Canada's Drug Agency
L'Agence des médicaments du Canada
Drugs. Health Technologies and Systems. Médicaments, technologies de la santé et systèmes.

CoLab Network

Summary Report

The Cost-Effectiveness and Budget Impact of Nirmatrelvir-Ritonavir, Remdesivir, and Tocilizumab for the Treatment of COVID-19

Nirmatrelvir-Ritonavir Report Authors

Marie Betsy Varughese, Karsten Hempel, Negar Razavilar, Jeff Round

Remdesivir Outpatient Report Authors

Marie Betsy Varughese, Karston Hempel, Ellen Rafferty, Weston Roda, Jeff Round

Remdesivir Inpatient Report Authors

Karsten Hempel, Marie Betsy Varughese, Ellen Rafferty, Weston Roda, Danica Wolitski, Jeff Round

Tocilizumab Report Authors

Marie Betsy Varughese, Karsten Hempel, Ellen Rafferty, Weston Roda, Danica Wolitski, Jeff Round

These pharmacoeconomic studies were conducted by the Alberta Drug and Technology Evaluation Consortium (ADTEC) through the Post-Market Drug Evaluation CoLab Network.

Executive Summary

Nirmatrelvir-ritonavir (NMV-r), remdesivir, and tocilizumab are approved for the treatment of COVID-19 in Canada.

The objective of the pharmacoeconomic analyses reported here was to estimate expected health system costs and health outcomes of these treatments in Canada. The analyses presented in the individual reports were conducted using 2022 data, which represented a year of the pandemic when a large proportion of the population were infected with COVID-19.

The cost-utility analyses suggest that increased use of NMV-r, remdesivir, and tocilizumab may be cost-effective at various willingness-to-pay thresholds. However, there is considerable uncertainty in the results, and factors such as age group, care setting, and treatment uptake rate can influence cost-effectiveness. The budget impact assessments suggest that increased use of NMV-r and remdesivir as an outpatient treatment could be cost-saving for high-risk populations. Inpatient use of remdesivir is likely to cost the health system money across all populations, while inpatient use of tocilizumab is likely to be cost-saving across all populations and uptake scenarios.

When data are available, future research could update this analysis and assess potential changes in cost-effectiveness of these treatments for COVID-19 variants circulating after 2022 and for patients who are immunocompromised.

EDITORIAL NOTE

Canada's Drug Agency (CDA-AMC) completed a reimbursement review of nirmatrelvir-ritonavir (Paxlovid) and remdesivir (Veklury) for nonhospitalized patients, and the Canadian Drug Expert Committee (CDEC) issued recommendations on April 11, 2024, and September 4, 2024, respectively. They recommended reimbursing nirmatrelvir-ritonavir for outpatient use according to the indication approved by Health Canada, restricted to patients who have severe or moderate immunosuppression. For remdesivir in nonhospitalized patients, the recommendation was to reimburse remdesivir according to the indication approved by Health Canada for outpatient use, with the same public drug programs funding criteria as nirmatrelvir-ritonavir.

Prior to the reimbursement recommendations, the Public Health Agency of Canada had commissioned the Post-Market Drug Evaluation program to conduct an economic evaluation and budget impact analysis of nirmatrelvir-ritonavir and remdesivir for outpatient use. The research and policy questions defined in these reports were developed in advance of the CDEC reimbursement recommendations.

The patient population included in the reports for nirmatrelvir-ritonavir and remdesivir for outpatients may be broader than the reimbursement recommendations and does not include patients who are immunocompromised. The data used in these economic evaluations are based on the epidemiology of COVID-19 in 2022 and may not reflect the current state of COVID-19.

Background

Several drug treatments for managing COVID-19 are approved for use in Canada. Initially, the federal government, through the Public Health Agency of Canada (PHAC), was responsible for the procurement and allocation of COVID-19 drug treatments to ensure their availability for federal, provincial, and territorial (FPT) health care systems. The following drugs were funded by the PHAC: NMV-r (Paxlovid), remdesivir (Veklury), and tocilizumab (Actemra).

Policy Issue

To provide reliable guidance, Canada's Drug Agency (CDA-AMC) conducted evidence reviews for NMV-r and remdesivir in the context of COVID-19 treatment. This led to reimbursement recommendations for these drugs to support funding decisions by FPT drug plans. Prior to these recommendations, PHAC commissioned economic evaluations and budget impact analyses for NMV-r, remdesivir, and tocilizumab to inform their policy decisions.

Policy Questions

The following policy questions were developed in advance of the reimbursement recommendations from CDA-AMC and based on COVID-19 conditions in Canada in 2022.

1. What are the health system impacts, access, and funding considerations of offering NMV-r as an outpatient treatment option for COVID-19 in Canada?
2. What are the health system impacts, uptake, and funding considerations of offering remdesivir as an outpatient treatment option for COVID-19 in Canada?
3. What are the health system impacts, uptake, and funding considerations of offering remdesivir as an inpatient treatment option for COVID-19 in Canada?
4. What are the health system impacts, uptake, and funding considerations of offering tocilizumab as an inpatient treatment option for COVID-19 in Canada?

The policy questions involve several considerations: the transition of COVID-19 into an endemic disease, access of these drugs by specific population cohorts within provinces and territories, the therapeutic effects of these drugs (including contraindications), the high-risk cohorts for developing severe disease, the potential use of these drugs if access is expanded, and the health care system costs and health outcomes associated with COVID-19 and treatment costs associated with these drugs.

