Remdesivir Reduced Healthcare Resource Utilization in Patients Hospitalized With COVID-19 During the Omicron-dominant Period

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Conclusions

- In this real-world cohort of patients hospitalized with COVID-19 during the Omicron-dominant period, remdesivir use was associated with a lower average hospital cost for both hospital and intensive care unit admissions

- Patients who received remdesivir were significantly less likely to be readmitted after their initial hospitalization

- Remdesivir use in patients hospitalized with COVID-19 has the potential to reduce healthcare resource utilization and associated costs

Plain Language Summary

- COVID-19 continues to have a global impact on public health

- Treating patients hospitalized with COVID-19 can be both expensive and labor intensive

- Studies have shown that remdesivir, an antiviral medication, can help patients with COVID-19 get better faster and reduce their chances of dying

- Here, the comparative effectiveness of remdesivir treatment on the use of healthcare services and goods was evaluated in patients hospitalized with COVID-19 during the period of time when the Omicron strain was dominant

- Overall, remdesivir use in patients hospitalized with COVID-19 was linked to lower average costs and shorter stays for patients admitted to the hospital and the intensive care unit, as well as fewer hospital readmissions

References: 1. World Health Organization. WHO COVID-19 dashboard. Accessed February 15, 2024. https://data.who.int/dashboards/covid19/cases. 2. Di Fusco M, et al. J Med Econ. 2021;24:308-17. 3. Scott A, et al. BMC Med. 2024;22:47. 4. Rees EM, et al. BMC Med. 2020;18:270. 5. Richards F, et al. Clinicoecon Outcomes Res. 2022;14:293-307. 6. Edoka I, et al. Int J Health Policy Manag. 2022;11:1354-61. 7. Jeck J, et al. Infection. 2022;50:191-201. 8. Chen C, et al. BMC Infect Dis. 2023;23:672. 9. Spinner CD, et al. JAMA. 2020;324:1048-57.

Introduction

- COVID-19 continues to have an impact on global public health, with >700,000,000 cumulative cases reported as of February 25, 2024[1]

- Healthcare resource utilization (HCRU) for patients with COVID-19 can be both costly and labor intensive,[2,3] as patients with COVID-19 may be hospitalized for <1 week to up to 2 months,[4] costing up to $1000/d[5-7]

