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Cost Effectiveness of Novel Antibiotic C/T in Patients with Hospital-Acquired Bacterial Pneumonia or ventilator-Associated Bacterial Pneumonia in Greece

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INTRODUCTION

- **Antibiotic Resistance** is one of the **most prominent issues, which could post a threat to global health**.[1]
- **Greece is among the countries with the highest percentages of antibiotic use and resistance.[2]**
- Cassini et. al., demonstrated in an analysis using the EARS-NET ECDC data that, "Greece had a substantially higher estimated burden of antibiotic-resistant bacteria than other EU and EEA countries, with carbapenem-resistant or colistin resistant bacteria causing a larger proportion of the total burden in Greece than it did in Italy."[3]
- The issue of antibiotic resistance **has worsened during the pandemic** given the increased use of antibiotics.[4]
- As a result, access of novel antibiotics is essential for Greek patients and especially in indications such as pneumonia, it can make the difference between life and death, as it will be displayed in this model.

AIM

The present study assesses the cost-effectiveness of **C/T(C/T)** in **ICU-admitted ventilated hospital-acquired bacterial pneumonia (vHABP)** and ventilator-associated bacterial pneumonia (VABP) due to **Multiple Drug Resistant Pseudomonas Aeruginosa** in Greece.

METHODS

Model Overview

The model consists of a decision-tree, depicting the period from vHABP/VABP onset to hospital discharge and a Markov model, projecting long-term outcomes (cured, not cured, and death) following hospital discharge. Costs and QALYs are discounted at an annual rate of 3.00%. Time horizon is set to 40 years. Standard sensitivity analyses were conducted to examine robustness of the model results.

Modelled Clinical Scenarios of C/T Use

In the initial treatment setting (Figure 1), patients are treated upon suspicion of infection. Once test results for the susceptibility profile of the causative pathogen are confirmed, patients follow one of three treatment pathways:

- Patients whose causative pathogen is susceptible to initial treatment remain on the initial treatment; however, if not cured, they will move to a second line of therapy
- Patients susceptible to initial treatment as well as a lower-cost treatment are de-escalated to that treatment
- Patients whose initial treatment is inappropriate (IIAT) and have to be switched to an alternative treatment

In the confirmed treatment setting (Figure 2), patients are treated when the susceptibility profile of the causative pathogen is known. Should this treatment fail, patients who are alive but uncured move to another line of therapy.

Data sources

Clinical efficacy of C/T and meropenem is informed by ASPECT-NP trial *. Greek inputs have been used where available, whereas data from the PACTS surveillance database of Italy have been used since it is a country with the most similar antibiotic resistance data with Greece. The data have been thereafter reviewed and validated by experts. Based on experts' opinion, C/T is expected to be used 50% in initial treatment setting and 50% in confirmed setting, as captured in the model base case.

