# Effectiveness of Remdesivir as Treatment for COVID-19 Positive US Veterans

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## Background

- Globally, COVID-19 disease has now claimed nearly 6.55 million lives.
- Antiviral treatment options are currently limited.
- As of October 2020, Remdesivir (GS-5734, VEKLURY®)—an analog of adenosine nucleotide—is the only antiviral drug that received FDA approval for treating COVID-19 disease.
- One of the subgroups of patients that the NIH guidelines recommend for using Remdesivir was hospitalized patients with low-flow supplemental oxygen.
- As of September 2022, WHO guidelines were updated to conditionally recommend Remdesivir for non-severe and severe patients but not those with critical conditions.
- This retrospective cohort data analysis was undertaken to evaluate and clarify the effectiveness of Remdesivir use in older, hospitalized US veterans.

## Method

- The deidentified veterans' data were collected using the VA COVID-19 Shared Data (IRB# 00133238).
- Propensity-matched cohorts with and without Remdesivir treatment were analyzed using Cox regression models.
- Immortal time and calendar time biases were taken into consideration.
- Limited to hospitalized veterans, patients were followed for 60 days to the outcomes of a mechanical ventilator (MV) use and death in separate models.
- The cohort was also limited to those who received low-flow without high-flow oxygen and a combination of low and high-flow oxygen in another set of models.

| | Total | Without Remdesivir treatment | With Remdesivir treatment | P-value |
|---|---|---|---|---|
| **Cohort** | N=3,372 | N=1,686 | N=1,686 | |
| **Patient characteristics** | | | | |
| **Age (year)** | 66.9 (13.9) | 67.0 (13.8) | 66.8 (14.1) | 0.68 |
| **Race** | | | | |
| **White** | 2,129 (63.1%) | 1,065 (63.2%) | 1,064 (63.1%) | |
| **Black or African American** | 679 (20.1%) | 342 (20.3%) | 337 (20.0%) | 0.93 |
| **Hispanic or Latino** | 284 ( 8.4%) | 144 ( 8.5%) | 140 ( 8.3%) | |
| **Others** | 280 ( 8.3%) | 135 ( 8.0%) | 145 ( 8.6%) | |
| **BMI groups(kg/m²)** | | | | |
| **Underweight (< 18.5)** | 92 ( 2.7%) | 46 ( 2.7%) | 46 ( 2.7%) | |
| **Normal weight (18.5 - 24.9)** | 733 (21.7%) | 357 (21.2%) | 376 (22.3%) | |
| **Overweight (25 - 29.9)** | 1,009 (29.9%) | 505 (30.0%) | 504 (29.9%) | 0.87 |
| **Obese (30 - 39.9)** | 1,257 (37.3%) | 644 (38.2%) | 613 (36.4%) | |
| **Morbidly Obese (40+)** | 270 ( 8.0%) | 129 ( 7.7%) | 141 ( 8.4%) | |
| **Unknown** | 11 ( 0.3%) | 5 ( 0.3%) | 6 ( 0.4%) | |
| **Geographic location** | | | | |
| **Midwest** | 695 (20.6%) | 350 (20.8%) | 345 (20.5%) | |
| **Northeast** | 235 ( 7.0%) | 119 ( 7.1%) | 116 ( 6.9%) | |
| **Others** | 291 ( 8.6%) | 139 ( 8.2%) | 152 ( 9.0%) | 0.87 |
| **Southeast** | 1,065 (31.6%) | 546 (32.4%) | 519 (30.8%) | |
| **Southwest** | 565 (16.8%) | 275 (16.3%) | 290 (17.2%) | |
| **West** | 521 (15.5%) | 257 (15.2%) | 264 (15.7%) | |
| **Rurality** | | | | |
| **City Town** | 296 ( 8.8%) | 136 ( 8.1%) | 160 ( 9.5%) | |
| **Small Town Rural** | 265 ( 7.9%) | 132 ( 7.8%) | 133 ( 7.9%) | 0.26 |
| **Urban** | 2,532 (75.1%) | 1,288 (76.4%) | 1,244 (73.8%) | |
| **Unknown** | 279 ( 8.3%) | 130 ( 7.7%) | 149 ( 8.8%) | |
| ***Index date (by months)** | | | | |
| **Jan - Feb** | 4 ( %) | 2 ( %) | 2 ( %) | |
| **Mar - Apr** | 316 ( %) | 158 ( %) | 158 ( %) | |
| **May - Jun** | 148 ( %) | 74 ( %) | 74 ( %) | 1.00 |
| **Jul – Aug** | 1,372 (%) | 686 (%) | 686 (%) | |
| **Sep – Oct** | 1,326 (%) | 663 (%) | 663 (%) | |
| **Nov - Dec** | 206 ( %) | 103 ( %) | 103 ( %) | |

