# Outcomes and Risk Factors Associated With SARS-CoV-2 Infection in Military Veterans with Multiple Sclerosis

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## Introduction

**Importance:**

- COVID-19 remains a prevalent and serious public health concern today and a new challenge to Multiple Sclerosis (MS) care.
- It is unclear what additional risks severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections pose to patients with MS (PwMS) from a population-based health system. The COVID-19 pandemic is driving the need for further investigation regarding the clinic outcomes and the morbidly and mortality risk factors associated SARS-CoV-2 infections in the MS population.

**Objective:**

- This study aims to investigate the impact of COVID-19 on PwMS and to evaluate the incidence, severity, and risk factors of SARS-CoV-2 infections among a large, and diverse cohort in the Veteran Affairs (VA) health system across the United States.

## Methods

**Design, Setting, and Participants:**

- This analysis utilized the VA CoVID19 Registry and the MS Surveillance Registry to identify PwMS with a confirmed SARS-Cov-2 infection between December 1, 2019 to December 31, 2020.
- Data was obtained from 282 patients across the entire VA health care system.

**Exposures:**

- Laboratory-positive SARS-CoV-2 infection

**Main Outcomes and Measures:**

- Data collected included demographic information, comorbidities, MS phenotype, current disease modifying therapy (DMT) use, Expanded Disability Status Scale (EDSS) score, MS disease duration, and SARS-Cov-2 outcomes.
- Outcomes included PwMS that were hospitalized, ventilated, admitted to the intensive care unit (ICU), or died.

## Results

- Of the 282 patients, 25% were female and 75% were male with a mean age (SD) of 58.7 years.
- 51 (18% ) patients had primary progressive multiple sclerosis (PPMS), 149 (53%) had relapsing-remitting multiple sclerosis (RRMS), and 82 (29%) had secondary-progressive multiple sclerosis.
- The median EDSS score was 6 and the mean disease duration was 23 years.
- 46% of PwMS were not on any DMT, 34% of patients were on a low efficacy DMT (interferons, glatiramer acetate, teriflunomide, fumarates), 20% were on a high efficacy DMT (natalizumab, alemtuzumab, rituximab, ocrelizumab, ofatumumab, cladribine, sphingosine-1-phosphate receptor modulators).
- 14% of PwMS were on an anti-CD20 agent.
- 31% of patients developed severe infection requiring hospitalization, 11% were admitted to the ICU, and 4% died.
- Ambulatory disability, progressive disease, and older age were each independently associated with increased odds of a poor outcome such as hospitalization, intubation, ICU admission, and death as seen in Figure 1, Figure 2, and Figure 4.
- Severe and critical infections were more likely to affect older males with comorbidities.
- A longer disease course and a higher EDSS score was associated with more severe morbidity and mortality outcomes as seen in Figure 4
- PwMS that were not on any DMT exhibited worse outcomes than those on a DMT as seen in Figure 3
- PwMS on anti-CD20 agents had similar outcomes compared to those on a low efficacy DMT.

### Conclusions

**Most PwMS included in this study had a favorable course of SARS-CoV-2 infection. This study demonstrated that the patients not on a DMT were at the highest risk for a poor outcome, and the use of anti-CD20 agents did not significantly increase the risk for a poor outcome. This study demonstrated that older patients, patients with progressive disease, and patients with a higher EDSS score have the highest risk for a poor outcome.**

Figure 1. Clinical severity of COVID-19 by multiple sclerosis disease type

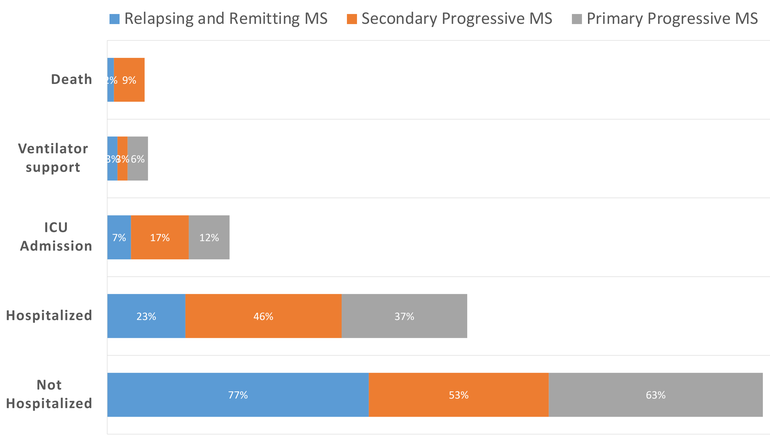



Figure 2. Clinical severity rate of COVID-19 by age

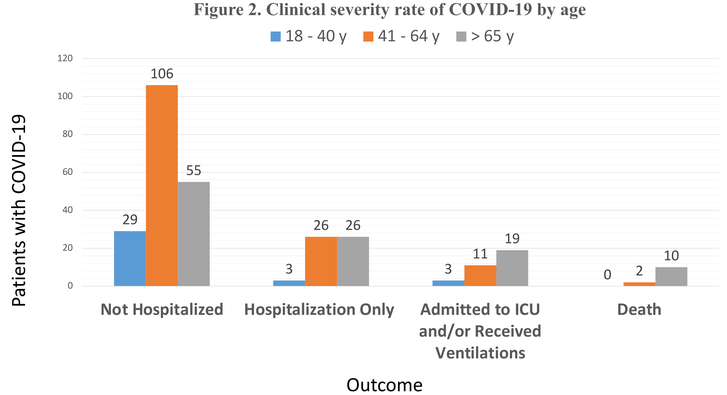



Figure 3. Clinical Severity of COVID-19 by DMT type

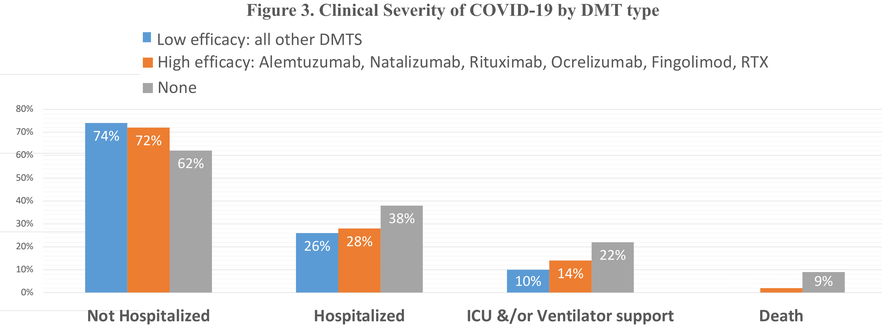
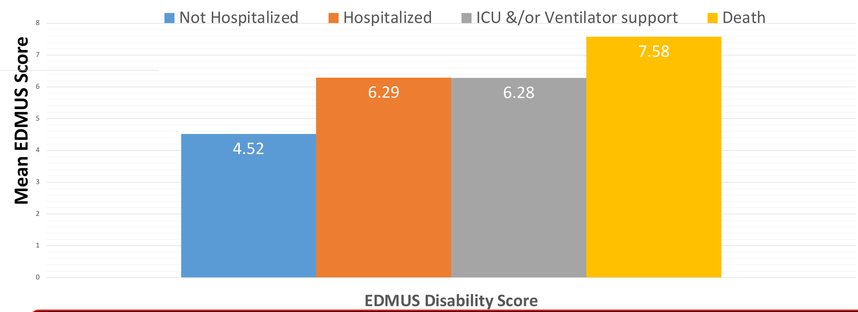



Figure 4. Clinical severity rates of COVID-19 by EDMUS disability score

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