

A cost comparison of treating *Clostridium difficile* with fidaxomicin or vancomycin from the German third-party payer perspective

Maureen Watt,¹ Sebastian Heimann,² Chris Longshaw¹

1. Astellas Pharma EMEA, Chertsey, UK; 2. University Hospital of Cologne, Germany

INTRODUCTION

- Although cost-effectiveness modelling methods may be the gold-standard decision aids, hospital-level budget holders often prefer simple and pragmatic cost calculation tools.
 - Accurate assessment of budget impact should include not only drug acquisition costs, but also additional healthcare utilisation costs.
- Vancomycin and metronidazole – commonly used first-line therapies for *Clostridium difficile* infection (CDI) in Germany – have low acquisition costs, but are associated with recurrence rates of up to 30%.¹
 - Fidaxomicin is associated with a significantly lower recurrence rate than vancomycin,^{2,3} but is frequently reserved as second-line treatment because of its higher acquisition costs.
- A recently published, independent academic study from a tertiary care hospital in Germany (Heimann et al 2015⁴) suggests that healthcare utilisation associated with (and therefore costs of) managing CDI, and in particular recurrent episodes, is much higher than previously thought.

OBJECTIVE

- To use German cost data to compare the budget impact of first-line treatment with fidaxomicin vs. vancomycin from a German third-party payer perspective, using a simple cost calculator tool.

METHODS

Budget impact analysis

- The potential budget impact of treating 100 hypothetical patients with fidaxomicin or vancomycin for CDI was compared.
- Recurrence rates were based on data from two Phase III head-to-head comparator trials of fidaxomicin vs. vancomycin.^{2,3}
- The costs associated with managing the initial and any recurrent CDI episodes were taken from the independent study conducted by Heimann et al 2015⁴ (Table 1). Compared with matched controls, the additional direct costs related to CDI were €3,932 (initial episode) and €59,367 (≥1 recurrent episode).⁴
 - The costs of treating recurrent episodes were driven mainly by the costs associated with intensive care unit (ICU) stays.
- It was assumed that the cost of treating a second recurrence is the same as that for treating a first recurrence, and that there is no additional acquisition cost for vancomycin, but an additional cost of €1,474 for fidaxomicin.
 - These are conservative assumptions, translating into lower mean costs in the vancomycin arm compared with the fidaxomicin arm.

Table 1. Costs associated with managing initial and subsequent CDI episodes in Germany (from Heimann et al 2015)⁴

	Cost (95% CI)		
	Initial CDI episode	Recurrent CDI episode	Controls ^a
Direct costs ^a	€18,463 (€14,655–€22,271)	€73,898 (€50,337–€97,460)	€14,531 (€11,729–€17,333)
Additional costs related to CDI	€3,932	€59,367	

^aIncludes costs of treatment on general ward or intensive care unit; mechanical ventilation; overall drug costs; additional treatment with anti-infectives, statins, H₂ receptor antagonists or proton pump inhibitors; microbiological tests; and specific infection control measures for CDI
^bMatched to CDI cases with respect to age (± 5 years), gender, level of the International Statistical Classification of Diseases and Related Health Problem (ICD Code), patient clinical complexity level (± 1), ethnicity and calendar year of patient stay CDI, *Clostridium difficile* infection; CI, confidence interval

Sensitivity analyses

- Sensitivity analyses were performed to:
 - Reduce the cost of treating the first recurrence to 30% and 50% of the cost in the base model (as this is derived from data on the cost of treating ≥1 recurrence).
 - Include an acquisition cost of €61 for vancomycin within the fidaxomicin arm.
 - Use recurrence data from a real-world clinical setting study of fidaxomicin compared with standard of care in the UK (3.1% and 10.6%, respectively),⁵ rather than data from randomised controlled trials.

