EE483

ID

Porta C[1], Pradelli L[1], Pinciroli M[2], Monterosso F[2], Houshmand H[2]

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

[1]AdRes HE&OR, Turin, Italy, [2]DiaSorin SpA, Saluggia, Italy

Objective

Community-Acquired Pneumonia (CAP) is one of the **leading causes of mortality** worldwide [1].
The identification of the **etiologic agent** poses a major challenge in the management of CAP patients. **Early detection** of the causative pathogen can mitigate antibiotic overuse and misuse, leading to reduced healthcare costs and curbing the rise of antimicrobial drug resistance [2].
This analysis aims to estimate the clinical and economic impact of a Host-Response Diagnostic Test (HRDT), able to **differentiate bacterial from viral pathogens** in CAP patients presenting to the Emergency Department (ED) in France.

Methods

A **literature-based cost-impact model** was adapted to the French context to evaluate the **financial consequences** of the introduction of HRDT into the Standard of Care (SOC) diagnostic process [3,4].

- **Clinical and economic outcomes** associated with treatment guided by SOC and treatment guided by SOC+HRDT in CAP patients presenting to the ED were compared.
- The population was stratified into four groups according to **Pneumonia Severity Index** (PSI). Clinical outcomes were simulated through a **decision tree model**, populated with data from literature searches [3,4]. In both arms, patients receive a bacterial or viral diagnosis based on the diagnostic process and, subsequently, they are either admitted to the hospital or treated in the ED. The accuracy of the diagnosis depends upon the sensitivity and specificity of the applied testing strategy.
  - Early and appropriate therapy can improve patients' prognosis, reducing the risk of Adverse Events (AEs) and Clostridium Difficile Infections (CDIs).
  - False positives undergo unnecessary antibiotic treatment and false negatives would remain in treatment for a longer duration due to their worsening clinical condition.
- Both **Third-Party Payers (TPP)** and **hospital perspectives** were considered.
- Unit cost inputs and resource use data, including the mean values of antibiotic (AB) treatment duration and length of stay (LOS), were collected from French national tariffs, institutional data, and published literature (*Table 1*) [5-12].
- Four scenarios were considered to evaluate HRDT impact, factoring in different drivers (*Table 2*).

Table 1. Unit costs (€)

Cost item	Value
Diagnostics & ED visit	
X-Ray	21.28
CBC	5.20
Viral PCR	135.00
ED visit	340.02
AB treatment	
Outpatient AB / day	1.53
Inpatient AB / day	26.07
Hospital	
Ward cost / day	846.15
CAP / episode	4,029.29
Inpatient CDI / episode	7,032.42
Outpatient CDI / episode	3,816.59

AB cost

Inpatient and outpatient antibiotic costs per day were calculated by averaging the daily cost of antibiotics recommended by international guidelines [5,11].

Hospital cost

Hospital perspective

Hospital cost was estimated by multiplying the LOS by the bed-day cost [12], factoring in additional hospital days in case of AE or CDI.

TPP perspective

- Hospital cost per CAP episode was calculated by applying the national Diagnosis-Related Group (DRG) tariffs, adjusted according to the number of patient discharges in France.
- In the case of inpatient CDI, the DRG associated with the most severe condition was considered.
- Cost of outpatient CDI was inferred by applying a weighted average of the DRG tariffs related to gastrointestinal disease.

Table 2. Impacts considered in each scenario

Scenario	Antibiotic prescription	Hospital admission	LOS/DRG reallocation*
Main Analysis (MA)	•		
Scenario 1 (S1)	•	•	
Scenario 2 (S2)	•		•
Scenario 3 (S3)	•	•	•

*SOC + HRDT was assumed to decrease the portion of patients allocated to more severe DRG classifications due to less severe patient cases.

