EE594

Comparison of the Clinical and Economic Impact of Two COVID-19 Vaccines in Immunocompromised Patients in France

Mathieu Uhart,[1,*] Arnaud Chéret,[1] Nicolas Van de Velde,[1] Amy Lee,[2] Michele Kohli[2]

[1]Moderna, Inc., Cambridge, MA, USA; [2]Quadrant Health Economics Inc., Cambridge, ON, Canada.
*Presenting author.

BACKGROUND

- The widespread availability of mRNA-based COVID-19 vaccines, including mRNA-1273 (Spikevax; Moderna, Inc., Cambridge, MA, USA) and BNT162b2 (Comirnaty; Pfizer Inc., New York, NY, USA; BioNTech Manufacturing GmbH, Mainz, Germany), has substantially mitigated poor outcomes in individuals with SARS-CoV-2 infection[1,2]
- However, immunocompromised (IC) individuals remain at an increased risk of COVID-19–associated hospitalizations and mortality[3,4]
  - Between December 2021 and May 2022, 43% of patients hospitalized in critical care with SARS-CoV-2 infection (omicron variant) in France were individuals who were IC[5]
- A recent systematic review and meta-analysis of real-world evidence studies from IC individuals found that mRNA-1273 was more effective compared with BNT162b2 against SARS-CoV-2 infections and COVID-19 hospitalizations and deaths[6,7]
  - An evaluation of the comparative clinical and economic impact of the Moderna fall 2023 updated COVID-19 mRNA vaccine (Moderna fall 2023 vaccine) compared with the Pfizer-BioNTech fall 2023 updated COVID-19 mRNA vaccine (Pfizer-BioNTech fall 2023 vaccine) in IC adults in France can help inform ongoing vaccination strategies in this population

OBJECTIVE

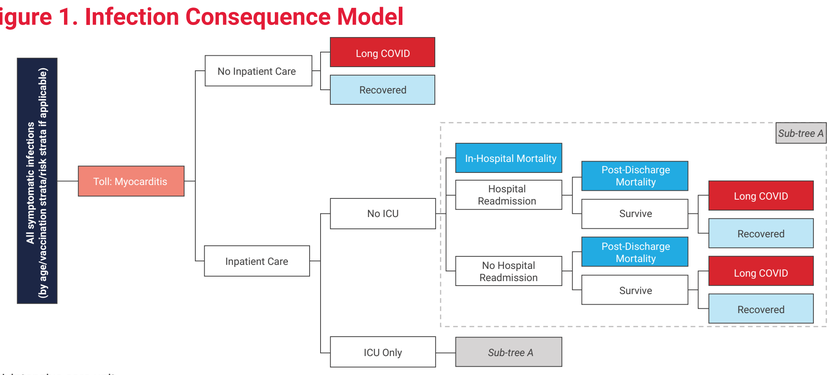
- To estimate the COVID-19–related clinical and economic outcomes of administering either the Moderna fall 2023 vaccine or the Pfizer-BioNTech fall 2023 vaccine to the entire IC population aged ≥30 years during the fall 2023 vaccine campaign in France over a 1-year time horizon

METHODS

Study Design

- A simplified static decision-analytic model (**Supplementary Figure 1; accessible through the QR code**) was used to predict the clinical and economic outcomes of administering either the Moderna or Pfizer-BioNTech updated fall 2023 vaccine in IC individuals in France
  - This model estimated the consequences of infection (**Figure 1**) and the associated costs by considering the IC population size, residual protection from prior vaccination and natural infection, and vaccine effectiveness (VE) (**see Supplementary Methods and Supplementary Table 1 and Supplementary Figure 2 for additional methods**)
- Vaccine coverage was assumed to be 100% in the IC population (n = 230,000)
- The unit cost for the Moderna fall 2023 vaccine and the Pfizer-BioNTech fall 2023 vaccine was assumed to be equivalent
- The Moderna and Pfizer-BioNTech fall 2023 vaccines were assumed to be well-matched to the circulating dominant variant of concern
- VE of the Moderna fall 2023 vaccine was assumed to be the same as the Moderna fall 2022 bivalent booster against BA.4/BA.5 in the IC population for hospitalizations (71.8%)[7] and the monovalent vaccine against omicron BA.1/BA.2 for infections (57.1%)[8]
- The relative risk of infection and hospitalization in the IC population, based on the meta-analysis findings, for the Moderna fall 2023 vaccine compared with the Pfizer-BioNTech fall 2023 vaccine[6] was applied to the above values to estimate VE values for the Pfizer-BioNTech vaccine
- Two scenario analyses were assessed:
  - Analysis wth lower SARS-CoV-2 infection incidence
  - Analysis based on vaccine uptake in the general population instead of 100% of the IC population
- Sensitivity analyses assessed the robustness of specific parameter estimates; where 95% confidence intervals were not available, parameters were varied by ± 25% (**Supplementary Table 2**)

