

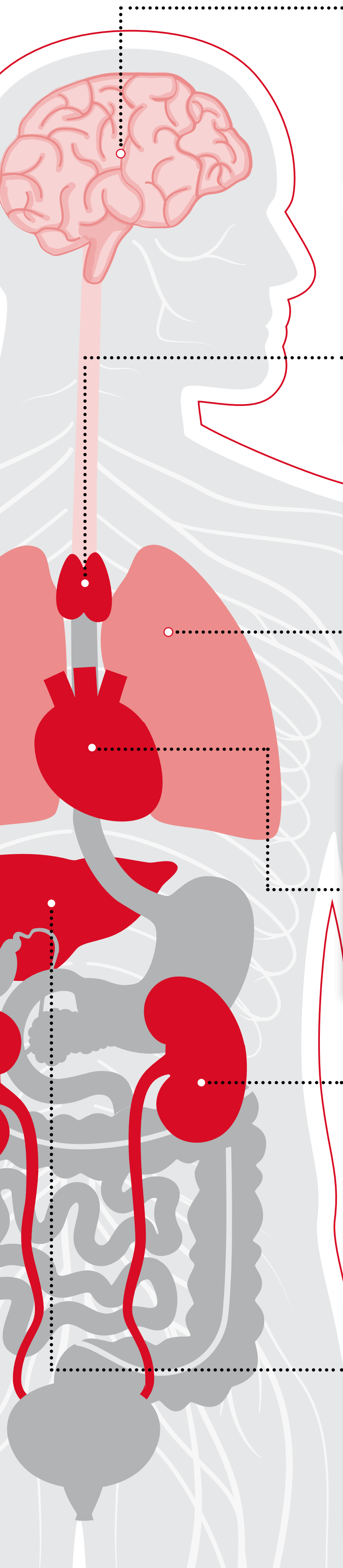
COVID-19 MAY WORSEN UNDERLYING MEDICAL CONDITIONS

LEADING TO SUBSTANTIALLY INCREASED MORBIDITY AND MORTALITY FOR PATIENTS¹⁻⁷



© 2025 Shionogi Inc., Florham Park, NJ 07932.
All Rights Reserved.
MED-US--2500732 v1 08/25

Even patients with **mild COVID-19** may experience exacerbation of pre-existing chronic conditions⁸⁻¹²



Neurological Disorders

Dementia^{1,13} | Epilepsy^{1,13} | Parkinson's Disease¹⁴

59%

Patients with COVID-19 experienced exacerbation of Parkinson's disease symptoms¹⁴

[Learn more](#)

Immune Conditions

Multiple Sclerosis and Related Disorders (MSRDs)² | Systemic Autoimmune Rheumatic Diseases (SARDs)³

41%

Patients with SARDs reported notable symptom flares following COVID-19 infection²

[Learn more](#)

Respiratory Diseases

Asthma¹⁵ | Bronchiectasis¹⁶ | Chronic Obstructive Pulmonary Disease (COPD)¹⁷ | Lung Cancer¹⁸

↑4x

Higher risk of severe COPD exacerbations in patients with severe COVID-19

vs patients with COPD without COVID-19¹⁷

[Learn more](#)

Cardiovascular Diseases

Coronary Artery Disease¹⁹ | Hypertension^{20,21}

↑139%

Higher risk of thromboembolic events in patients with COVID-19 vs patients without COVID-19⁸

[Learn more](#)

Kidney Diseases

Chronic Kidney Disease²²

↑3x

Higher risk of acute kidney injury in patients with kidney disease and COVID-19

vs kidney disease patients with influenza²²

[Learn more](#)

Liver Disorders

Chronic Hepatitis B²³ | Chronic Liver Disease^{7,24} | Cirrhosis^{7,24}

20%

Patients with COVID-19 and cirrhosis experienced either acute-on-chronic liver failure or decompensation due to COVID-19⁷

[Learn more](#)

Abbreviations: COPD, chronic obstructive pulmonary disease; COVID-19, coronavirus disease 2019; CVD, cardiovascular disease; MSRD, multiple sclerosis and related disorders; SARD, systemic autoimmune rheumatic diseases.

