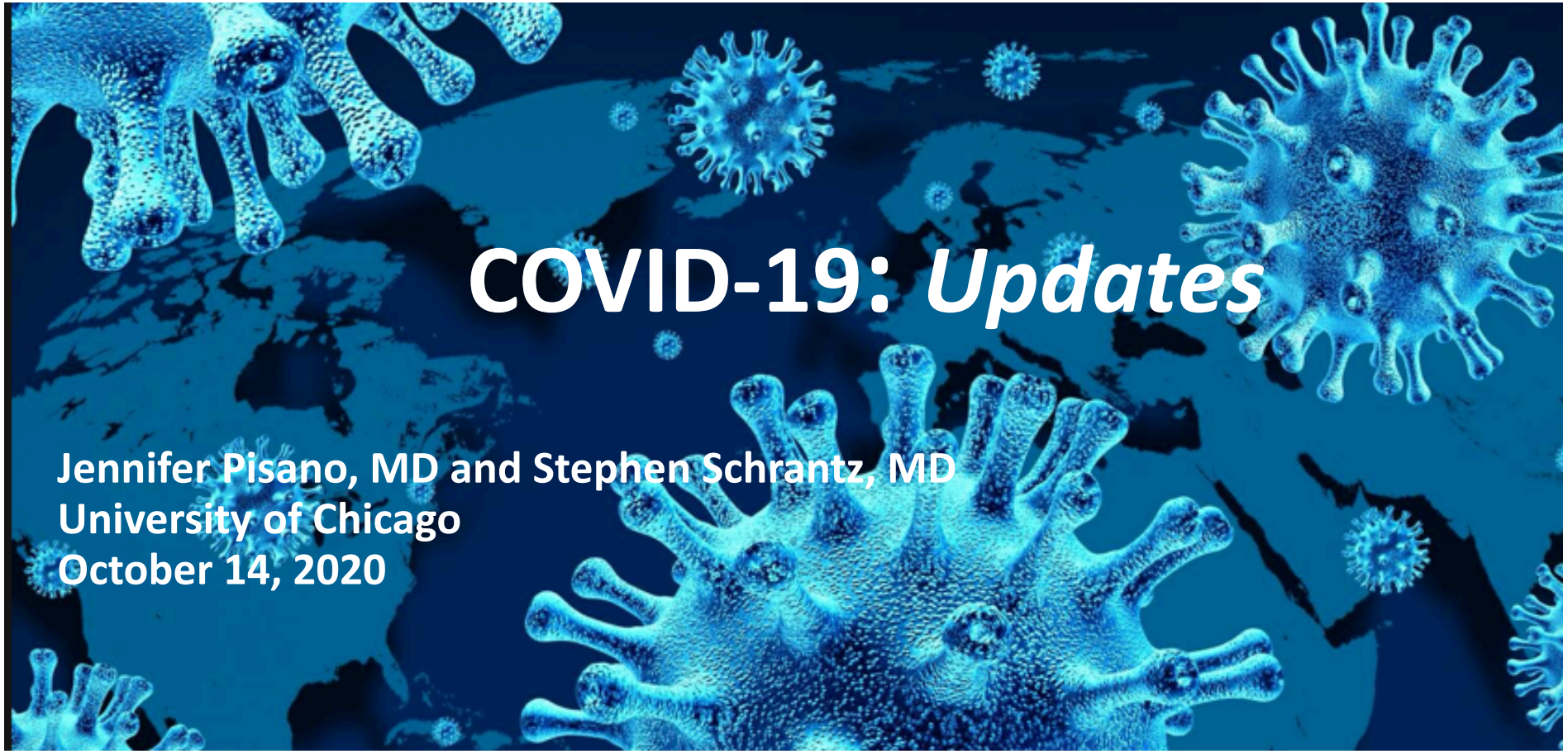

# COVID-19: *Updates*

**Jennifer Pisano, MD and Stephen Schrantz, MD**
**University of Chicago**
**October 14, 2020**

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# Disclosures

- I have no relevant financial interests to disclose.