Figure 1. Infection Consequence Model



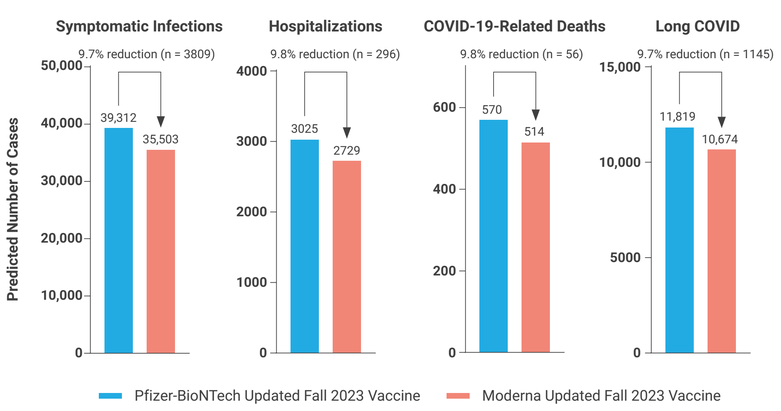
ICU, intensive care unit.

RESULTS

Clinical Outcomes

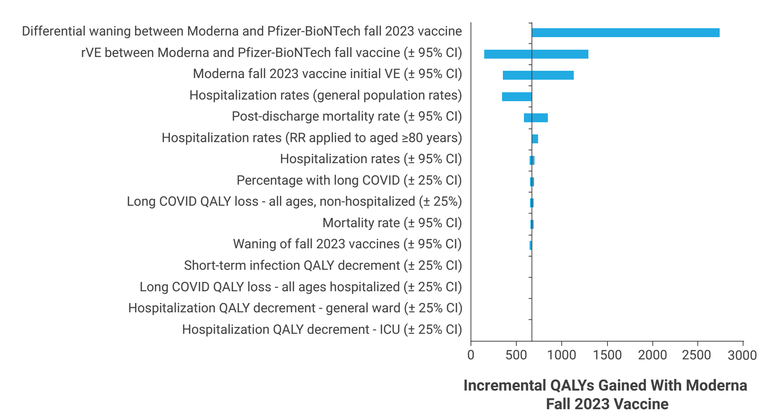
- IC individuals who received the Moderna fall 2023 vaccine had fewer cases of symptomatic infections, COVID-19 hospitalization, mortality, and long COVID cases compared with those who received the Pfizer-BioNTech fall 2023 vaccine (**Figure 2**)
  - Vaccination with the Moderna fall 2023 vaccine also led to fewer infection-related myocarditis cases compared with the Pfizer-BioNTech fall 2023 vaccine (46 vs 51, respectively; 9.8% reduction); vaccine-induced myocarditis was the same for both vaccines (2 cases each)
- The Moderna fall 2023 vaccine resulted in 670 fewer quality-adjusted life-years (QALYs) lost compared to the Pfizer-BioNTech fall 2023 vaccine (**Supplementary Table 3**)
  - Based on the deterministic sensitivity analysis, the incremental QALYs gained with the use of the Moderna fall 2023 vaccine ranged between 148 and 2067 (**Figure 3**)

Figure 2. Clinical Outcomes in Immunocompromised Individuals Vaccinated With the Moderna Fall 2023 Vaccine or the Pfizer-BioNTech Fall 2023 Vaccine[a]



[a]The number of COVID-19 vaccinations administered was assumed to be 230,000 for the Moderna and Pfizer-BioNTech fall 2023 vaccination campaigns.

Figure 3. Deterministic Sensitivity Analyses of Incremental QALYs in the Immunocompromised Population Vaccinated With the Moderna Fall 2023 Vaccine vs the Pfizer-BioNTech Fall 2023 Vaccine

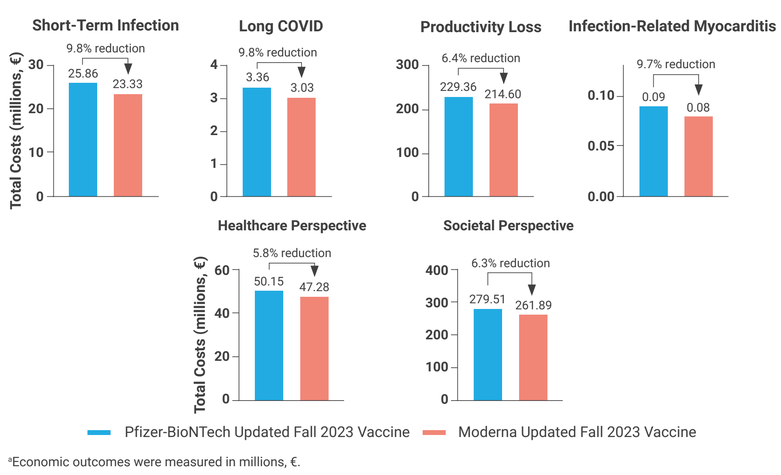


CI, confidence interval; ICU, intensive care unit; QALY, quality-adjusted life-year; RR, relative risk; rVE, relative vaccine effectiveness; VE, vaccine effectiveness.