References: 1. Marsters CM, et al. *Brain*. 2024;147(7):2542-2551; 2. Conway SE, et al. *Mult Scler Relat Disord*. 2022;63:103946; 3. Di Iorio M, et al. *Semin Arthritis Rheum*. 2022;55:152025; 4. Chiner-Vives E, et al. *Arch Bronconeumol*. 2022;58(Suppl 1):39-50; 5. Pepera G, et al. *Rev Cardiovasc Med*. 2022;23(1):28; 6. Nugent J, et al. *JAMA Netw Open*. 2021;4(3):e211095; 7. Sarin SK, et al. *Hepatol Int*. 2020;14(5):690-700; 8. Xie Y, et al. *Nat Med*. 2022;28(3):583-590; 9. Xie Y, et al. *BMJ*. 2022;376:e068993; 10. Srivastava S, et al. *World J Meta-Anal*. 2021;9(3):220-233; 11. Tenforde MW, et al. *MMWR Morb Mortal Wkly Rep*. 2020;69(30):993-998; 12. Graham EL, et al. *Ann Clin Transl Neurol*. 2021;8(5):1073-1085; 13. Sakibuzzaman Md, et al. *Cureus*. 2022;14(9):e29297; 14. Kubota T, et al. *Clin Neurol Neurosurg*. 2021;200:106349; 15. Kwok WC, et al. *Respir Res*. 2023;24(1):53; 16. Kwok WC, et al. *Respirology*. 2024;29(3):209-216; 17. Kwok WC, et al. *Sci Rep*. 2024;14(1):13881; 18. Peng Y-L, et al. *Cancers (Basel)*. 2024;16(2):304; 19. Hadidchi R, et al. *EBioMedicine*. 2025;116:105778; 20. Zheng Z, et al. *J Infect*. 2020;81(2):e16-e25; 21. Del Sole F, et al. *Eur J Clin Invest*. 2020;50(10):e13378; 22. Chen I-W, et al. *Sci Rep*. 2025;15(1):10924; 23. Zou X, et al. *Clin Gastroenterol Hepatol*. 2021;19(3):597-603; 24. Marjot T, et al. *Nat Rev Gastroenterol Hepatol*. 2021;18(5):348-364.



Reach out to your MSL

<https://www.shionogimedical.com/request-msl>

Visit the Shionogi U.S. Medical Website

<https://shionogimedical.com/>



SHIONOGI
U.S. Medical

COVID-19 MAY WORSEN UNDERLYING MEDICAL CONDITIONS

LEADING TO SUBSTANTIALLY INCREASED MORBIDITY AND MORTALITY FOR PATIENTS¹⁻⁷



© 2025 Shionogi Inc., Florham Park, NJ 07932.
All Rights Reserved.
MED-US--2500732 v1 08/25

NEUROLOGICAL DISORDERS

Patients with COVID-19 and underlying neurological disorders may experience worsening of symptoms¹⁻⁶



71%

Patients with underlying neurological disorders* are negatively impacted[†] by COVID-19 in the 6 months following infection¹

Following COVID-19 infection, these patients often experience persistent worsening of:

- Pain interference and intensity



60%

Patients with COVID-19 and dementia experienced symptom exacerbations^{2,3} including:⁴

- Increased delirium
- Behavioral alteration
- Worsening functional status



59%

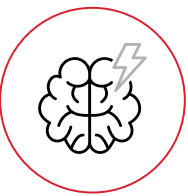
Patients with COVID-19 and Parkinson’s disease experienced worsening symptoms^{2,3} including:⁵

Motor symptoms

- Bradykinesia
- Gait disturbances
- Rigidity
- Tremors

Non-motor symptoms

- Autonomic disruptions
- Cognitive disruptions
- Mood disturbances
- Pain
- Sleep disturbances



>12x

Patients with a history of COVID-19 infection and epilepsy had higher odds of experiencing seizure worsening as defined by:⁶

- Increased frequency or duration of seizures

*Neurological disorders included Guillain-Barré syndrome, multiple sclerosis, migraines, narcolepsy, optic neuritis, and traumatic brain injury.
†“Negative impact” refers to a decline in patient-reported quality of life metrics.