RESULTS

Budget impact analysis

- It was estimated that of 100 hypothetical patients treated with vancomycin for an initial CDI episode, 26 would have a recurrence and of these, nine would have a further, second recurrence. When 100 hypothetical patients were treated with fidaxomicin, 14 would experience a first recurrence and three of these would have a second recurrence.
- The costs of treating the initial CDI episode and two recurrences are summarised in Table 2.
 - Treating 100 patients with CDI with first-line fidaxomicin rather than vancomycin is associated with cost savings of almost €900,000 (Figure 1).

Sensitivity analyses

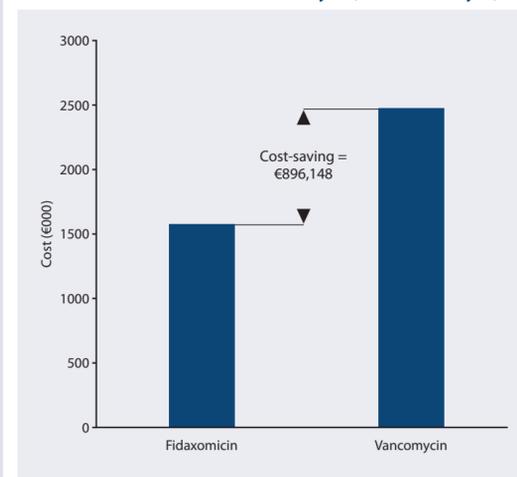
- In all sensitivity analyses, the cost of treating 100 patients with first-line fidaxomicin rather than vancomycin was still associated with substantial cost savings.
 - When the cost of treating the first recurrence was reduced to 30% and 50% of the base-case cost, cost savings were €397,464 and €539,952, respectively (Tables 3 and 4).
 - When the cost of vancomycin was assumed to be €61, the cost saving was €903,285 (Table 5).
 - Using real-world recurrence data, the cost saving was €293,283 (Table 6).

Table 2. Costs of treating initial and recurrent CDI episodes with first-line fidaxomicin or vancomycin

	Fidaxomicin		Vancomycin	
	Number of patients	Cost	Number of patients	Cost
Initial episode	100	€540,600 [100 × cost of initial episode ^a + 100 × cost of fidaxomicin ^b]	100	€393,200 [100 × cost of initial episode ^a]
First recurrence	14	€851,774 [14 × cost of recurrent episode ^a + 14 × cost of fidaxomicin ^b]	26	€1,543,542 [26 × cost of recurrent episode ^a]
Second recurrence	3	€182,523 [3 × cost of recurrent episode ^a + 3 × cost of fidaxomicin ^b]	9	€534,303 [9 × cost of recurrent episode ^a]
Total cost	–	€1,574,897	–	€2,471,045
Cost saving with fidaxomicin	–	-€896,148	–	–

^a€3,932; ^b€1,474; ^c€59,367
 CDI, *Clostridium difficile* infection

Figure 1. Budget impact of treating 100 patients with CDI with first-line fidaxomicin rather than vancomycin (base-case analysis)



CDI, *Clostridium difficile* infection

Table 3. Sensitivity analysis – cost of first recurrence reduced to €17,810 (30% of base-case cost)

	Fidaxomicin		Vancomycin	
	Number of patients	Cost	Number of patients	Cost
Initial episode	100	€540,600 [100 × cost of initial episode ^a + 100 × cost of fidaxomicin ^b]	100	€393,200 [100 × cost of initial episode ^a]
First recurrence	14	€269,976 [14 × cost of recurrence 30% + 14 × cost of fidaxomicin ^b]	26	€463,060 [26 × cost of recurrence 30%]
Second recurrence	3	€182,523 [3 × cost of second recurrence ^a + 3 × cost of fidaxomicin ^b]	9	€534,303 [9 × cost of second recurrence ^a]
Total cases	117		135	
Total cost	–	€993,099	–	€1,390,563
Cost saving with fidaxomicin	–	-€397,464	–	–

