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A Conceptual Paper: Integrating a Pharmacometric Multistate Model with Cost-Effectiveness Analysis for Infectious Diseases Treatment Optimisation

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INTRODUCTION

Suboptimal dosing and antimicrobial resistance are major contributors to treatment failure in infectious diseases. These challenges are particularly important in low- and middle-income countries (LMICs), where the burden of infectious diseases is high and healthcare resources are limited. Optimizing dosing strategies is therefore essential to improving clinical outcomes and reducing economic burden.

OBJECTIVE

- Develop and apply a pharmacometric multistate model to characterise disease progression and outcomes in infectious diseases
- Explore optimised dosing strategies to improve treatment success and survival in high-risk patient subgroups
- Integrate model-predicted outcomes into cost-effectiveness analyses
- Evaluate the clinical and economic impact of optimised dosing versus standard treatment

CONCLUSION

An integrated framework that combines pharmacometric multistate models with economic evaluations can bridge the current gap between clinical and economic modelling. Such integration has the potential to support model-based decision-making in both clinical practice and health policy. Advancing this approach may improve the efficiency, equity, and long-term sustainability of treatment strategies, particularly in resource-limited settings where optimising both health outcomes and costs is crucial.

OPTIMISING INFECTIOUS DISEASES TREATMENT
A PHARMACOMETRIC & PHARMACOECONOMIC INTEGRATED FRAMEWORK

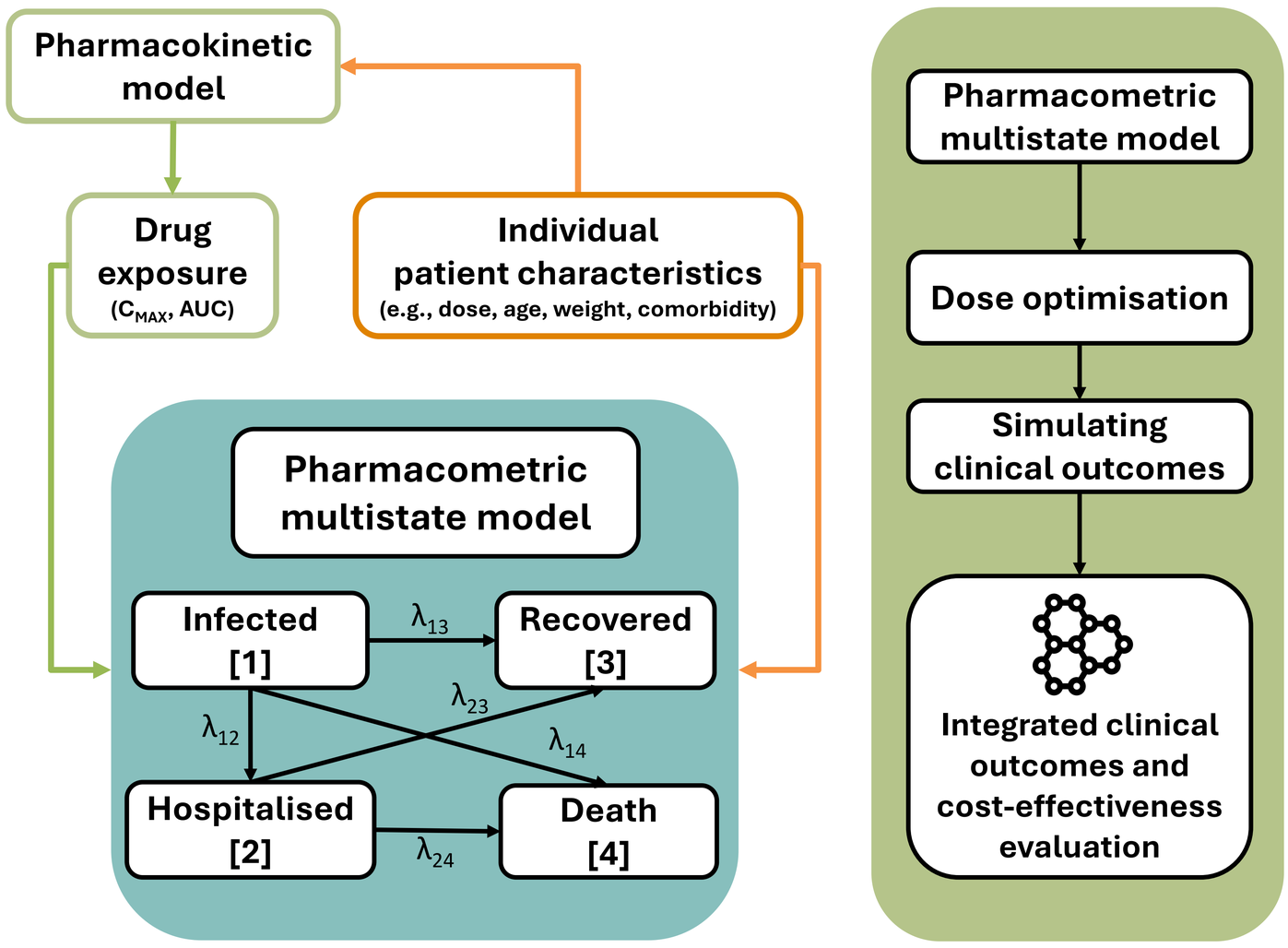

Figure 1. Framework for optimising infectious disease treatment through integrated pharmacometric and pharmacoeconomic modelling.
A pharmacometric multistate model characterises patient movement between disease states over time by estimating transition rates (λ), which could be influenced by drug exposure and patient characteristics, allowing prediction of clinical outcomes. These model-generated outcomes are then incorporated into a cost-effectiveness analysis to compare current and optimised dosing strategies and assess their clinical and economic value.

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