Hypertensive Patients Treated with Medication Show Better COVID-19 Outcomes than Untreated Patients

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Early in the COVID-19 pandemic, experts expressed concerns that hypertensive patients taking renin-angiotensin-aldosterone system (RAAS) inhibitors to control blood pressure might be at a higher risk of increased COVID-19 disease severity and mortality.[1] However, analysis of EHR data suggests that COVID-19 patients treated with certain RAAS inhibitor medications, specifically angiotensin-converting-enzyme (ACE) inhibitors and angiotensin II receptor blockers (ARBs), have lower COVID-19 disease severity and mortality.

This study examined COVID-19 severity for 69,182 active hypertensive patients who had a known COVID-19 outcome by July 8, 2020. RAAS inhibitors are commonly used as a single medication for the treatment of high blood pressure. Additional medication types that may be used alone to treat high blood pressure include calcium channel blockers (CCB) and thiazide-type diuretics. Patients were considered untreated for hypertension if there was no record of a chronic prescription for ACE inhibitors, ARBs, CCBs, thiazide-type diuretics, or β-blockers.

Patients treated only with an ACE inhibitor (4.9% mortality) or ARB (6.5% mortality) showed similar outcomes to other patients treated with a single anti-hypertension medication (7.6% mortality average across treatments). Patients who received a combination of medications showed slightly poorer outcomes (9.4% mortality average across treatments) compared to patients treated with single medications. Patients who did not receive anti-hypertension medications showed the worst COVID-19 outcomes (12.3% mortality) compared to the overall population. We did not control for additional comorbidities, such as congestive heart failure, which could account for the slightly poorer outcomes for patients receiving more than one medication.

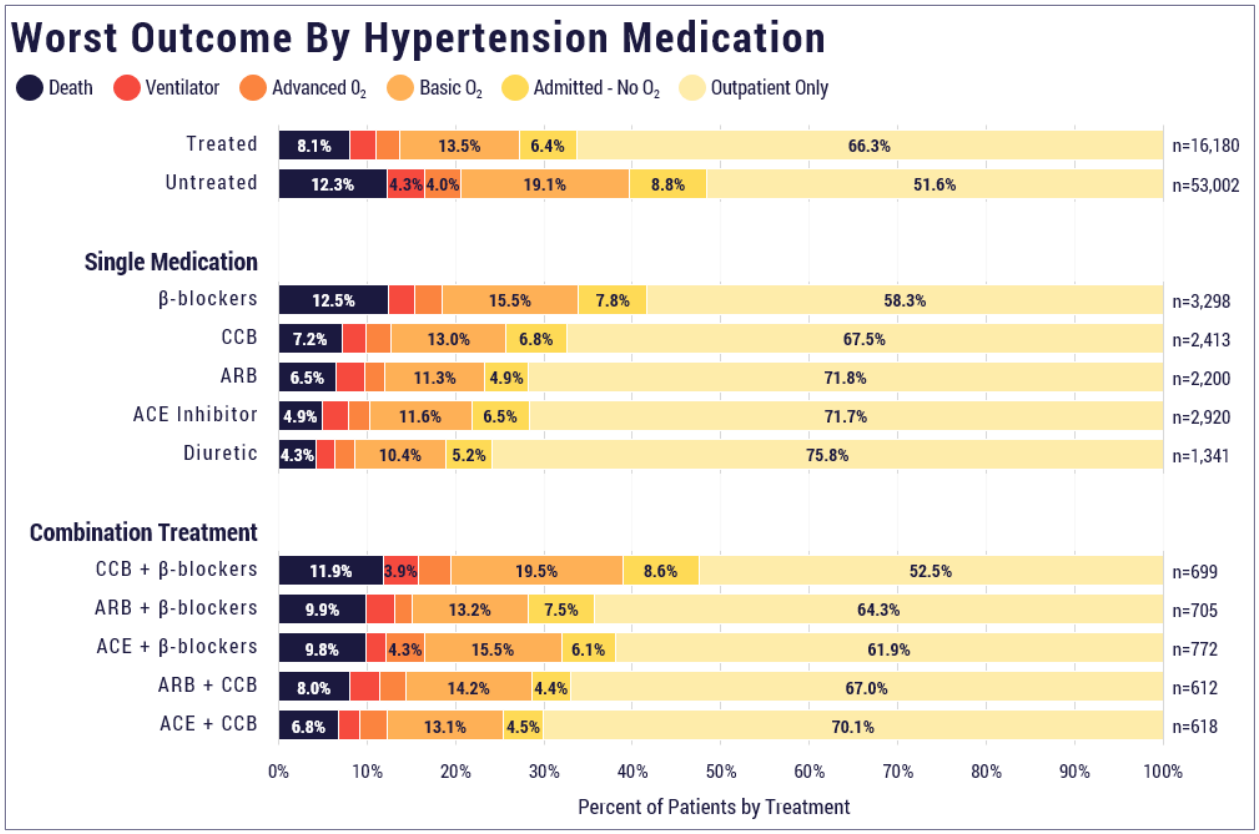

Figure 1. Distribution of worst COVID-19 outcomes by treatment.

