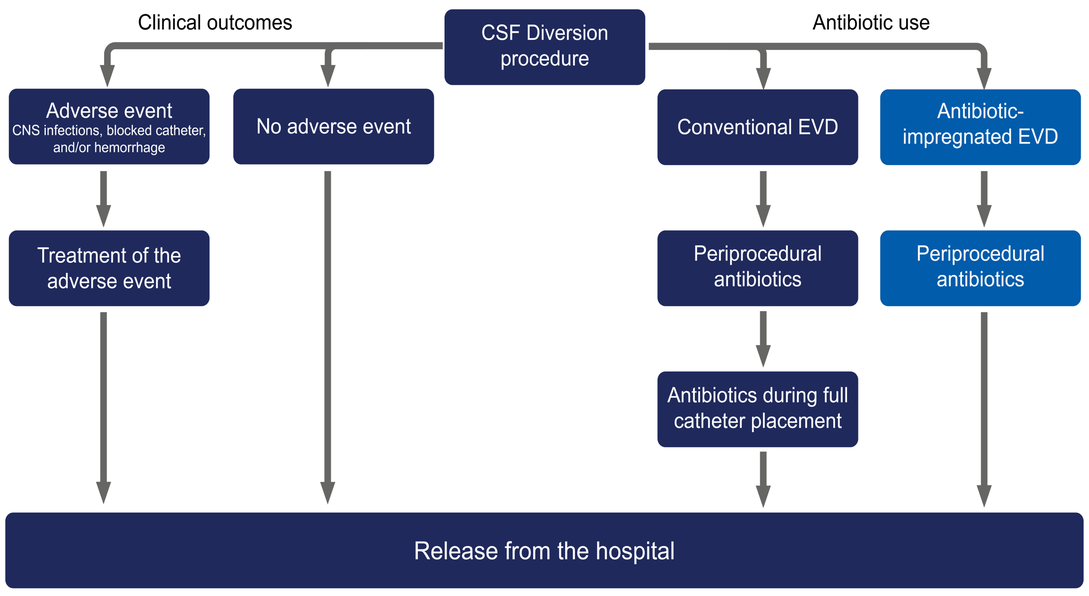

Figure 1 Pathway of the Markov model. CSF: Cerebrospinal fluid; EVD: External ventricular drain; CNS: Central nervous system

Methods

- A decision-tree model compared treatment with either conventional or antibiotic-impregnated catheters (**Figure 1**).
- The input costs were detailed for the index procedure, consumables, antibiotic use, and revision due to infections to simulate the hospital resource consumption.
- Cost data were sourced from both official reimbursement documentation and published literature for each country.
- Clinical inputs included only EVD-related adverse events and the use of systemic antibiotics (**Table 1**).
- The model estimated a 1-year time horizon from the local hospital payers' perspective.
- Cost drivers were evaluated using one-way sensitivity analysis.

Parameters	Antibiotic-impregnated EVD	Conventional EVD
Time on antibiotics	1 day[1]	10.6 days[1]
CNS infection	0.57%[2]	2.80%[2]
Blocked catheter	5.00%[1]	7.00%[1]
Hemorrhage	1.00%[1]	2.00%[1]

Table 1 Key clinical parameters used in the model. EVD: External ventricular drain; CNS: Central nervous system

CONCLUSION

Antibiotic-impregnated EVD catheters are expected to offer a cost-saving alternative to systemic antibiotic use in the four European countries examined.

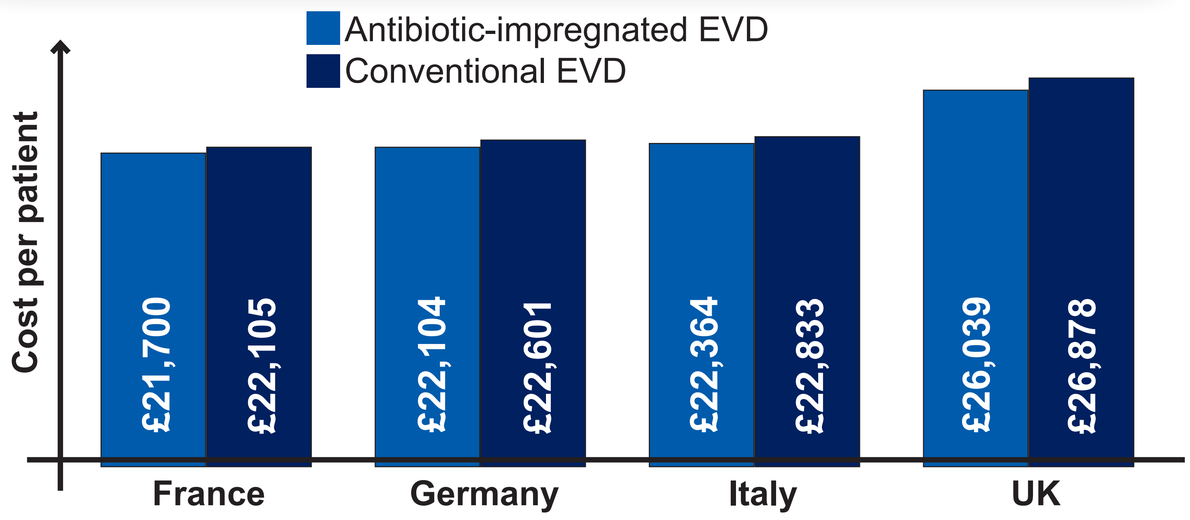

Figure 2 Cost difference per patient. EVD: External ventricular drain

Results

- In regard to clinical outcomes and costs the antibiotic-impregnated EVD system appears advantageous for the four examined European countries.
- Costs per patient were reduced in all countries (**Figure 2**), with savings ranging from 1.8% (France) to 3.1% (UK).
- In monetary terms, savings per patient were estimated to be:
  - €405 (France)
  - €497 (Germany)
  - €469 (Italy)
  - £839 (UK)
- Savings from reduced use of systemic, intravenous antibiotics accounted for up to 55% (France) of savings accrued.
- Cutbacks in infection-related management expenses from improved antibiotic prophylaxis effectively offset the higher procurement the antibiotic-impregnated catheters.
- One-way sensitivity showed that the length of stay was the largest driver of total costs of care, followed by the incidence of CNS infections.

Limitations

- The model was developed using the best clinical data available, but data is scarce and further investigations would be recommendable.
- Systemic antibiotics resource costs were modelled, but no consequences and side effects of antibiotics utilization were included.
- This is the first economic evaluation on antibiotic-impregnated EVDs and no comparison against other approaches could be made.

References

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Disclosures

This research was funded by Integra Lifesciences.

RTT and JH are employees and RS is the owner of Coreva Scientific, who received consultancy fees for this research.

LDD is an employee of Integra Lifesciences.

DR reports no conflicts of interest.

RB reports speaker fees from a device manufacturer, not for personal gain, paid direct to university.