Results

HRDT can help **save healthcare resources**

- **43%** reduction in antibiotic prescription
- **1.02** antibiotic days saved per patient
- **0.8%** reduction in hospital admission
- **0.04-0.42** hospital days saved per patient

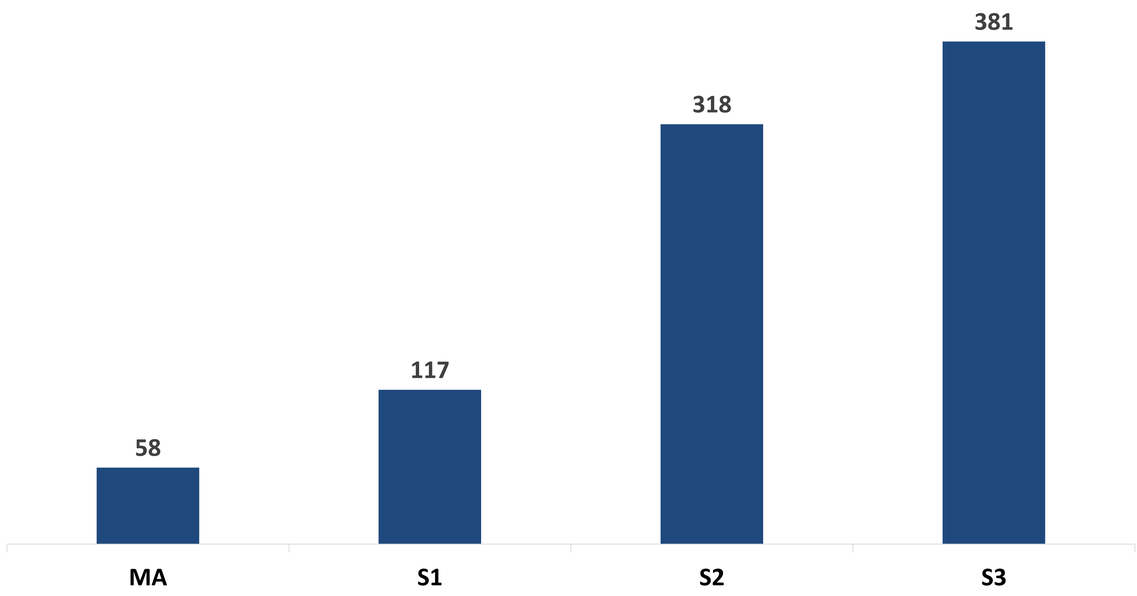
The cost of the hospital stay was the key determinant of results (*Table 3*).

Table 3. Savings breakdown per patient (€) – Hospital perspective

Cost drivers	MA	S1	S2	S3
Inpatient AB	25.6	28.0	25.6	28.0
Adverse events	1.0	1.1	1.0	1.1
Inpatient CDI	17.3	19.1	17.3	19.1
Outpatient CDI	14.0	18.2	14.0	18.2
Hospital stay	-	50.5	260.2	314.3
Total savings	**57.9**	**116.9**	**318.1**	**380.7**

The adoption of HRDT (omitting its cost) would result in cost **savings per patient** in the range **€58-€381** for **hospitals**, depending on which of the saving drivers are factored in (*Figure 1*). Considering the TPP perspective, savings per patient would be as follows: €19 (MA), €51 (S1), €92 (S2), and €126 (S3).

Figure 1. Savings per patient across scenarios (€) – Hospital perspective



MA (Main Analysis), **S1** (Scenario 1), **S2** (Scenario 2), **S3** (Scenario 3)

Conclusions

In CAP patients presenting to the ED in France, **SOC+HRDT results as a cost-saving alternative** for both payers and hospitals, whilst providing substantial clinical benefits.

References

1. WHO The Top 10 Causes of Death—Factsheet. https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death
2. Tamma PD et al. *JAMA Intern Med.* 2017;177(9):1308–1315.
3. Schneider JE et al. *J Med Econ.* 2022;25(1):138-151.
4. Houshmand H et al. *Int J Environ Res Public Health.* 2023;20(5):3853.
5. Metlay JP et al. *Am J Respir Crit Care Med.* 2019;200(7):e45-e67.
6. Scan Santé. Stats ATIH. http://www.scansante.fr/
7. Martin M et al. *J Antimicrob Chemother.* 2007;59(5):977-989.
8. CCAM. Classification commune des actes medicaux. https://www.ameli.fr/accueil-de-la-ccam/index.php
9. Actes de biologie médicale par type de prescripteur. https://assurance-maladie.ameli.fr/etudes-et-donnees/actes-biologie-medicale-type-prescripteur-biolam
10. Referentiel des actes innovants hors nomenclature. https://sante.gouv.fr/systeme-de-sante/innovation-et-recherche/rihn
11. BdM_IT. http://www.codage.ext.cnamts.fr/codif/bdm_it/
12. Pradelli et al. *Clin Nutr.* 2014;33(5):785-792.

Acknowledgements This analysis was funded by DiaSorin SpA, Italy