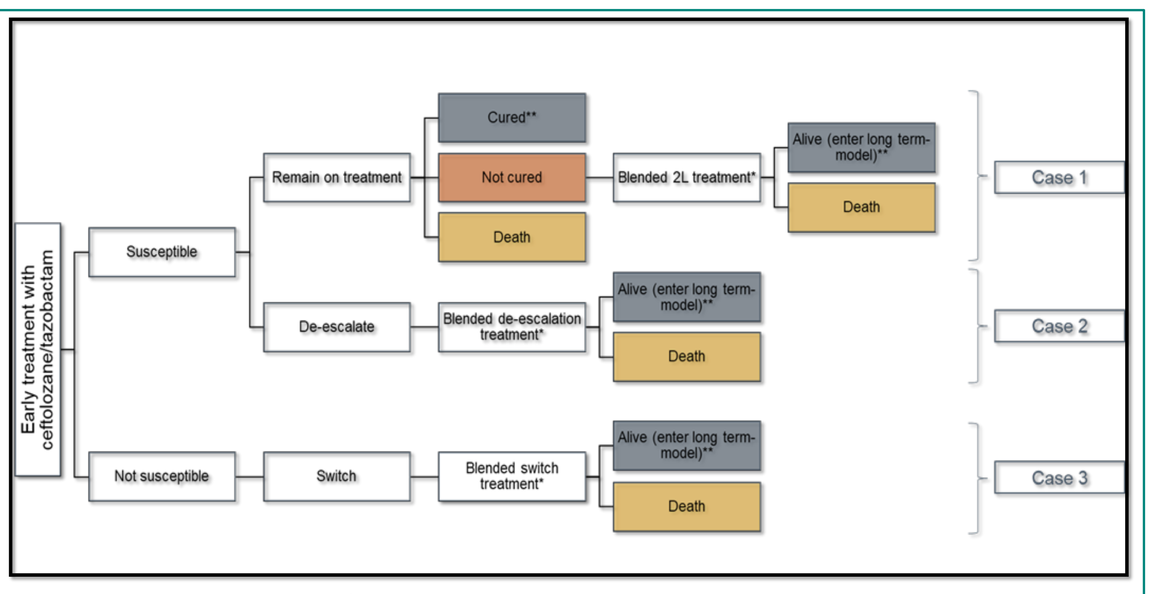
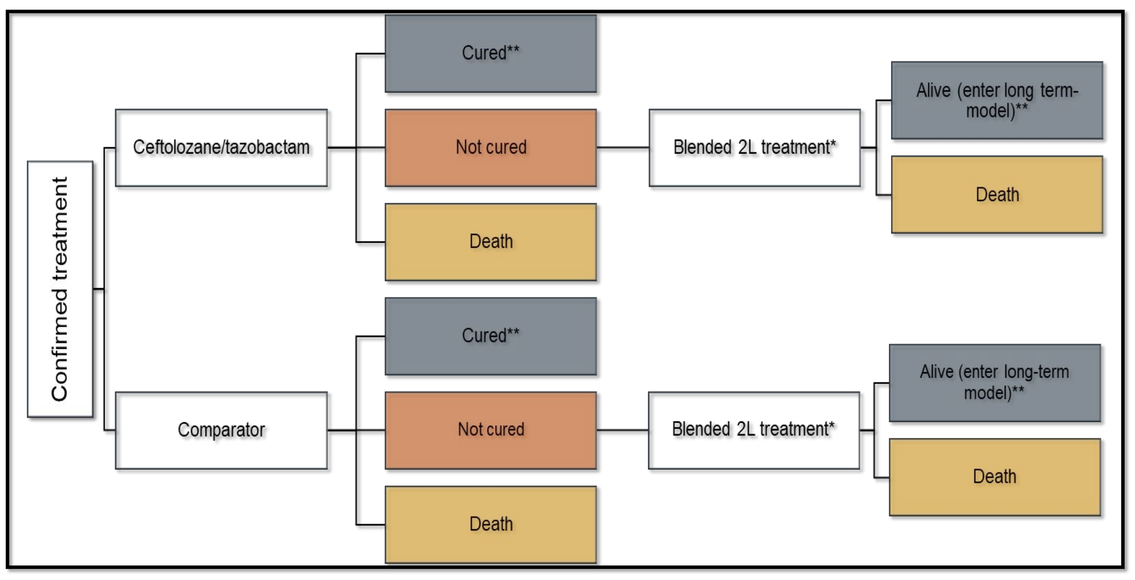


Figure 1: Initial Treatment Setting

Figure 2: Confirmed Treatment Setting



* ASPECT-NP trial did not limit to MDR PsA patient only but all qualified ICU-admitted HABP/VABP patients. It is expected that the comparative efficacy is more in favor of C/T in the MDR PsA subgroup. Therefore, this is considered a conservative assumption in the model.

RESULTS

Base case results

Patients who received C/T spent 1.97 days less (avg. 17.99 days) with mechanical ventilator support compared to Meropenem (avg. 19.97 days) with mechanical ventilator support.(Figure 3) Patients in the Meropenem treatment arm are expected to have 8.66 LY's and 7.11 QALY's with a cost of 33,896€. Whereas patients in the C/T arm are expected to have 10.18 LY's and 8.34 QALY's at a cost of 35,135€.