Abbreviations: COVID-19, coronavirus disease 2019

References: 1. Shanley JE, et al. *Ann Clin Transl Neurol.* 2022;9(7):995-1010; 2. Kubota T, et al. *Clin Neurol Neurosurg.* 2021;200:106349; 3. Sakibuzzaman M, et al. *Cureus.* 2022;14(9):e29297; 4. Bianchetti A, et al. *J Nutr Health Aging.* 2020;24(6):560-562; 5. Brown EG, et al. *J Parkinsons Dis.* 2020;10(4):1365-1377; 6. Khedr EM, et al. *Egypt J Neurol Psychiatry Neurosurg.* 2024;60(1):101.

Close X

COVID-19 MAY WORSEN UNDERLYING MEDICAL CONDITIONS

LEADING TO SUBSTANTIALLY INCREASED MORBIDITY AND MORTALITY FOR PATIENTS¹⁻⁷



© 2025 Shionogi Inc., Florham Park, NJ 07932.
All Rights Reserved.
MED-US--2500732 v1 08/25

IMMUNE CONDITIONS

In the US, ~8% of the population has ≥1 autoimmune conditions¹

Multiple Sclerosis and Related Disorders (MSRDs)

Systemic Autoimmune Rheumatic Diseases (SARDs)

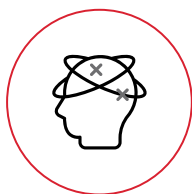
Frequent flares are associated with concomitant COVID-19 infection^{2,3}



41%

Patients with SARDs and COVID-19 experienced symptom flares including:²

- Poor rheumatic disease control
- Increased pain
- Increased fatigue
- Disruptions to DMARD therapeutic regimen



37%

Patients with COVID-19 and MSRDs experienced new or worsening neurological symptoms including:³

- Motor symptoms
- Sensory symptoms
- Cognitive impairment
- Fatigue
- Dizziness
- Spasticity
- Nystagmus
- Pseudorelapse

Abbreviations: COVID-19, coronavirus disease 2019; DMARD, disease-modifying antirheumatic drug; MSRDs, multiple sclerosis and related disorders; SARDs, systemic autoimmune rheumatic diseases; US, United States.

References: 1. NIH. <https://orwh.od.nih.gov/OADR-ORWH>. Accessed July 10, 2025; 2. Di Iorio M, et al. *Semin Arthritis Rheum.* 2022;55:152025; 3. Conway SE, et al. *Mult Scler Relat Disord.* 2022;63:103946.

Close X

COVID-19 MAY WORSEN UNDERLYING MEDICAL CONDITIONS

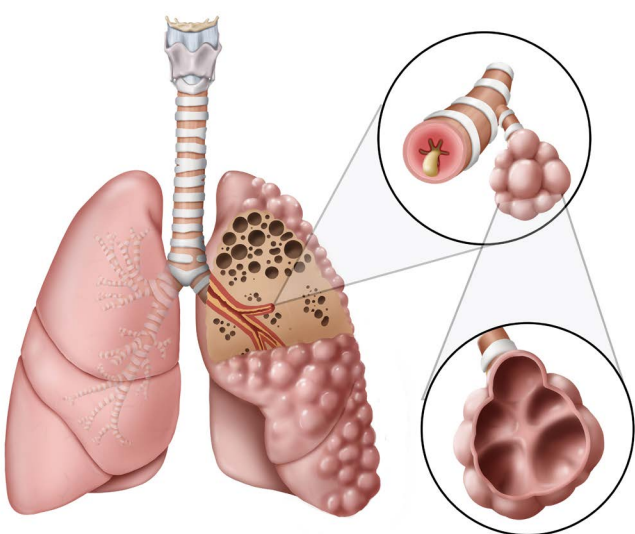
LEADING TO SUBSTANTIALLY INCREASED MORBIDITY AND MORTALITY FOR PATIENTS¹⁻⁷



© 2025 Shionogi Inc., Florham Park, NJ 07932. All Rights Reserved. MED-US--2500732 v1 08/25