We broke down the data to determine whether a possible effect might be hidden by either age or sex and found that the stratified results were similar to the overall sample. Therefore, it appears that the possible effects of RAAS inhibitors are not being masked by differences based on age or sex.

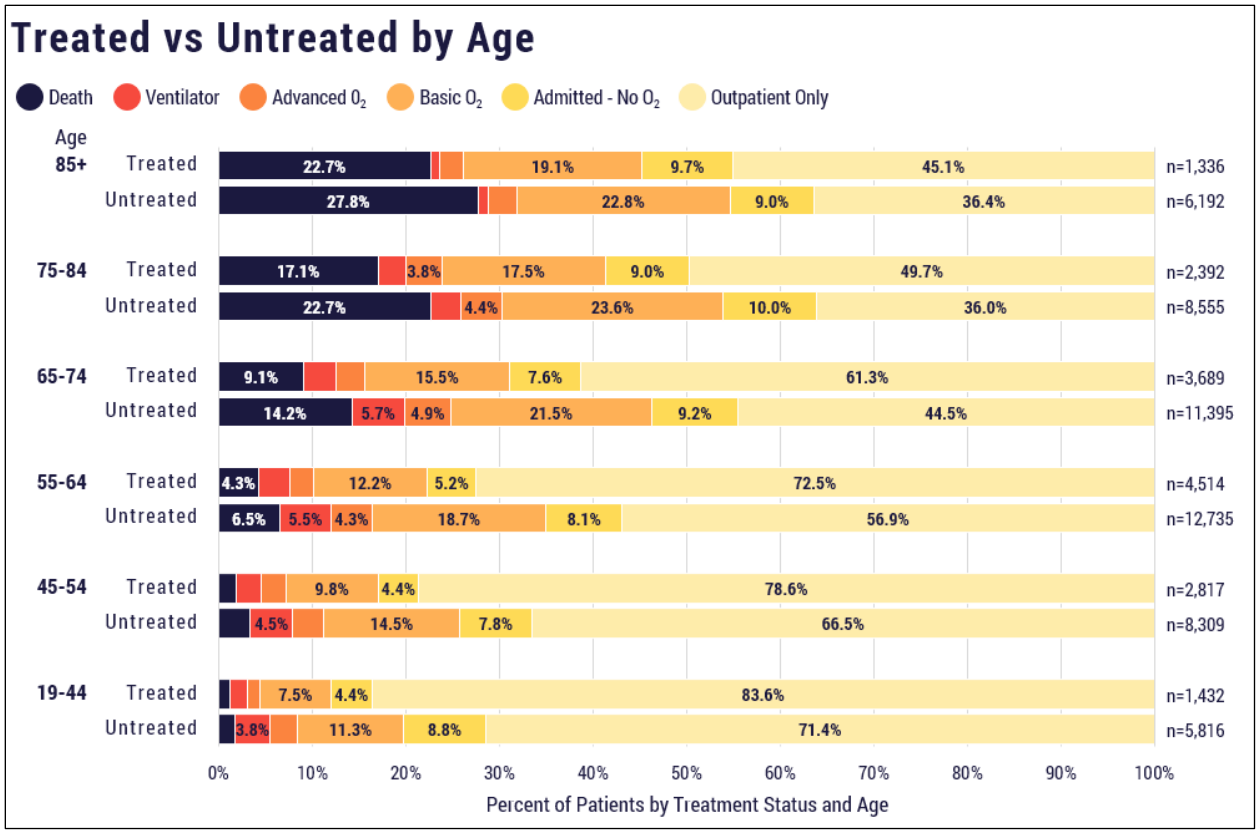

Figure 2. Distribution of worst COVID-19 outcomes by treatment, broken down by age group.