- Clinical trials and observational studies have demonstrated the clinical efficacy of remdesivir (RDV) in patients with COVID-19, including reduced mortality and shortened time to clinical improvement (eg, improvement from baseline scores on a 7-point ordinal scale)[8,9]
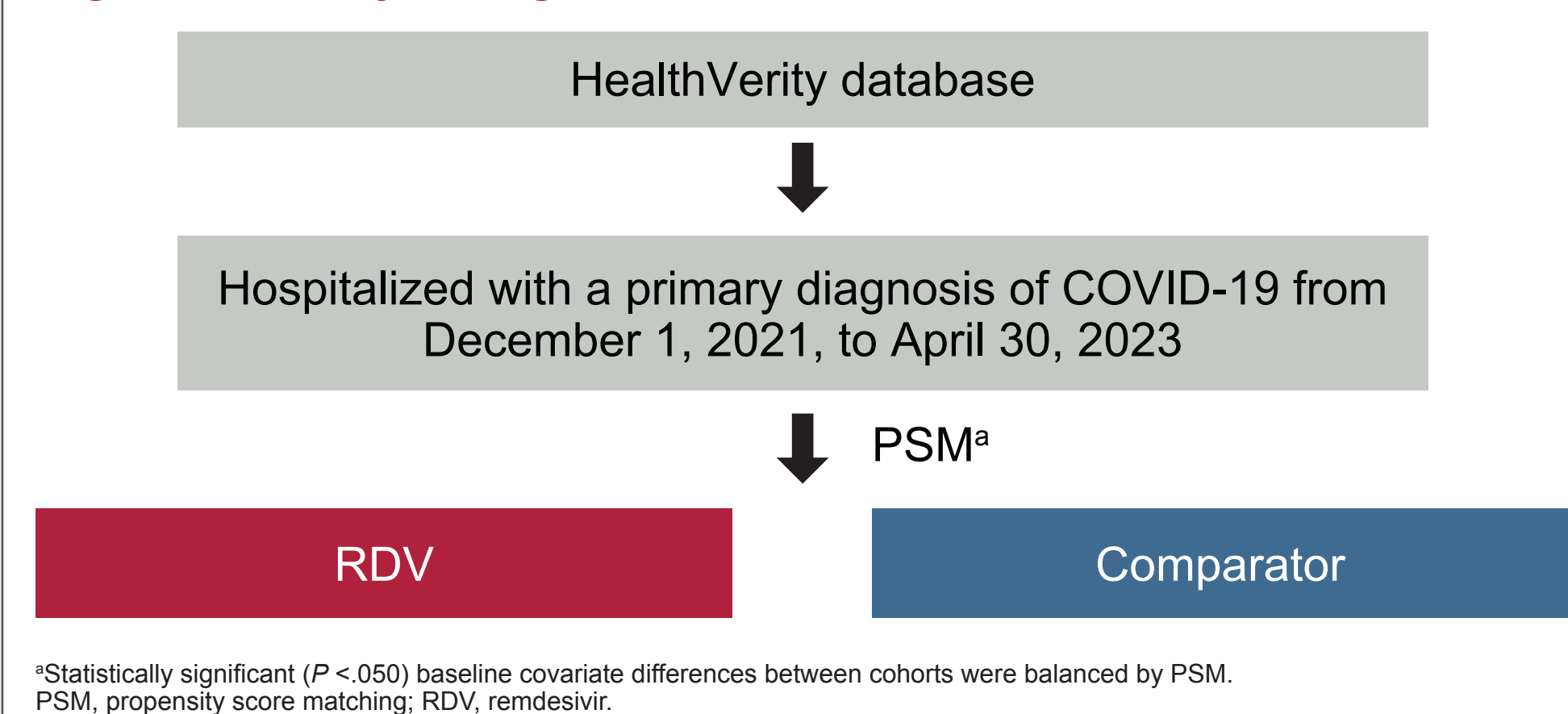
Objective

- To evaluate the comparative effectiveness of RDV treatment on HCRU in patients hospitalized with COVID-19 during the Omicron-dominant period

Methods

- This retrospective, observational cohort study utilized deidentified health insurance claims and hospital chargemaster data from the US HealthVerity database

- The study population consisted of patients aged ≥18 years who were hospitalized with a primary diagnosis of COVID-19 (International Classification of Diseases, Tenth Revision code U07.1) from December 1, 2021, to April 30, 2023; had ≥12 months of prior claims enrollment; and either received ≥1 dose of RDV (RDV group) or did not receive RDV (comparator group) at any time during hospitalization (Figure 1)

  — Key exclusion criteria included evidence of COVID-19 inpatient hospitalization prior to the RDV emergency use authorization (May 2020) or pregnancy during the index hospitalization stay

Figure 1. Study Design

HealthVerity database

↓

Hospitalized with a primary diagnosis of COVID-19 from December 1, 2021, to April 30, 2023

↓ PSM[a]