***Table 1*. Demographic characteristics**

## Results

- A total of 3,372 veterans were included (hospitalized between 01 January to 31 December 2021 for COVID-19 disease).
- 1,686 received Remdesivir treatment, while their matches never received Remdesivir. After propensity score matching (demographics, vaccination status, comorbidities, medication use, lab tests), Remdesivir recipients and controls were similar in age (66.8±14.1 vs. 67.0±13.8 years (**Table 1**).
- Significant relative risk reductions (1-HR), 53% for MV, and 42% for death (**Fig. 1**) were observed with low-flow oxygen and Remdesivir therapy.
- In veterans who received high and low-flow oxygen, although there was a significant relative 18% reduction in risk for death with Remdesivir treatment, progression to MV was not significantly reduced (relative 12% reduction, p=0.22). The 12% may be clinically significant, but our available N provided adequate power (80%) only for a relative reduction of at least 17%.
- These results are displayed graphically with Kaplan-Meier plots (**Fig. 2**).
- A higher proportion of Veterans overall fared the disease well when receiving a low flow oxygen therapy.

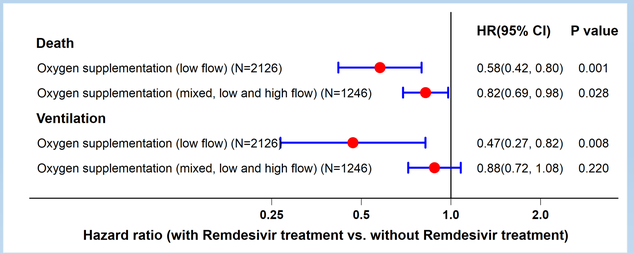


***Fig. 1:* A forest plot showing the hazard ratios for death and mechanical ventilator use**

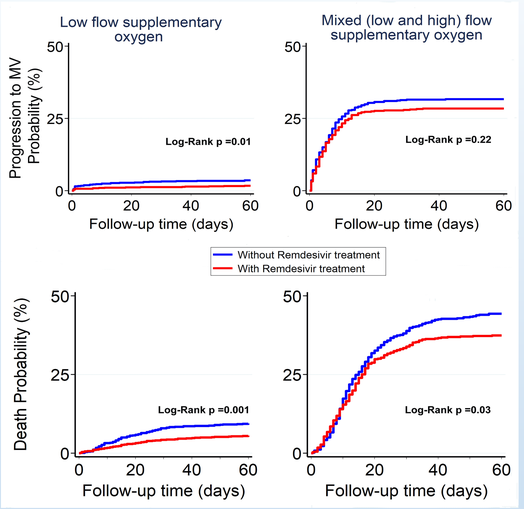


***Fig. 2:* Kaplan-Meier survival curves showing progression to MV or death probabilities between Remdesivir recipients and control veterans**

## Conclusion

The data showed significant risk reductions of disease progression to MV/death when Remdesivir was used in COVID-19-positive patients with low supplementary oxygen flow, **supporting the current NIH guidelines.**

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