# Hard not to start here…

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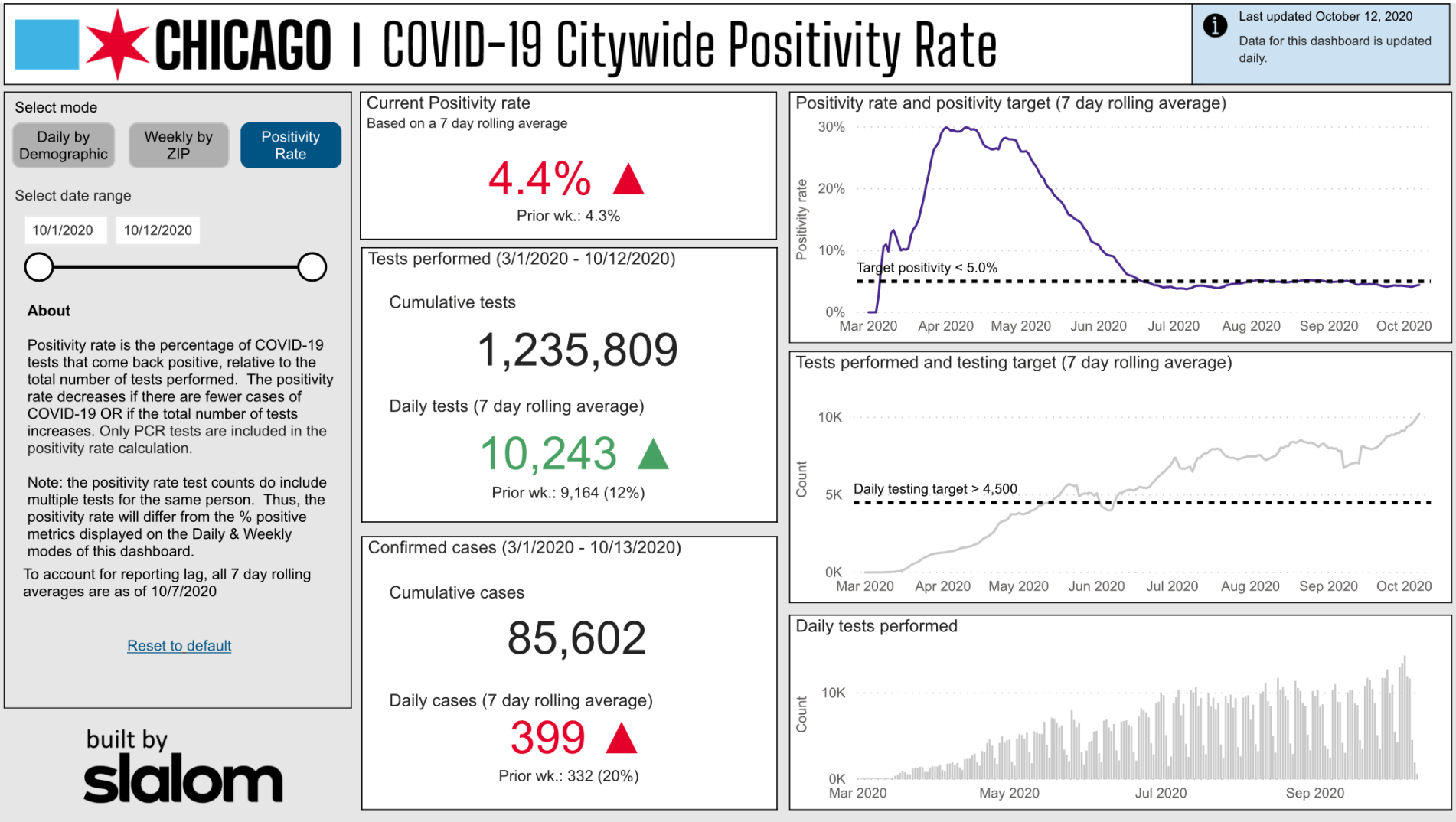
# Local Epidemiology