| RDV | Comparator |

[a]Statistically significant (P <.050) baseline covariate differences between cohorts were balanced by PSM. PSM, propensity score matching; RDV, remdesivir.
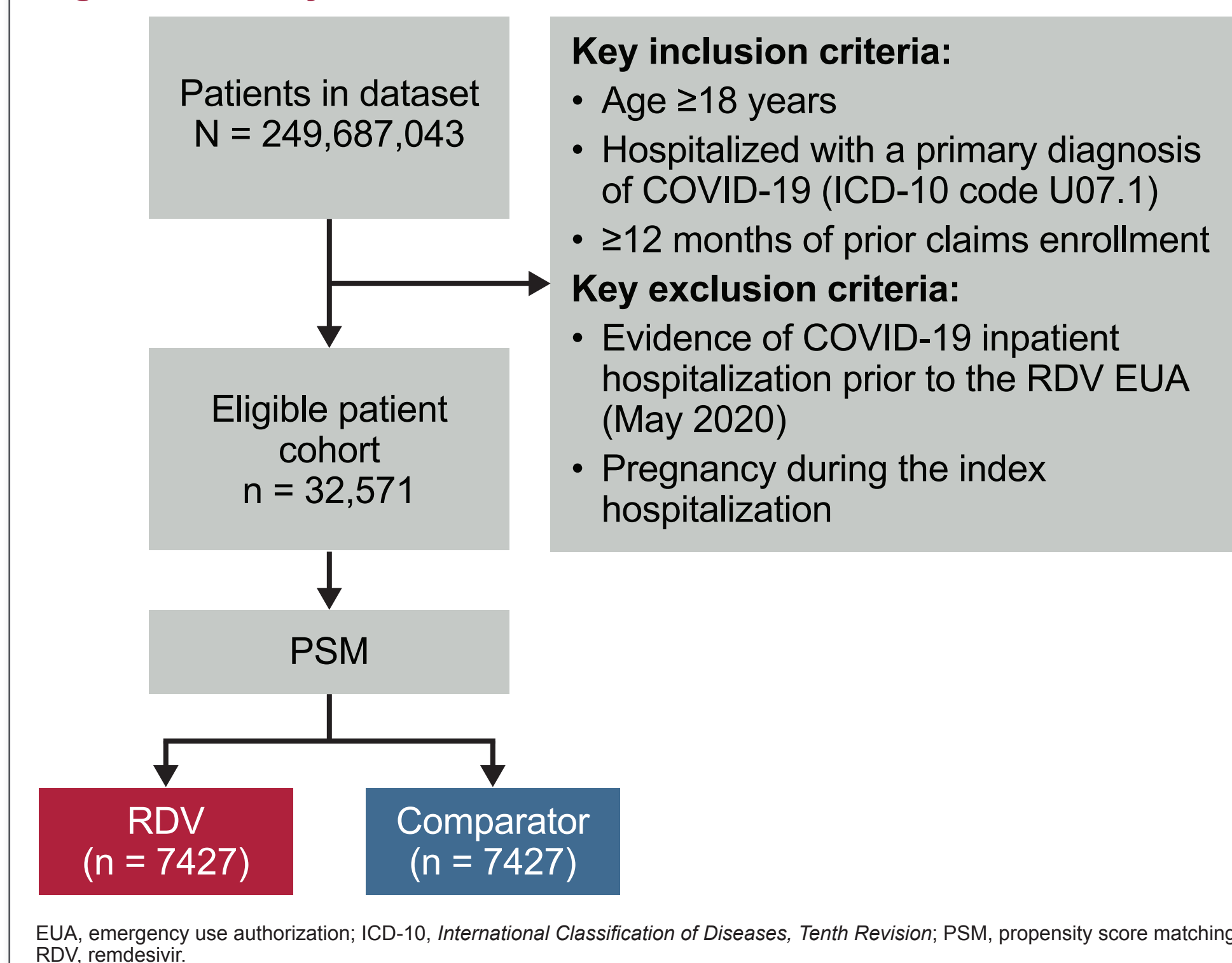
- Patients were followed from the index date (initiation of RDV or the corresponding match date for the comparator group) to the earliest of the following events: death, end of the study period, or ≤180 days after the discharge date

- For patients with >1 COVID-19–related hospitalization during the study period, the first eligible admission was used as the index hospitalization; gaps of <2 days between a hospital discharge and a consecutive admission date were considered a single hospital episode

- Endpoints included the rate of readmission (all-cause and COVID-19–related) and healthcare expenditures

- Study variables were summarized descriptively; generalized linear models with gamma error distribution and log-link function were used to compare the total hospital or intensive care unit (ICU) cost between groups, and logistic regression was used to estimate odds ratios (ORs) and 95% CIs for readmission analyses

Results

- Of 249,687,043 patients in the dataset, 32,571 met the study criteria and were included in the study (Figure 2)

  — After propensity score matching (PSM), 7427 patients from each group were matched (1:1)

Figure 2. Study Patients

Patients in dataset N = 249,687,043

Key inclusion criteria:
- Age ≥18 years
- Hospitalized with a primary diagnosis of COVID-19 (ICD-10 code U07.1)
- ≥12 months of prior claims enrollment

Key exclusion criteria:
- Evidence of COVID-19 inpatient hospitalization prior to the RDV EUA (May 2020)
- Pregnancy during the index hospitalization

↓

Eligible patient cohort n = 32,571

↓

PSM

↓

| RDV (n = 7427) | Comparator (n = 7427) |

EUA, emergency use authorization; ICD-10, International Classification of Diseases, Tenth Revision; PSM, propensity score matching; RDV, remdesivir.