^a€3,932; ^b€1,474; ^c€17,810; ^d€59,367

Table 4. Sensitivity analysis – cost of first recurrence reduced to €29,684 (50% of base-case cost)

	Fidaxomicin		Vancomycin	
	Number of patients	Cost	Number of patients	Cost
Initial episode	100	€540,600 [100 × cost of initial episode ^a + 100 × cost of fidaxomicin ^b]	100	€393,200 [100 × cost of initial episode ^a]
First recurrence	14	€436,212 [14 × cost of recurrence 50% + 14 × cost of fidaxomicin ^b]	26	€771,784 [26 × cost of recurrence 50%]
Second recurrence	3	€182,523 [3 × cost of second recurrence ^a + 3 × cost of fidaxomicin ^b]	9	€534,303 [9 × cost of second recurrence ^a]
Total cases	117		135	
Total cost	–	€1,159,335	–	€1,699,287
Cost saving with fidaxomicin	–	-€539,952	–	–

^a€3,932; ^b€1,474; ^c€29,684; ^d€59,367

Table 5. Sensitivity analysis for removing cost of vancomycin from fidaxomicin costs

	Fidaxomicin		Vancomycin	
	Number of patients	Cost	Number of patients	Cost
Initial episode	100	€534,500 [100 × cost of initial episode ^a + 100 × cost of fidaxomicin ^b - 100 × cost of vancomycin ^c]	100	€393,200 [100 × cost of initial episode ^a]
First recurrence	14	€850,920 [14 × cost of recurrent episode ^a + 14 × cost of fidaxomicin ^b - 14 × cost of vancomycin ^c]	26	€1,543,542 [26 × cost of recurrent episode ^a]
Second recurrence	3	€182,340 [3 × cost of recurrent episode ^a + 3 × cost of fidaxomicin ^b - 3 × cost of vancomycin ^c]	9	€534,303 [9 × cost of recurrent episode ^a]
Total cases	117		135	
Total cost	–	€1,567,760	–	€2,471,045
Cost saving with fidaxomicin	–	-€903,285	–	–

^a€3,932; ^b€1,474; ^c€61; ^d€59,367

Table 6. Sensitivity analysis using real-world recurrence data

	Fidaxomicin		Vancomycin	
	Number of patients	Cost	Number of patients	Cost
Initial episode	100	€540,600 [100 × cost of initial episode ^a + 100 × cost of fidaxomicin ^b]	100	€393,200 [100 × cost of initial episode ^a]
First recurrence	3.1	€188,607 [3.1 × cost of recurrent episode ^a + 3.1 × cost of fidaxomicin ^b]	10.6	€629,290 [10.6 × cost of recurrent episode ^a]
Total cases	103.1		110.6	
Total cost	–	€729,207	–	€1,022,490
Cost saving with fidaxomicin	–	-€293,283	–	–

^a€3,932; ^b€1,474; ^c€59,367

CONCLUSIONS

- From a German third-party payer perspective, first-line treatment with fidaxomicin rather than vancomycin would be associated with substantial cost savings.
 - This is driven by the significantly lower recurrence rates with fidaxomicin and the high cost of treating such recurrences, based on data from the tertiary care setting in which patients require significant care in ICU.
- These analyses emphasise the importance of looking beyond simple drug acquisition costs when evaluating the budget impact of different treatment options.

ACKNOWLEDGEMENTS

Initiated and financially supported by Astellas Pharma EMEA. Editorial support was provided by Nicola French of Bioscript Medical and funded by Astellas Pharma EMEA.

REFERENCES

- Leong C, Zelenitsky S. Can J Hosp Pharm 2013;66:361–8.
- Louie TJ, et al. N Engl J Med 2011;364:422–31.
- Cornely OA, et al. Lancet Infect Dis 2012;12:281–9.
- Heimann SM, et al. Infection 2015;43:707–14.
- Goldenberg SD, et al. Eur J Clin Microbiol Infect Dis 2016;35:251–9.