RESPIRATORY DISEASES

COVID-19 may exacerbate pre-existing respiratory diseases¹⁻⁴



Asthma¹

COVID-19 was associated with

↑5.5x **Uncontrolled asthma**
vs patients with asthma without COVID-19

Lung Cancer³

COVID-19 was associated with

3.4x **Shorter progression-free survival**
vs patients with lung cancer without COVID-19

COPD²

Patients with severe COVID-19 infection experienced

4.7x **Higher risk of severe COPD exacerbations**
vs patients with COPD without COVID-19

Bronchiectasis⁴

Among patients with underlying bronchiectasis, those with COVID-19 experienced

0.7 **Increased frequency of exacerbations per year**
vs patients with bronchiectasis without COVID-19*

*Non-COVID-19 patients showed a decrease of 0.1 exacerbations/year.

Abbreviations: COPD, chronic obstructive pulmonary disease; COVID-19, coronavirus disease 2019.

References: 1. Kwok WC, et al. *Respir Res.* 2023;24(1):53; 2. Kwok WC, et al. *Sci Rep.* 2024;14(1):13881; 3. Peng Y-L, et al. *Cancers (Basel).* 2024;16(2):304; 4. Kwok WC, et al. *Respirology.* 2024;29(3):209-216.

Close X

COVID-19 MAY WORSEN UNDERLYING MEDICAL CONDITIONS

LEADING TO SUBSTANTIALLY INCREASED MORBIDITY AND MORTALITY FOR PATIENTS¹⁻⁷



© 2025 Shionogi Inc., Florham Park, NJ 07932. All Rights Reserved. MED-US--2500732 v1 08/25

CARDIOVASCULAR DISEASES

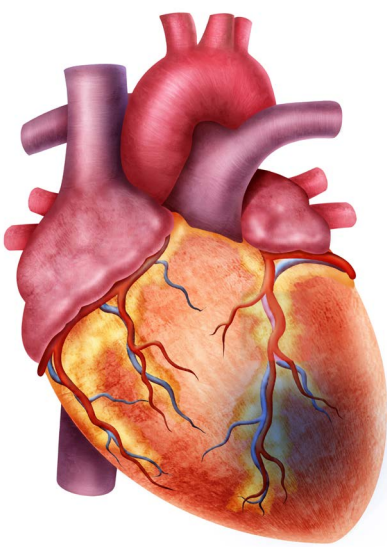
COVID-19 is associated with worsening of pre-existing cardiovascular disease¹⁻⁵

Patients with COVID-19 and underlying CVD or hypertension experienced exacerbation of cardiovascular complications including:^{1,2}

61% Acute cardiac injury^{*1}

34% Heart failure^{*1}

~8x Higher risk of myocardial injury^{†2}



Coronary artery disease

Patients with pre-existing coronary artery disease hospitalized for COVID-19 experienced:³

>1.5x Higher risk of MACE[‡]

>1.8x Higher risk of myocardial infarction[‡]

Patients with COVID-19 were at

139% Higher risk of thromboembolic events including:⁴

- Pulmonary embolism[§]
- Deep vein thrombosis[§]

Patients with COVID-19 were at an increased risk of:⁵

- | | |
|------------------------------|---|
| • Cerebrovascular incidents | • Ischemic heart disease |
| • Dysrhythmia | • Thrombotic disorders |
| • Inflammatory heart disease | • Other cardiac disorders |

^{*}These patients had either underlying CVD or hypertension. [†]These patients had pre-existing CVD, defined as prior myocardial infarction, percutaneous coronary intervention, coronary artery bypass graft surgery, angina or greater than 50% stenosis of an epicardial vessel on coronary angiography. These patients were compared to patients without preexisting CVD based on unvariable analysis. [‡]Compared with patients with underlying coronary artery disease and negative COVID-19. [§]Compared to patients without COVID-19. ^{||}Other cardiovascular outcomes include heart failure, nonischemic cardiomyopathy, cardiac arrest, and cardiogenic shock.