- Clinical and demographic characteristics were well matched (Table 1)

Table 1. Clinical and Demographic Characteristics in the RDV and Comparator Groups After PSM

Characteristic	RDV (n = 7427)	Comparator (n = 7427)
Age, y, mean (SD)	64.20 (17.88)	62.95 (18.14)
Geographic region, n (%)		
Northeast	2128 (29)	1849 (25)
Midwest	505 (7)	558 (8)
South	2370 (32)	2549 (34)
West	2423 (33)	2469 (33)
Sex, n (%)		
Female	4088 (55)	4033 (54)
Male	3339 (45)	3394 (46)
Oxygen support status,[a] n (%)		
Room air[b]	5024 (68)	5073 (68)
Low flow	2193 (30)	2118 (29)
High flow or NIV	202 (3)	224 (3)
ECMO	8 (<1)	12 (<1)
Any ventilator use,[a] n (%)	688 (9)	711 (10)
Any RDV use prior to index date,[c] n (%)	643 (9)	475 (6)
HCRU during baseline period or on index date[d]		
Any hospitalizations,[e] n (%)	3756 (51)	3279 (44)
Number of hospitalizations pppm,[e] mean (SD)	0.20 (0.49)	0.16 (0.45)
Number of days of hospitalization pppm,[e] mean (SD)	0.94 (2.26)	0.72 (1.92)
Any ICU admissions,[f] n (%)	0	0
Number of outpatient visits pppm,[e] mean (SD)	1.85 (2.90)	1.68 (2.77)

[a]Measured on the index date.
[b]Room air was defined as the absence of the following procedures: low-flow oxygen, high-flow oxygen/NIV, or IMV/ECMO.
[c]Evidence of prior outpatient or inpatient RDV use, measured 365 days prior to the index date.
[d]HCRU metrics were estimated pppm and measured for all patients.
[e]Measured 365 days prior to the index date.
[f]Measured on the admission date through the index date.
ECMO, extracorporeal membrane oxygenation; HCRU, healthcare resource utilization; ICU, intensive care unit; IMV, invasive mechanical ventilation; NIV, noninvasive ventilation; pppm, per patient per month; PSM, propensity score matching; RDV, remdesivir.

- During hospitalization, the mean (95% CI) all-cause hospital admission cost (RDV: $20,132.07 [$20,130.98-$20,133.38]; comparator: $20,865.68 [$20,864.69-$20,866.87]) was lower for the RDV group than for the comparator group (Table 2)

  — Mean (95% CI) ICU cost was also significantly lower for the RDV group than for the comparator group

  — Notably, the mean (95% CI) all-cause hospital, ICU, and non-ICU costs per patient per month (pppm) were significantly lower for the RDV group than for the comparator group

