Patterns of Remdesivir Initiation in Immunocompromised Patients Hospitalized With COVID-19

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Conclusions

- Among 54,238 patients with immunocompromising conditions who received remdesivir in the United States from May 2020 to December 2023, 46,198 (85%) initiated remdesivir treatment during the first 2 days of hospitalization for COVID-19
- However, the majority of patients (100,612/154,850 [65%]) hospitalized for COVID-19 never received remdesivir, suggesting an opportunity to prevent disease progression in one of the populations at the highest risk for severe COVID-19

Plain Language Summary

- Remdesivir is an antiviral treatment for people in the hospital with COVID-19
- People with immunocompromising conditions tend to get sicker from COVID-19 compared to people without these conditions because their bodies have weakened defenses against viruses
- Early treatment with an antiviral, such as remdesivir, may help people with immunocompromising conditions who are hospitalized with COVID-19 recover
- In this study, we used health insurance and hospital data to understand when people with immunocompromising conditions received remdesivir after admission to a hospital or if they received remdesivir at all
- From May 2020 to December 2023 in the United States, 85% of people with immunocompromising conditions who received remdesivir initiated remdesivir treatment during the first 2 days of hospitalization for COVID-19
- Notably, 65% of patients were never treated with remdesivir, which suggests that there is much more potential to treat people with immunocompromising conditions to help them avoid getting severely ill or dying from COVID-19

Introduction

- Patients with immunocompromising conditions who are hospitalized with COVID-19 and initiate remdesivir (RDV) within the first 2 days of hospitalization have a lower risk of all-cause mortality than those who do not initiate RDV[1]
- The treatment course of RDV should be initiated within 7 days of COVID-19 symptom onset[2]
- The proportions of patients with immunocompromising conditions who initiate RDV at different stages of hospitalization (ie, early, intermediate, late, or never) are unknown

Objective

- To describe the patterns of RDV initiation by patient demographic and clinical characteristics in patients with immunocompromising conditions who were hospitalized with COVID-19

Methods

- This was a retrospective, observational cohort study using the HealthVerity database, which includes hospital chargemaster data and medical and pharmacy claims from the United States
- To be eligible for the study, patients must have been hospitalized with a diagnosis of COVID-19 between May 1, 2020, and December 3, 2023; been aged ≥12 years; had continuous insurance enrollment for 365 days before hospitalization, with no single gap in enrollment of >30 days; and had 1 or more existing diagnoses of an immunosuppressive condition (**Table 1**)[3]

Table 1. Codes Used to Identify Diagnosis With an Immunosuppressive Condition[3]

Code List	ICD-10-CM Codes
HIV/AIDS	B20-B24
Hematologic malignancy	C81-C83, C88-C96
Other immune conditions	D89, D70, D71, D72.0, D72.81, D72.89, D72.9, D75.81, D47.4, D75.89, D75.9, D89.2, D75.89, R76, R83.4-R87.4, R89.4
Solid malignancy	C00-C07, C11-C19, C22-80, Z85, C7A, C7B, D3A, D00-D49
Organ transplant	T86, Z94, Z98.85
Rheumatologic/inflammatory	D86, E85, E85.0, M04, E85.1, E85.3, E85.8, G35, G36, G37.1, G37.3, G37.8, G37.9, G61.0, G61.9, I40, M30, T78.40, J67.9, J84.01, J84.02, J84.09, K50-K52, L93.0, L93.2, M32, L94, M35.8, M35.9, M12.9, M01.X0, M02.10, M11, M05-M14, M46, M31.5, M35.3

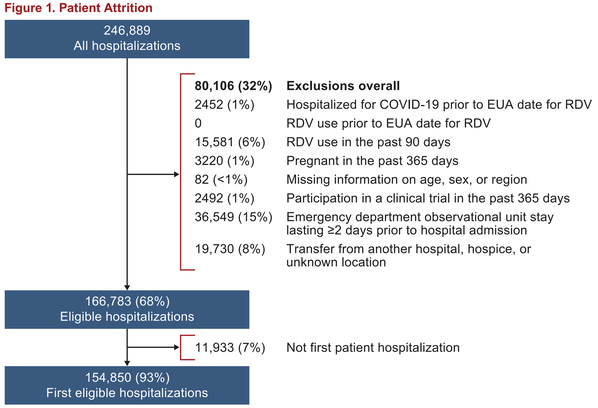
ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification.

- Exclusion criteria included evidence of RDV use in the past 90 days, pregnancy in the past 365 days, and participation in a clinical trial in the past 365 days
- Patients were evaluated by time of RDV initiation after hospital admission: early (Days 1-2), intermediate (Days 3-7), late (Days 8-28), or never (no evidence of RDV initiation during the follow-up period of up to 28 days); Day 1 was defined as the day of admission
- Analyses were stratified by age, variant period, sex, geographic region, insurance type, hospital size, comorbidities, severity of immunosuppression, immunosuppressive conditions, baseline medications, and baseline oxygen support

Results

- 154,850 of 246,889 patient hospitalizations were included in the study (**Figure 1**)

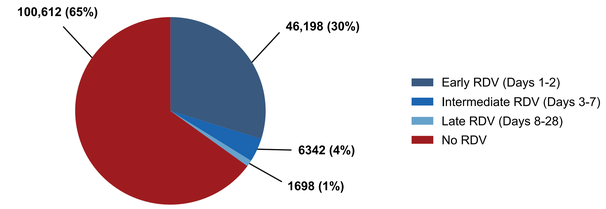
Figure 1. Patient Attrition



EUA, emergency use authorization; RDV, remdesivir.