Abbreviations: COVID-19, coronavirus disease 2019; CVD, cardiovascular disease; MACE, major adverse cardiovascular event.

References: 1. Chen T, et al. *BMJ*. 2020;368:m1091; 2. Sritharan HP, et al. *Front Cardiovasc Med*. 2023;10:1224886; 3. Hadidchi R, et al. *eBioMedicine*. 2025;116:105778; 4. Xie Y, et al. *Nat Med*. 2022;28(3):583-590; 5. Xie Y, et al. *Nat Med*. 2022;28(3):583-590. Supplementary Appendix.

Close X

COVID-19 MAY WORSEN UNDERLYING MEDICAL CONDITIONS

LEADING TO SUBSTANTIALLY INCREASED MORBIDITY AND MORTALITY FOR PATIENTS¹⁻⁷



© 2025 Shionogi Inc., Florham Park, NJ 07932. All Rights Reserved. MED-US--2500732 v1 08/25

KIDNEY DISEASES

In patients with underlying kidney disease, COVID-19 may accelerate the decline of kidney function and may increase the risk of CKD more than other respiratory infections do^{1,2}

COVID-19 vs Influenza¹

In comparison to patients with influenza, those with COVID-19 had a higher risk of developing:

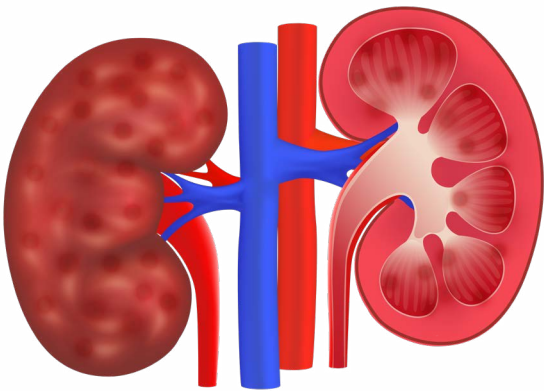
3x Acute kidney injury within 12 months

2x Advanced CKD* within 12 months

COVID-19 vs Pneumonia²

In hospitalized patients, those with COVID-19 had a

42% Higher risk of kidney function decline* vs those with pneumonia



Kidney failure

*Advanced CKD defined as stages 3-5. *As defined by a 25% decline in eGFR.

Abbreviations: AKI, acute kidney injury; CKD, chronic kidney disease; COVID-19, coronavirus disease 2019; eGFR, estimated glomerular filtration rate.

References: 1. Chen I-W, et al. *Sci Rep.* 2025;15(1):10924; 2. Mahalingasivam V, et al. *JAMA Netw Open.* 2024;7(12):e2450014.

Close X

COVID-19 MAY WORSEN UNDERLYING MEDICAL CONDITIONS

LEADING TO SUBSTANTIALLY INCREASED MORBIDITY AND MORTALITY FOR PATIENTS¹⁻⁷



© 2025 Shionogi Inc., Florham Park, NJ 07932.
All Rights Reserved.
MED-US--2500732 v1 08/25

LIVER DISORDERS

COVID-19 may cause notable liver dysfunction in patients with chronic liver disease (CLD) by triggering:

Acute Liver Injury^{1,2}

Acute Decompensation^{1,2}

Acute-on-chronic Liver Failure^{1,2}



Cirrhosis

72% of patients with COVID-19 and underlying CLD experienced acute liver injury³

29% of patients with COVID-19, chronic HBV co-infection, and liver injury experienced acute-on-chronic liver failure⁴

20% of patients with COVID-19 and cirrhosis experienced either acute-on-chronic liver failure or decompensation due to COVID-19¹

Abbreviations: CLD, chronic liver disease; COVID-19, coronavirus disease 2019; HBV, hepatitis B virus.

References: 1. Sarin SK, et al. *Hepatol Int.* 2020;14(5):690-700; 2. Marjot T, et al. *Nat Rev Gastroenterol Hepatol.* 2021;18(5):348-364; 3. Phipps MM, et al. *Hepatology.* 2020;72(3):807-817; 4. Zou X, et al. *Clin Gastroenterol Hepatol.* 2021;19:597-603.

Close X