

Asthma Has a Greater Impact on Outcomes in Younger COVID-19 Patients

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From the beginning of the pandemic, there have been concerns that subsets of the population would be at increased risk of experiencing severe disease with COVID-19. For example, multiple studies, as well as CDC data, have shown age to be an important risk factor of severe disease in COVID-19 patients.^{1,2} Another population of concern is people with asthma, which is a common condition with an estimated prevalence in the US of 7.9%.³ This concern seems logical since people with asthma have an increased risk of more severe outcomes from other viral respiratory infections, such as those associated with the common cold.⁴ The effect of asthma on outcomes in COVID-19 patients, however, remains unclear. Studies have shown conflicting results.⁵ Our data show asthma has a greater impact on outcomes in younger COVID-19 patients.

We first evaluated the rate of hospitalization, ICU admission, and death in patients with asthma without age stratification. The data show a higher percentage of COVID-19 patients with asthma were admitted to the hospital than non-asthmatic patients (25% vs. 19%). The percentage of admitted patients requiring treatment in the ICU was similar for asthma patients and non-asthmatic patients (28% vs. 29%). When admitted, the median hospital length of stay (LOS) was the same for both asthmatic patients and non-asthmatic patients. When they required ICU admission, the median ICU LOS was also the same in both groups. The percentage of patients who died was similar in both groups (see Figure 1).

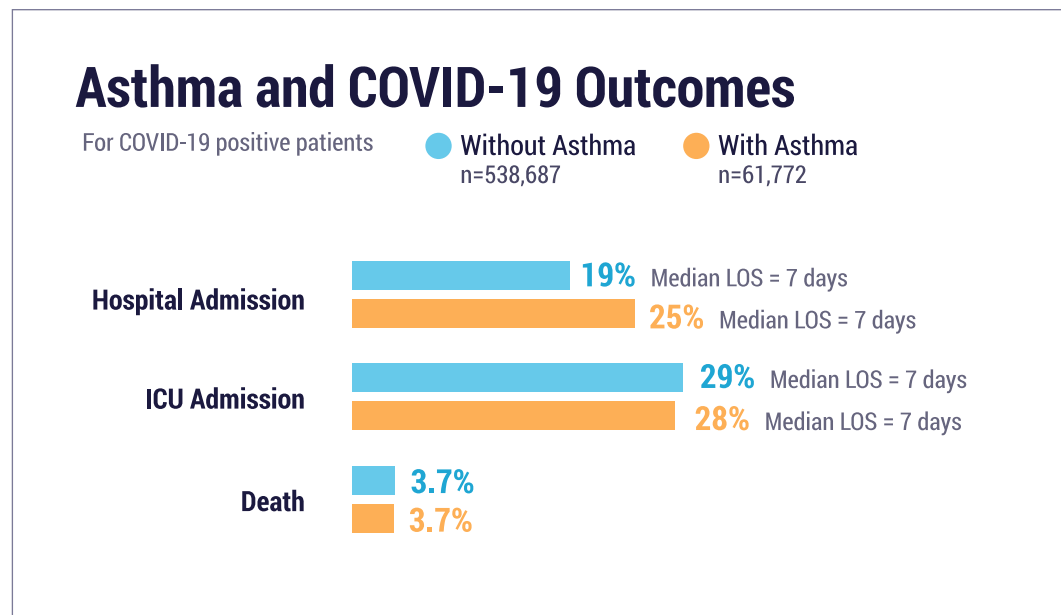


Figure 1. This table shows the rate of hospitalization, ICU admission, and mortality for asthmatic and non-asthmatic COVID-19 patients. The median hospital and ICU length of stay are shown for each. The median hospital LOS is restricted to patients who were admitted. The rate of ICU admission is restricted to admitted patients, and the median ICU LOS is restricted to patients with an ICU stay. Mortality rate only includes deaths that were recorded in the EHR. Patients were included regardless of follow-up time. Median LOS measures were the same regardless of whether currently admitted patients were included.

When the outcomes of asthma patients were compared to the outcomes of non-asthmatic patients in the same age group, asthma appeared to be a more important risk factor for poor outcome in younger patients (Figure 2). For example, in the 19-34 years old age group, COVID-19 patients with asthma were two times more likely to be admitted to the hospital, two times more likely to be admitted to the ICU, and three times more likely to die than non-asthmatic COVID-19 patients in the same age group. In contrast, in the 75-84 years old age group, patients with asthma were 7% more likely to be admitted, 4% more likely to be admitted to the ICU, and 10% less likely to die than non-asthmatic patients. This trend was statistically significant for all three outcomes ($p < 0.05$).