Objective

The objective of the pharmacoeconomic analyses was to estimate the impacts of providing NMV-r, remdesivir, and tocilizumab as treatment for COVID-19 in Canada on health system costs and health outcomes.

Findings

Researchers used a state transition model to estimate costs and health outcomes for a range of possible treatment scenarios to understand the conditions under which using these drugs may be cost-effective and how they may impact health care budgets.

Cost-Effectiveness Analyses

The cost-utility analyses suggest that increased use of NMV-r, remdesivir, and tocilizumab may be cost-effective across a range of willingness-to-pay thresholds. However, there is considerable uncertainty in the results, and factors such as age group, therapeutic effects, care setting, and treatment uptake rate can influence cost-effectiveness. The findings indicate potential cost-effectiveness in different scenarios, but also highlight the need to consider uncertainties and factors not accounted for in the analyses.

Outpatient use of NMV-r could be cost-effective for individuals aged 65 years and older and those in long-term care (LTC). However, there is considerable uncertainty in the results, with data limitations in the LTC data. Scenarios that only included LTC had lower expected net monetary benefit across a range of willingness-to-pay thresholds. However, these values may be underestimated because factors such as the prevention of deaths and health care costs associated with managing COVID-19 within LTC homes were not accounted for.

Outpatient use of remdesivir could be cost-effective depending on the willingness-to-pay thresholds, especially for high-risk populations such as those aged 65 years and older and those in LTC. However, there is considerable uncertainty in the results, with data limitations in the LTC data (described previously in the outpatient use of NMV-r), potentially affecting the cost-effectiveness of remdesivir in this population.

Inpatient use of remdesivir could be cost-effective depending on the willingness-to-pay thresholds, especially for high-risk populations such as those aged 65 years and older and those in LTC. However, the results were uncertain, with unknowns surrounding the therapeutic effects of remdesivir.

Inpatient use of tocilizumab is likely to be cost-effective across all populations, with higher uptakes yielding greater benefits. These findings were robust even when considering uncertainty.

Budget Impact Analyses

The budget impact assessment results suggest that increased use of **NMV-r** among people aged 65 years and older and those in LTC could potentially lead to cost savings, provided that the cost of the drug treatment regimen does not exceed $370. **Outpatient use of remdesivir** is likely to cost the health system money, except when it is used in those aged 65 years and older and those in LTC, which showed potential for cost savings. **Inpatient use of remdesivir** is likely to cost the health system money across all populations and uptake scenarios. However, the scenarios with a lower uptake and smaller budgetary impact also had higher mortality. **Inpatient use of tocilizumab** has the potential to be cost-saving for all populations and under a range of possible uptake scenarios. However, scenarios with the highest uptake were found to have the greatest cost savings to the health care system.

Limitations

The pharmacoeconomic evaluations of these drugs have limitations and uncertainties. The therapeutic effect estimates of COVID-19 drug treatments used in this analysis were based on circulating variants before 2023. The patient population included in these reports may be different than those considered in the reimbursement reviews and recommendations. The analyses were affected by data limitations related to

deaths in LTC populations and health care costs associated with managing COVID-19 in LTC homes. There are also uncertainties on the uptake of these drugs between lab-confirmed cases and infections, drug costs if the drugs become more widely available, and the potential underestimation of quality-adjusted life years lost per patient admitted to the hospital. Drug costs were estimated based on publicly available sources if data on the price paid in Canada were not available. The models did not account for reinfections or repeat dispensations.

Implications for Policy-Making

The analyses presented in the pharmacoeconomic reports were conducted using 2022 data, which represented a year of the pandemic when a large proportion of the population were infected with COVID-19. For subsequent years, the reduced volume of lab-confirmed cases and infections compared to 2022 should be considered in similar analyses to estimate expected drug costs and budget impact. In addition, future work should also include new evidence related to therapeutic effects for circulating variants after 2022 to assess potential changes in cost-effectiveness results.

Considerations

Post-Market Drug Evaluation (PMDE) projects aim to produce health policy issue evidence and are not linked to a recommendation.

This work was intended to inform health policy. Clinical questions regarding treatment recommendations for COVID-19 should be directed to a health care professional.

For more information on CoLab and its work, visit the **CoLab website**.

For the full scientific reports, visit:

The Cost-Effectiveness and Budget Impact of Nirmatrelvir-Ritonavir for COVID-19

The Cost-Effectiveness and Budget Impact of Remdesivir for Outpatient Treatment of COVID-19

The Cost-Effectiveness and Budget Impact of Remdesivir for Inpatient Treatment of COVID-19

The Cost-Effectiveness and Budget Impact of Tocilizumab for COVID-19

This work was conducted by the Alberta Drug and Technology Evaluation Consortium (ADTEC) through the Post-Market Drug Evaluation CoLab Network. It was supported by Canada's Drug Agency (CDA-AMC) and its Post-Market Drug Evaluation Program through funding provided by Health Canada.

CDA-AMC is a pan-Canadian health organization. Created and funded by Canada's federal, provincial, and territorial governments, we're responsible for driving better coordination, alignment, and public value within Canada's drug and health technology landscape. We provide Canada's health system leaders with independent evidence and advice so they can make informed drug, health technology, and health system decisions, and we collaborate with national and international partners to enhance our collective impact.

CoLab is a pan-Canadian network of experts in applied research, scientific methods, and data analysis. CoLab members work with the Post-Market Drug Evaluation Program to produce credible and timely evidence on postmarket drug safety and effectiveness.

cda-amc.ca

March 2025