Microsimulation Model of Future Trends in Cystic Fibrosis (CF) Burden and Demography in France

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INTRODUCTION

Over the past few decades, in addition to an overall improved standard of care, advances in diagnostic and therapeutic procedures for CF, such as those for Pseudomonas aeruginosa, have led to increased survival for patients with cystic fibrosis (CF).

In France, demographic forecasts have predicted a 75% increase in the adult CF population and a 45% increase in the overall CF population between 2010 and 2020. However, previous population projections and trends have not accounted for more recent advances such as cystic fibrosis transmembrane conductance regulator (CFTR) modulators.

It is therefore important to accurately model future trends in CF burden and demography (children, adults, and patients with lung transplants [LTs]) to provide insight into how health care systems may need to adapt.

OBJECTIVE

To model future trends in CF demography and disease burden, taking into consideration the evolution of standard of care and the introduction of CFTR modulators over time (i.e., ivacaftor/lumacaftor).

METHODS

Model Overview

The model consists of a microsimulation model that tracks virtual patients with CF by birth cohort until death (Figure 1).

RESULTS

Model Validation: Accurate Prediction of Age Distribution

The model accurately reproduced real-life CF age distribution with low residual differences (Figure 2).

Evolution of Population Size

The model predicts a 22% increase in patients with CF between 2015 and 2030 due to improved longevity (Figure 3).

Evolution of Population Age from 2015 to 2030

• Median age is predicted to increase from 16 years to 21 years (Figure 4).
• Median age at time of death is predicted to increase by 9 years.

Evolution of Lung Transplantation

The model predicted a 16% increase in patients with CF aged >40 years.

Deterministic Sensitivity Analysis

The model is sensitive to changes in the slope of FEV1, decline in F508del/CFTRm (ppFEV1), and weight, reduction in pulmonary exacerbations, and impact of treatment on rate of FEV1 decline.

DISCUSSIONS

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