- Among the 154,850 eligible patients, the median (Q1, Q3) age was 71 (60, 80) years, and 54,238 (35%) patients initiated RDV during hospitalization
- Among the 54,238 patients who initiated RDV during hospitalization, 46,198 (85%) patients started RDV on Days 1 to 2 (**Figure 2**)

Figure 2. Number of Patients by Timing of RDV Initiation (N = 154,850)



RDV, remdesivir.

- Among those who received RDV, the proportion of patients who initiated RDV on Days 1 to 2 of hospitalization was comparable between subgroups when stratified by age, variant period, sex, geographic region, insurance type, hospital size, certain comorbidities, severity of immunosuppression, certain immunosuppressive conditions, certain baseline medications, or baseline oxygen support (**Table 2**)
  - One exception was the use of oral antivirals; of the 3 patients who were on oral antivirals at baseline, 2 (67%) initiated RDV on Days 1 to 2 of hospitalization

Table 2. Timing of RDV Initiation[a] by Demographic and Clinical Characteristics

n (%)[b]	Early RDV (n = 46,198)	Intermediate RDV (n = 6342)	Late RDV (n = 1698)	Total RDV (N = 54,238)
Age group				
12-64 years	15,767 (88)	1754 (10)	471 (3)	17,992 (100)
≥65 years	30,431 (84)	4588 (13)	1227 (3)	36,246 (100)
Variant period[c]				
Initial wave	18,359 (82)	3261 (15)	641 (3)	22,261 (100)
Delta	8608 (90)	769 (8)	156 (2)	9533 (100)
Omicron	19,231 (86)	2312 (10)	901 (4)	22,444 (100)
Sex				
Female	23,113 (86)	3087 (11)	830 (3)	27,030 (100)
Male	23,085 (85)	3255 (12)	868 (3)	27,208 (100)
Insurance type				
Commercial	11,285 (89)	1109 (9)	279 (2)	12,673 (100)
Medicaid	3846 (87)	438 (10)	120 (3)	4404 (100)
Medicare	26,331 (84)	3952 (13)	1089 (3)	31,372 (100)
Comorbidities				
Cancer (excluding nonmelanoma skin cancer)	16,081 (84)	2378 (12)	717 (4)	19,176 (100)
Cardiovascular disease	35,939 (85)	5071 (12)	1424 (3)	42,434 (100)
Chronic kidney disease	11,551 (82)	1926 (14)	605 (4)	14,082 (100)
Chronic lung disease	21,997 (85)	2892 (11)	900 (3)	25,789 (100)
Diabetes (type 1 or 2)	19,372 (84)	2839 (12)	786 (3)	22,997 (100)
Obesity	15,315 (86)	1899 (11)	512 (3)	17,726 (100)
Severity of immunosuppression				
Mild	37,504 (85)	5163 (12)	1310 (3)	43,977 (100)
Moderate/severe	8694 (85)	1179 (11)	388 (4)	10,261 (100)
Immunosuppressive condition				
HIV/AIDS	782 (86)	103 (11)	25 (3)	910 (100)
Hematologic malignancy	2619 (82)	430 (13)	160 (5)	3209 (100)
Other immune condition	4830 (84)	722 (13)	217 (4)	5769 (100)
Solid malignancy	28,686 (85)	3924 (12)	1092 (3)	33,702 (100)
Organ transplant	2796 (84)	424 (13)	115 (3)	3335 (100)
Rheumatologic/inflammatory condition	19,666 (85)	2763 (12)	736 (3)	23,165 (100)
Baseline medications				
Oral antivirals[d]	2 (67)	1 (33)	0 (0)	3 (100)
Dexamethasone	27,322 (92)	2110 (7)	228 (1)	29,660 (100)
Biologic immunomodulators	1671 (97)	45 (3)	7 (0)	1723 (100)
Baseline oxygen support				
No evidence of oxygen support	32,121 (84)	4881 (13)	1361 (4)	38,363 (100)
Low-flow oxygen	7077 (88)	806 (10)	144 (2)	8027 (100)
High-flow oxygen	4821 (90)	434 (8)	122 (2)	5377 (100)
Mechanical ventilation or ECMO	2179 (88)	221 (9)	71 (3)	2471 (100)

[a]"Early RDV" was defined as RDV initiation on Days 1 to 2 of hospitalization. "Intermediate RDV" was defined as RDV initiation on Days 3 to 7 of hospitalization. "Late RDV" was defined as RDV initiation on Days 8 to 28 of hospitalization.
[b]Percentages were calculated using the total number of patients from each respective row as the denominator. Percentages may not sum to 100% due to rounding.
[c]The initial wave was defined as the time period from May 1, 2020, to May 31, 2021. The Delta period was the time period from June 1, 2021, to November 30, 2021. The Omicron period was the time period from December 1, 2021, to December 3, 2023.
[d]Oral antivirals included nirmatrelvir/ritonavir and molnupiravir.
ECMO, extracorporeal membrane oxygenation; RDV, remdesivir.