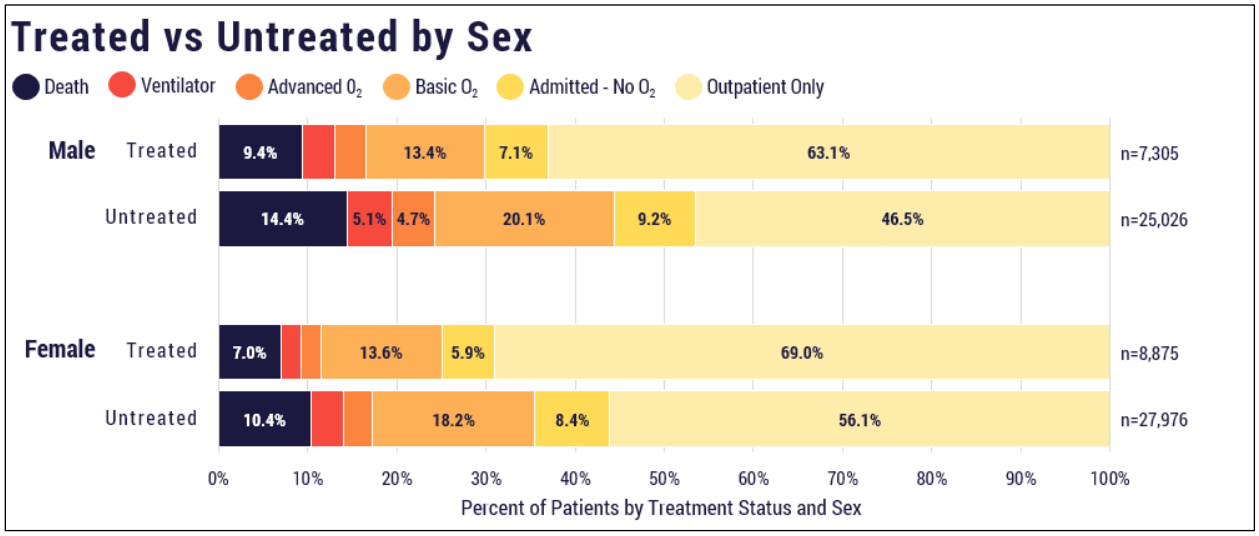

Figure 3. Distribution of worst COVID-19 outcomes by treatment, broken down by sex.

Our analysis of EHR data suggests that COVID-19 patients with pre-existing hypertension treated with any anti-hypertensive medication have better outcomes than patients with untreated hypertension. The data also shows that patients treated with either an ACE inhibitor or an ARB do not have higher disease severity and mortality, in contrast to initial expert concerns. Further research into the impact of multiple comorbidities often associated with hypertension may be needed to explain the more severe outcomes seen in patients taking multiple medications.

This summary includes an examination of COVID-19 severity for 69,182 active hypertensive patients who had a known COVID-19 outcome as of July 8, 2020.

Data are pooled from 38 healthcare organizations representing 272 hospitals that span 20 states and cover 41.4 million patients.

Term	Definition
Hypertension	SNOMED: 38341003 or any of its child concepts, excluding patients who also have an ICD-10-CM code starting with "O," as these are pregnancy-related conditions.
COVID-19 Positive Patient	Patient with a positive SARS-CoV-2 lab result or a COVID-19 diagnosis.
COVID-19 Related Death	A COVID-19 patient with a death date or discharge date with discharge disposition of deceased within 6 weeks of their COVID-19 "start date."
Severity Score Index	An ordinal scale from most severe to least severe: • Death • Patient on ventilator • Patient on advanced oxygen support • Patient on basic oxygen support • Patient has COVID-19 related admission, no supplemental oxygen • Discharged • No Admission We have purposefully left our numeric values off our description of this scale. We have aligned this severity scale with the severity index scores used by numerous clinical trials, FDA, CDC, and WHO, regardless of which numeric end they have coded as "high severity." Severity is assessed daily. The most severe score a patient has attained on a calendar date (midnight to midnight) is recorded. Note, if a patient tests positive on Day 0 and is admitted on Day 4, Days 0-3 would be severity=No Admission, Day 4 would be one of the first 5 severity levels. When they are discharged, they would then be severity=Discharged.
Worst Outcome	This is defined as the worst severity a patient has attained over all the days assessed for the patient.
Active Patient	A patient who has interacted with the health system in the past 2 years, indicated by either a face-to-face visit or an order placed on their chart.

REFERENCES

1. de Abajo, Francisco J et al., on behalf of the MED-ACE2-COVID19 Study Group. "Use of renin–angiotensin–aldosterone system inhibitors and risk of COVID-19 requiring admission to hospital: a case-population study," *Lancet* 395 (May 2020): 1671, https://doi.org/10.1016/S0140-6736(20)31030-8.

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Check for updates at:
https://ehrn.org/wp-content/uploads/Hypertensive-Patients-Treated-With-Medication-Show-Better-Outcomes.pdf