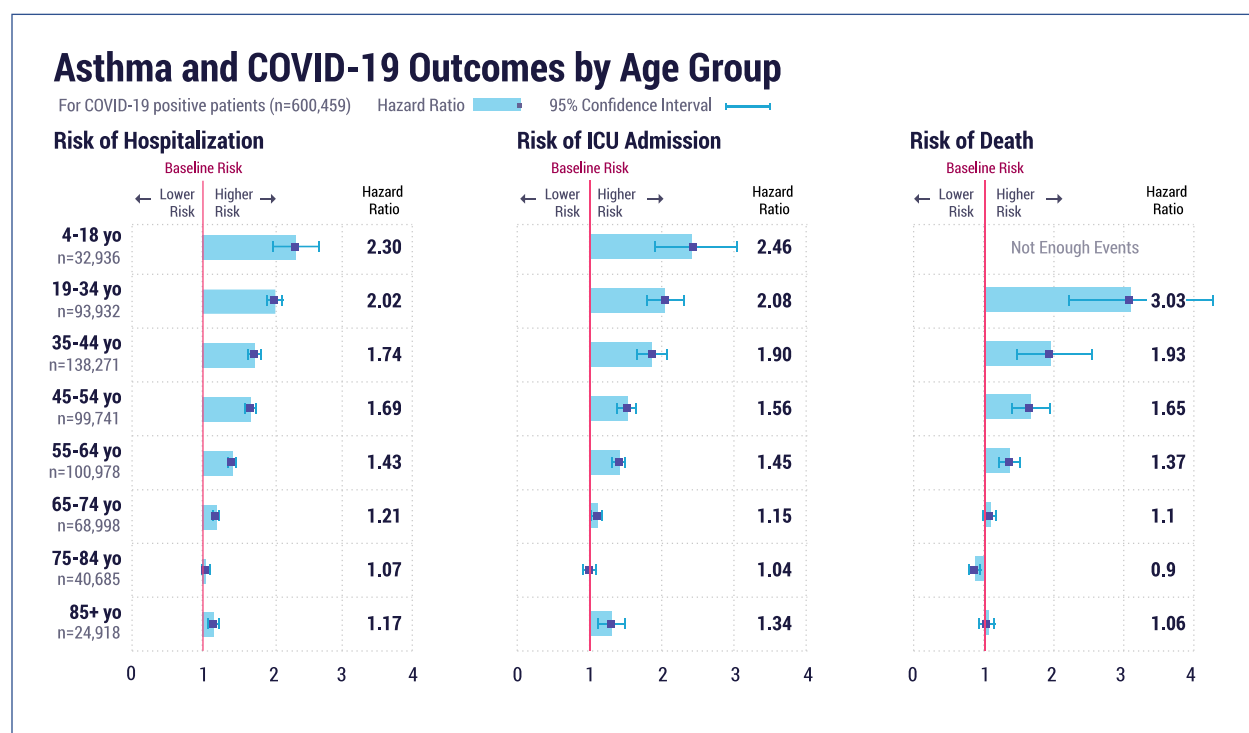


Figure 2: The light blue bars show the risk of hospitalization, ICU admission, and death for an asthmatic patient with COVID-19 when compared to a non-asthmatic patient in the same age group. The dark blue lines indicate the 95% confidence intervals, or the range that contains the true value with 95% certainty. The risk was calculated using a hazard ratio, a statistical method used to assess the probability of an event in one group (asthmatic patients with COVID-19) compared to a control group (non-asthmatic patients with COVID-19 in the same age group). A hazard ratio of 1 means an asthmatic patient has the same risk of the event as a non-asthmatic patient. A hazard ratio of 2 means an asthmatic patient is twice as likely to experience the event, while a hazard ratio of 0.5 means an asthmatic patient is half as likely to experience the event.

In summary, asthma appears to have a more significant impact on outcomes in younger COVID-19 patients. We suggest that the additional risk associated with asthma is overshadowed in older patients by their already elevated risk.

This summary includes data as of September 3, 2020. Data are pooled from 65 healthcare organizations representing 616 hospitals and 11,606 clinics that span 27 states.

NOTES ON OUR METHODS

We used a Cox proportional hazards model to evaluate whether asthma is associated with increased risk of death, hospitalization, or admission to the ICU. For all outcomes, we recorded time to event as the time since the patient was diagnosed with COVID-19 or tested positive. Each model controlled for sex. Patients who contracted COVID-19 while admitted and patients under the age of four were excluded from the analysis.

We stratified each of these models by age group to see if there is an interaction between age and the effect of asthma on death, hospitalization, and ICU admission. To test for trend, we created linear models for hazard ratio by age group and evaluated whether the coefficient was significant using a t-test.⁶

NOTES ON OUR FINDINGS

For all outcomes, the effect of asthma significantly decreased with age. This trend with age may explain the small difference in unadjusted death and admission rate between asthmatics and non-asthmatics, as younger patients are less likely to experience serious outcomes with COVID-19.

The true risk of asthma for COVID-19 patients may be larger than what is stated here due to sampling bias. Asthmatic patients in this sample are tested at higher rates than non-asthmatic patients (10.4% vs. 4.8%). This suggests that patients with less severe disease are more likely to be counted in the COVID-19 population if they have asthma than if they do not have asthma.

DATA DEFINITIONS

Term	Definition
COVID-19 Patient	Patient with a positive SARS-CoV-2 lab result or a COVID-19 diagnosis.
Length of Stay	The number of calendar days between hospital admission and discharge (inclusive). For example, a patient admitted and discharged on the same day has a length of stay of 1. For currently active admissions, the length of stay is calculated up to the current date.
ICU Days	The number of calendar days where the patient was billed with an ICU bed charge (revenue codes 0200 – 0203 and 0209) or admitted to a department marked as an ICU. Similar to length of stay, ICU days is inclusive. Also, for currently active admissions, ICU days are calculated up to the current date.
Asthma	Includes the following ICD-10 codes: J45.4, J45.40, J45.41, J45.42, J45.5, J45.50, J45.51, J45.52, J45.2, J45.3, J45.20, J45.30, J45.31, J45.32, J45.21, J45.22, J45.901, J45.909, J45.90, J45.902, J45.998 (ICD-10-CM) Patients were said to have asthma if one of these codes were either: (1) On their problem list at the time that they were confirmed to be COVID-19 positive or before the earliest of the following dates: discharge date of first COVID-19 admission, COVID-19 death date, or 42 days after COVID-19 diagnosis date. (2) Listed as an encounter or billing diagnosis for an encounter in the two years prior to the time that they were confirmed to be COVID-19 positive.

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