- Most (100,612/154,850 [65%]) patients did not initiate RDV within the follow-up period of up to 28 days (**Figure 2**)
- The proportion of patients who received RDV was comparable between subgroups when stratified by age, sex, hospital size, certain comorbidities, severity of immunosuppression, or certain immunosuppressive conditions (**Table 3**)
  - The proportion of patients who received RDV was greater in patients hospitalized during the Delta period as well as in patients on oxygen support
  - In contrast to all other subgroups, in which most patients did not receive RDV, the majority of patients on dexamethasone and the majority of patients on biologic immunomodulators received RDV

Table 3. Initiation of RDV by Demographic and Clinical Characteristics

n (%)[a]	RDV (n = 54,238)	No RDV (n = 100,612)	Total (N = 154,850)
Age group			
12-64 years	17,992 (34)	34,686 (66)	52,678 (100)
≥65 years	36,246 (35)	65,926 (65)	102,172 (100)
Variant period[b]			
Initial wave	22,261 (36)	39,346 (64)	61,607 (100)
Delta	9533 (47)	10,959 (53)	20,492 (100)
Omicron	22,444 (31)	50,307 (69)	72,751 (100)
Sex			
Female	27,030 (34)	51,902 (66)	78,932 (100)
Male	27,208 (36)	48,710 (64)	75,918 (100)
Insurance type			
Commercial	12,673 (38)	20,464 (62)	33,137 (100)
Medicaid	4404 (30)	10,311 (70)	14,715 (100)
Medicare	31,372 (35)	58,806 (65)	90,178 (100)
Comorbidities			
Cancer (excluding nonmelanoma skin cancer)	19,176 (35)	35,547 (65)	54,723 (100)
Cardiovascular disease	42,434 (34)	81,927 (66)	124,361 (100)
Chronic kidney disease	14,082 (30)	33,302 (70)	47,384 (100)
Chronic lung disease	25,789 (35)	47,901 (65)	73,690 (100)
Diabetes (type 1 or 2)	22,997 (34)	45,632 (66)	68,629 (100)
Obesity	17,726 (36)	31,618 (64)	49,344 (100)
Severity of immunosuppression			
Mild	43,977 (35)	82,523 (65)	126,500 (100)
Moderate/severe	10,261 (36)	18,089 (64)	28,350 (100)
Immunosuppressive condition			
HIV/AIDS	910 (31)	1983 (69)	2893 (100)
Hematologic malignancy	3209 (40)	4794 (60)	8003 (100)
Other immune condition	5769 (32)	12,228 (68)	17,997 (100)
Solid malignancy	33,702 (36)	60,555 (64)	94,257 (100)
Organ transplant	3335 (38)	5468 (62)	8803 (100)
Rheumatologic/inflammatory condition	23,165 (33)	46,149 (67)	69,314 (100)
Baseline medications			
Oral antivirals[c]	3 (6)	44 (94)	47 (100)
Dexamethasone	29,660 (56)	23,714 (44)	53,374 (100)
Biologic immunomodulators	1723 (69)	771 (31)	2494 (100)
Baseline oxygen support			
No oxygen	38,363 (33)	78,196 (67)	116,559 (100)
Low-flow oxygen	8027 (44)	10,125 (56)	18,152 (100)
High-flow oxygen	5377 (41)	7858 (59)	13,235 (100)
Mechanical ventilation or ECMO	2471 (36)	4433 (64)	6904 (100)

[a]Percentages were calculated using the total number of patients from each respective row as the denominator. Percentages may not sum to 100% due to rounding.
[b]The initial wave was defined as the time period from May 1, 2020, to May 31, 2021. The Delta period was the time period from June 1, 2021, to November 30, 2021. The Omicron period was the time period from December 1, 2021, to December 3, 2023.
[c]Oral antivirals included nirmatrelvir/ritonavir and molnupiravir.
ECMO, extracorporeal membrane oxygenation; RDV, remdesivir.

Limitation

- Inclusion relied on continuous insurance enrollment for 365 days and 1 or more existing diagnoses of an immunosuppressive condition; because Medicare patients are underrepresented in commercial claims data, these requirements limit the generalizability of the study to the population with immunosuppressive conditions who are commercially insured in the United States

References: 1. Mozaffari E, et al. *Clin Infect Dis*. 2023;77:1626-34. **2.** VEKLURY® (remdesivir) for injection, for intravenous use [prescribing information]. Gilead Sciences, Inc.; 2025. **3.** Patel M, et al. *Emerg Infect Dis*. 2020;26:1720-30.

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