The ICER for C/T was 994€ per QALY compared to Meropenem, lower than the unofficial threshold in Greece of 52,770 per QALY € (3x Greece 2021 GDP per capita).[5] **The initiation of C/T for this indication is expected to save 25 patient's** lives within **the first 5 year of its introduction to the market.**

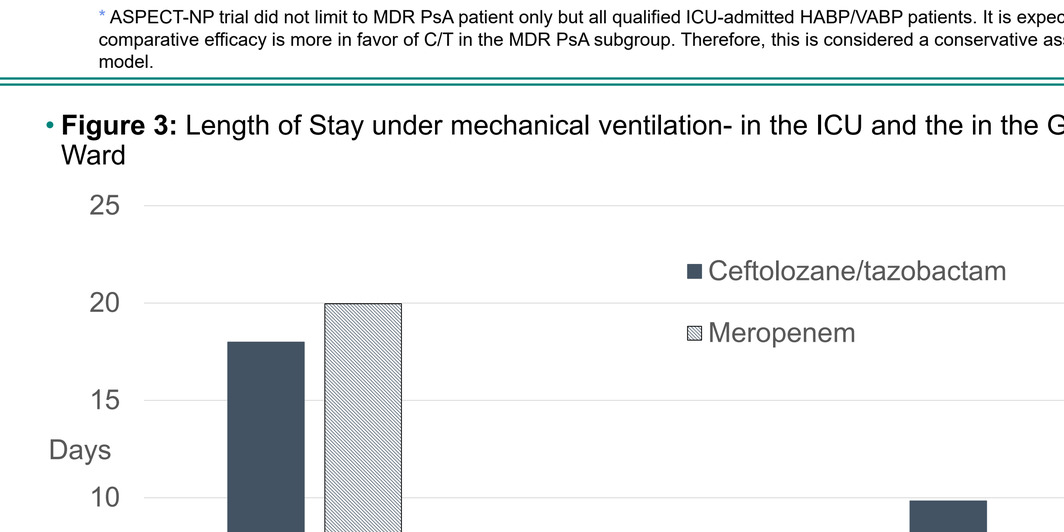
Sensitivity Analysis

One-way sensitivity analysis (Figure 4) suggested that most influential parameters were the days spent on mechanical ventilation, in the ICU and in the general ward. This is expected as hospital LOS directly affects resource use costs in the short-term model, where the majority of costs are incurred.

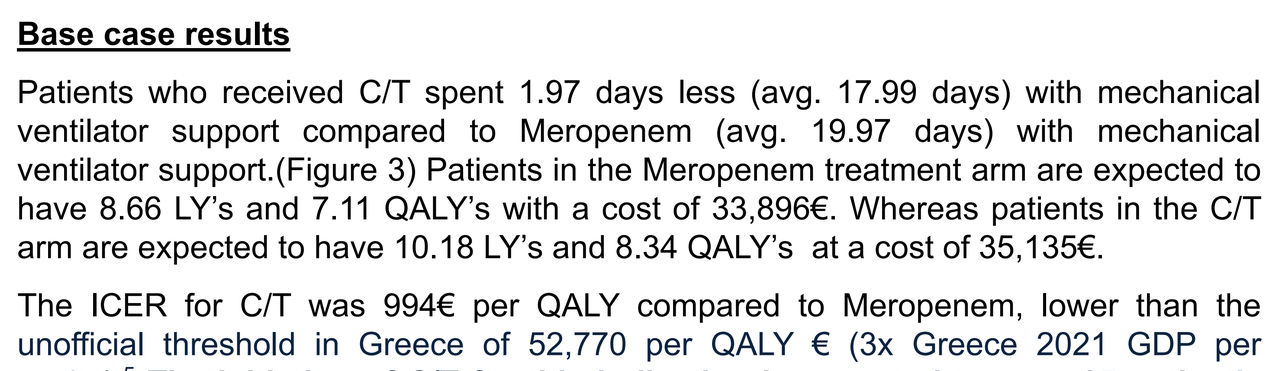
A Probabilistic Sensitivity Analysis (Figure 5) showed that C/T had a 99.94% probability of being cost effective at a threshold of 52,770€ per QALY (3x Greece 2021 GDP per capita).[5]

• **Figure 3:** Length of Stay under mechanical ventilation- in the ICU and the in the General Ward

• **Figure 4:** Deterministic Sensitivity Analysis Results



• **Figure 5:** Probabilistic Sensitivity Analysis Results



CONCLUSIONS

- The present study suggests that C/T could be a cost-effective treatment option for patients with **ICU-admitted ventilated hospital-acquired bacterial pneumonia (vHABP)** and ventilator-associated bacterial pneumonia (VABP) due to **Multiple Drug Resistant Pseudomonas Aeruginosa** in Greece.
- It is essential for Greece to follow a comprehensive plan to limit antibiotic overuse and to recognize the value of novel antibiotics, since the access of such products is of great importance.

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