- Post hospitalization, mean (95% CI) COVID-19–related hospital costs per patient per readmission (pppr) and outpatient costs per visit were lower in the RDV group; however, differences were not statistically significant between groups (Table 2)
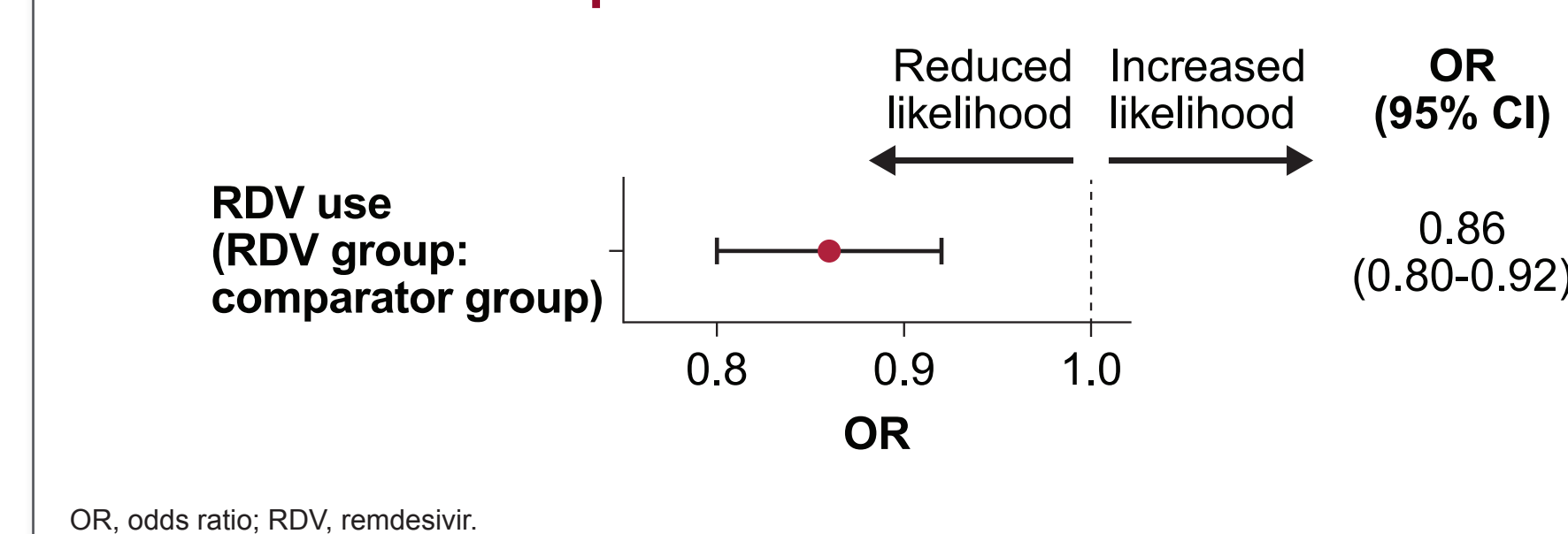
Table 2. Mean (95% CI) All-cause Costs During Hospitalization and COVID-19–related Costs Post Hospitalization in the RDV and Comparator Groups

	RDV	Comparator	P Value
During hospitalization			
Billed amount, $, mean (95% CI)			
Average cost			
Hospital	20,132.07 (20,130.98-20,133.38)	20,865.68 (20,864.69-20,866.87)	<.001
ICU	21,612.80 (21,611.55-21,614.34)	24,019.51 (24,018.36-24,020.93)	<.001
Non-ICU	32,605.65 (32,604.69-32,606.79)	32,600.53 (32,599.62-32,601.63)	.342
Cost pppm			
Hospital	76,516.24 (76,515.08-76,517.60)	85,073.27 (85,072.11-85,074.67)	<.001
ICU	74,557.22 (74,555.89-74,558.84)	87,778.31 (87,777.00-87,779.93)	<.001
Non-ICU	127,968.17 (127,967.14-127,969.40)	138,570.57 (138,569.47-138,571.89)	.007
COVID-19–related post hospitalization			
Billed amount, $, mean (95% CI)			
Inpatient cost, pppr	5126.81 (5125.94-5128.60)	6432.53 (6431.39-6435.02)	.227
Outpatient cost, per visit	255.60 (254.86-256.63)	277.77 (276.74-279.20)	.107

ICU, intensive care unit; pppm, per patient per month; pppr, per patient per readmission; RDV, remdesivir.

- Between the RDV and comparator groups, patients in the RDV group were significantly less likely to be readmitted after the initial hospitalization (OR [95% CI], 0.86 [0.80-0.92]; P <.001; Figure 3)

Figure 3. Logistic Regression for Likelihood of Readmission After the Initial Hospitalization

	Reduced likelihood ←	→ Increased likelihood	OR (95% CI)
RDV use (RDV group: comparator group)			0.86 (0.80-0.92)

OR, odds ratio; RDV, remdesivir.

Limitations

- Interpretations are constrained by limitations inherent to a retrospective, observational study, including the lack of patient randomization and the inability to independently verify select factors, such as COVID-19 diagnosis and provider/hospital practices related to RDV administration

- Some eligible hospitalized patients treated with RDV were not included if a suitable comparator could not be identified for PSM