Economic Impact

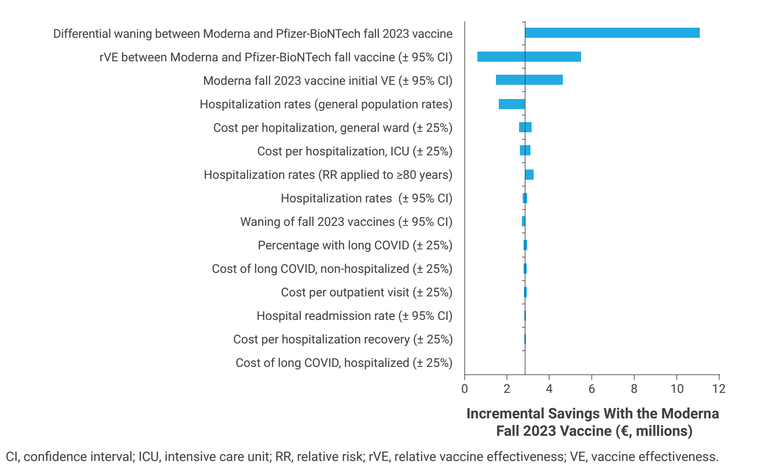
- Total costs associated with short-term infection, long COVID, productivity loss, and infection-related myocarditis were lower in IC individuals who received the Moderna fall 2023 vaccine compared with those that received the Pfizer-BioNTech fall 2023 vaccine (**Figure 4**)
- Results from the cost-effective analysis in the IC population (n= 230,000) showed economic savings from the healthcare (€2.86 million saved) and societal perspectives (€17.62 million saved) (**Supplementary Table 4**)
  - The cost savings per dose of the Moderna fall 2023 vaccine were €12.44 compared with the Pfizer-BioNTech fall 2023 vaccine
  - In deterministic sensitivity analyses, incremental savings ranged from €621,900 to €11,089,300 (**Figure 5**)
- At a willingness to pay threshold of €37,000 per QALYs gained (approximately 1× GDP/capita)[9], the value-based price difference between the Moderna and Pfizer-BioNTech Fall 2023 vaccines is €120

Figure 4. Economic Outcomes[a] in Immunocompromised Individuals Vaccinated With the Moderna Fall 2023 Vaccine or the Pfizer-BioNTech Fall 2023 Vaccine



[a]Economic outcomes were measured in millions, €.

Figure 5. Deterministic Sensitivity Analyses of Incremental Savings in the Immunocompromised Population Vaccinated With the Moderna Fall 2023 Vaccine vs the Pfizer-BioNTech Fall 2023 Vaccine



CI, confidence interval; ICU, intensive care unit; RR, relative risk; rVE, relative vaccine effectiveness; VE, vaccine effectiveness.

CONCLUSIONS

- If the Moderna fall 2023 vaccine (50 µg/dose)[10] is clinically more effective than the Pfizer-BioNTech fall 2023 vaccine (30 µg/dose)[11] among the French IC population, there could be substantial QALYs and incremental economic savings gained, suggesting that the Moderna fall 2023 vaccine will be better-suited for the IC population as a vaccination strategy
- The cost-effective analysis showed that the Moderna fall 2023 vaccine dominated the Pfizer-BioNTech fall 2023 vaccine at the healthcare and societal perspectives
- Although adjustments were made to account for differences in the risk between IC individuals and the general population, uncertainties around vaccine coverage and VE in the IC population may result in an underestimation of results
- As the COVID-19 disease burden remains high in the IC population, these individuals should follow up-to-date vaccination guidance for the fall 2023/2024 season

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Disclosures

MU, AC, and NVV are employees of Moderna, Inc., and may hold stock/stock options in the company. MK is a shareholder in Quadrant Health Economics Inc., which was contracted by Moderna, Inc., to conduct this study. AL is a consultant at Quadrant Health Economics Inc.

ADDITIONAL INFORMATION

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For additional information, please contact Mathieu Uhart (mathieu.uhart@modernatx.com)

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