A Cost-Impact Analysis of a Novel Diagnostic Test to Assess Community-Acquired Pneumonia Etiology in the Emergency Departments: a French Perspective

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Model structure

A cost-impact model was developed to estimate the clinical and economic impact of a Host-Response Diagnostic Test (HRDT), able to differentiate bacterial from viral pathogens in Community-Acquired Pneumonia (CAP) patients presenting to the Emergency Department (ED) in France [1,2].

Clinical outcomes were simulated through a decision tree model, populated with data from literature searches. The model scheme is presented in Figure 1. In the first treatment arm, patients receive a bacterial or viral diagnosis based on SOC diagnostic processes (i.e., X-ray, complete blood count, and viral PCR testing). Subsequently, patients are either admitted to the hospital or treated in the ED. They are then classified according to the accuracy of the diagnosis as a true positive (TP; bacterial diagnosis), false positive (FP; misclassified viral etiology), true negative (TN; viral diagnosis), or false negative (FN; misclassified bacterial etiology).

SOC + HRDT-diagnosed patients follow the same pathway, which is informed by the test results. With a bacterial diagnosis (HRTD test scores from 65–100), patients are administered antibiotics. In the case of a viral diagnosis (scores from 0–35), the patient is not exposed to antibiotics. Patients with uncertain test results (scores from 35–65) follow the SOC-guided treatment path.

Early and appropriate therapy can improve clinical outcomes, reducing the risk of Adverse Events (AE) and Clostridium Difficile Infections (CDI). On the other hand, FP patients would undergo unnecessary antibiotic treatment, and FN patients would remain in treatment for a longer duration due to their worsening clinical condition.

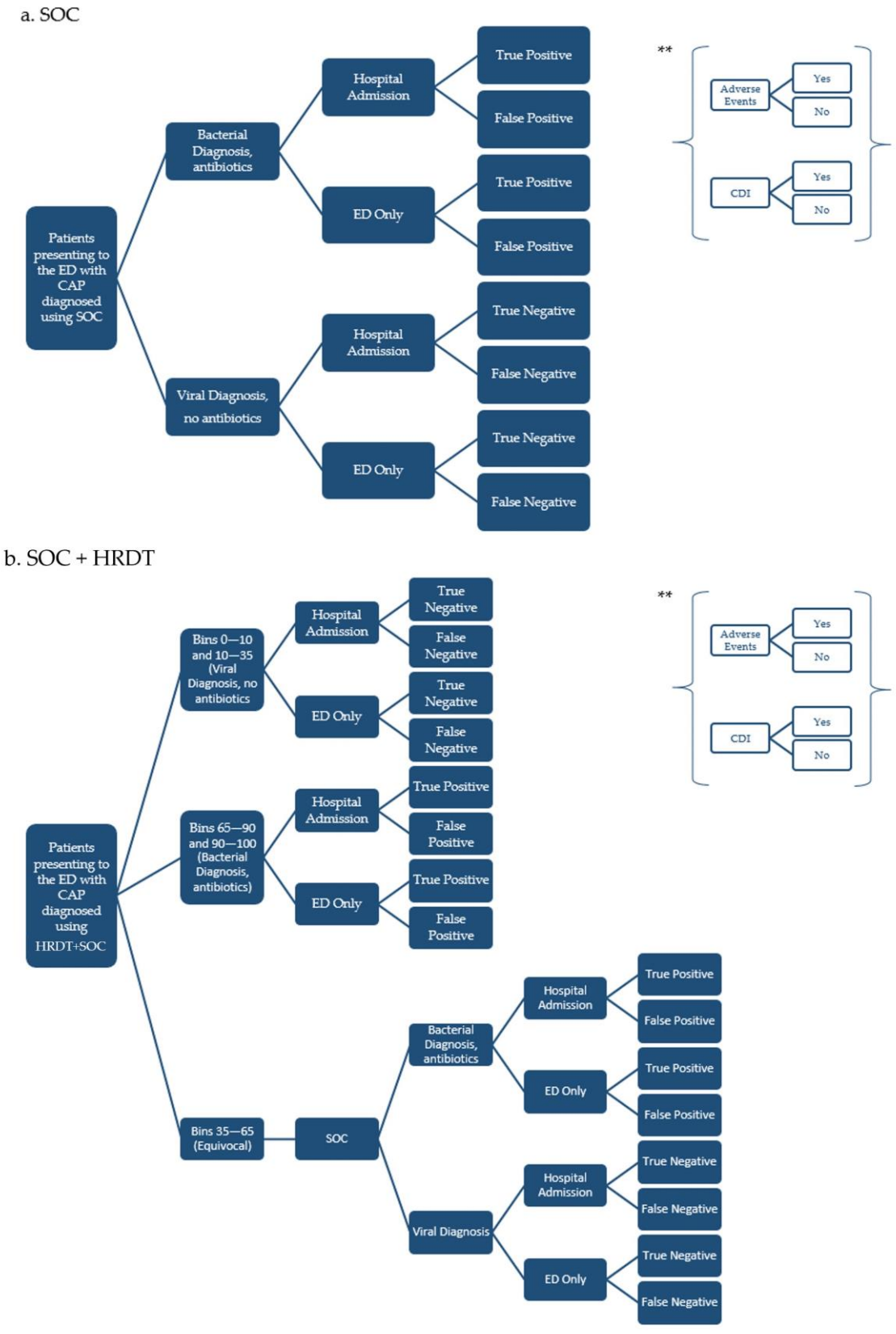

Figure 1. Simplified model scheme [2]. ** At each leaf node of the decision tree, patients may experience antibiotic-related AEs or CDIs. AEs: adverse events; CDIs: *Clostridium difficile* infection.

Results

Table 1 displays the breakdown of savings from both perspectives.

Table 1 - Saving per patient (€)

Cost item	Main analysis		Scenario 1		Scenario 2		Scenario 3	
	H	TPP	H	TPP	H	TPP	H	TPP
Diagnostic testing	-	-	-	-	-	-	-	-
ED visit	-	-	-	-	-	-	-	-
Inpatient days of AB treatment	25.6	-	28.0	-	25.6	-	28.0	-
Outpatient days of AB treatment	-	0.1	-	(0.1)	-	0.1	-	(0.1)
Adverse events	1.0	-	1.1	-	1.0	-	1.1	-
Inpatient CDI	17.3	18.5	19.1	20.3	17.3	18.5	19.1	20.3
Outpatient CDI	14.0	11.0	18.2	10.0	14.0	11.0	18.2	10.0
Hospital Stay	-	(10.6)	50.5	20.7	260.1	62.5	314.3	95.3
Total	***57.9***	***19.0***	***116.9***	***51.0***	***318.1***	***92.0***	***380.7***	***125.6***

AB: antibiotic; CDI: *Clostridium difficile* infection; ED: emergency department; H: hospital; TPP: third-party payers

References

1. Schneider JE, Cooper JT. Cost impact analysis of novel host-response diagnostic for patients with community-acquired pneumonia in the emergency department. J Med Econ. 2022;25(1):138-151. doi:10.1080/13696998.2022.2026686
2. Houshmand H, Porta C, Pradelli L, Pinciroli M, Sotgiu G. Cost-Impact Analysis of a Novel Diagnostic Test to Assess Community-Acquired Pneumonia Etiology in the Emergency Department Setting: A Multi-Country European Study. International Journal of Environmental Research and Public Health. 2023; 20(5):3853. https://doi.org/10.3390/ijerph20053853