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Framework Concepts For Economic Evaluation Of New Antibiotics

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OBJECTIVES

Currently, the value of new antibiotics is underestimated since the special “externalities” are not considered in conventional economic evaluation[1]. This conceptual paper aims to provide a practical framework with transmission value, namely the value of successful treatment in preventing or reducing the spread of infection.

METHODS

FRAMEWORK:

Incremental direct costs: arise from the different costs comparing the new therapy with the existing one.

Transmission savings: benefit from the decreased transmission of infections to the rest of the population. **Costs**

ICER

(Incremental Cost-Effectiveness Analysis) $= (\Delta C - S_t) / (\Delta V + V_t)$

Incremental direct benefits: arise from the different health outcomes comparing the new therapy with the existing one.

Transmission benifits: benefit from the decreased transmission of infections to the rest of the population. **QALYs**

RESULTS

Under the hospital setting, we assume that there is just one bacterial infection and that the particular pathogen is resistant to the existing antibiotic. The incidence of infections will decrease as a result of prevented transmission once the new antibiotic has been administered to resistant inpatients for a while. The integers N_{begin} and N_{end} represent the number of inpatients who are infected when admission and all infected inpatients after the given period, respectively. N_a is the total number of avoided transmission cases between utilizing new and existing antibiotics (1).

$$N_a = \Delta (N_{end} - N_{begin}) \quad (1)$$

Differences in *Cost*, *Hospital LOS* and *Utility Value* are between inpatients utilizing new and existing antibiotics (2), (3). ΔV is measured in quality-adjusted life years (QALYs) (3).

$$\text{Incremental Direct Costs } (\Delta C) = N_{begin} \times \Delta \text{Cost} \quad (2)$$

$$\text{Incremental Direct Benefits } (\Delta V) = N_{begin} \times \Delta \text{Hospital LOS} \times \Delta \text{Utility Value} \quad (3)$$

Inpatients could only be treated with existing antibiotics before the new antibiotic being available (4). We assume that the *Hospital LOS* for healthy individuals is 0. Differences in *Hospital LOS* and *Average Utility Value* are between healthy individuals and inpatients utilizing existing antibiotic (4)(5).

$$\text{Transmission Savings } (S_t) = N_a \times \text{Cost of Existing Antibiotic} \quad (4)$$

$$\text{Transmission Benefits } (V_t) = N_a \times \Delta \text{Hospital LOS} \times \Delta \text{Average Utility Value} \quad (5)$$

CONCLUSIONS

More scenarios, such as the population setting where N_a is available from the dynamic disease transmission model, could be covered by the framework. To do so would better understand the direct and transmission value of new antibiotics and inform clinical and reimbursement decisions.

Reference: [1] MORTON A, COLSON A, LEPOROWSKI A, et al. How Should the Value Attributes of Novel Antibiotics Be Considered in Reimbursement Decision Making?[J/OL]. MDM Policy & Practice, 2019, 4(2): 238146831989223. DOI:10.1177/2381468319892237.

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