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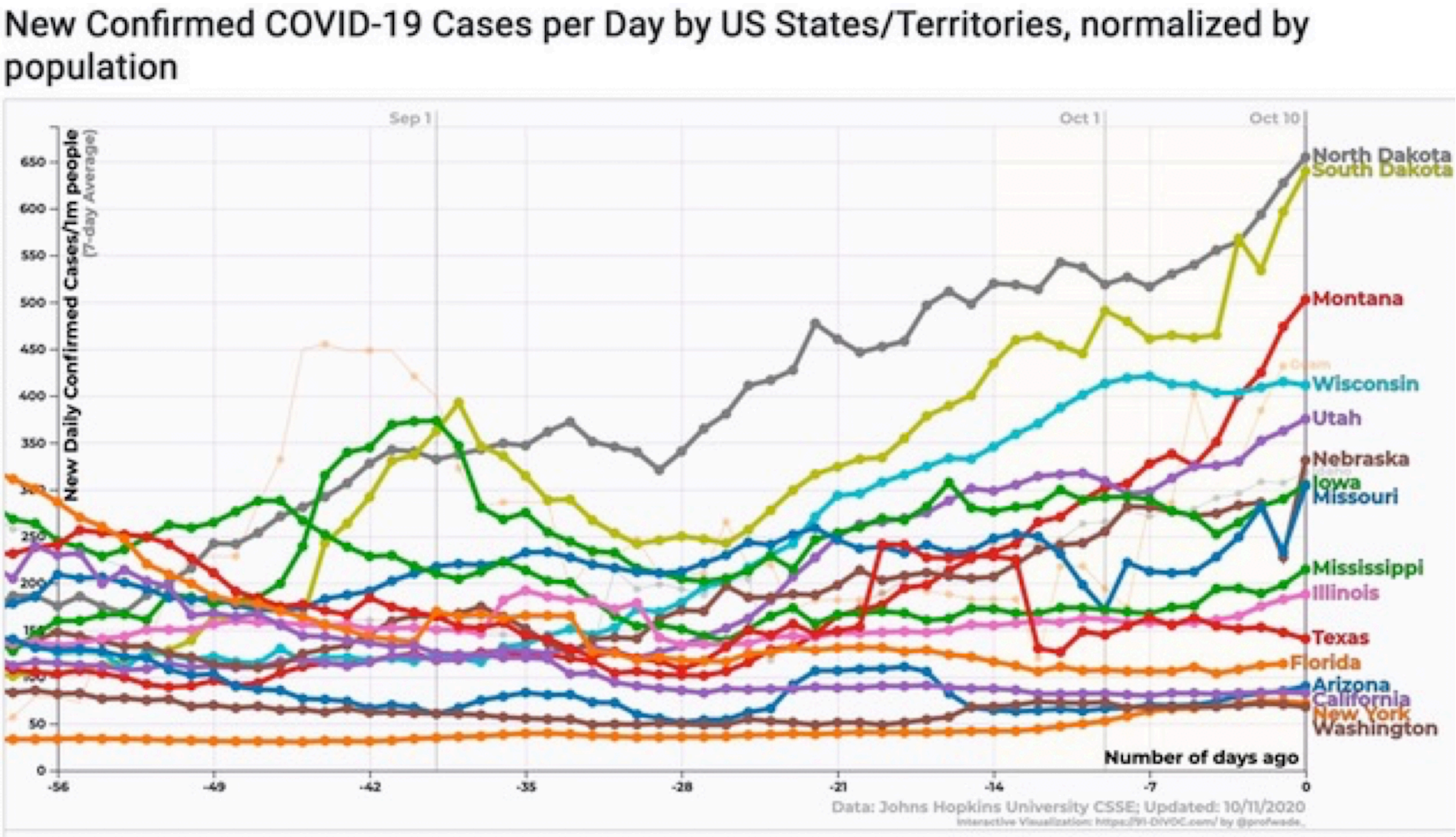
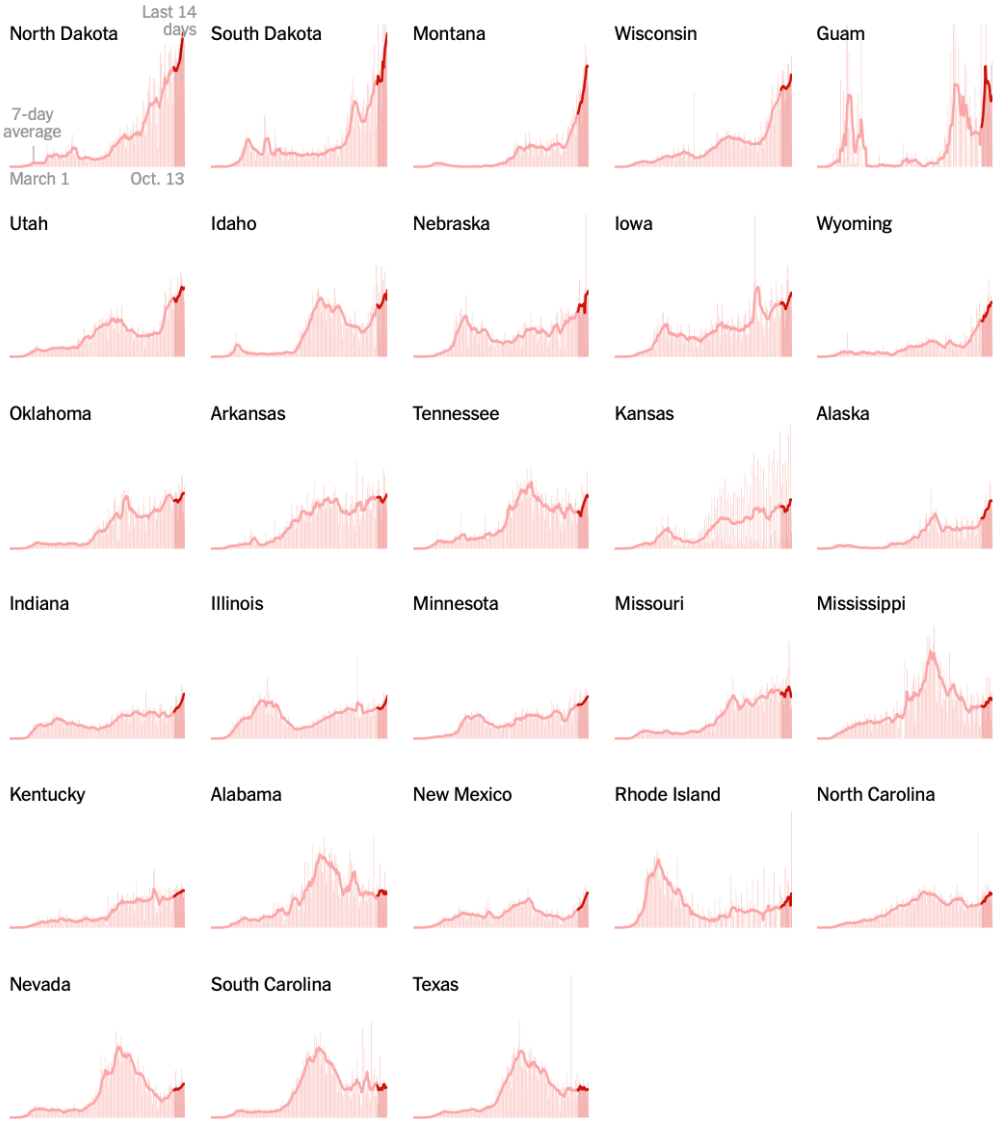
# And Elsewhere…



# Chicago's Quarantine List Grows…

- Now includes **Indiana** in addition to the previous Wisconsin, Iowa, Missouri.
- 26 states are now listed
- While numbers remain relatively stable in Chicago, fear of a resurgence persist…

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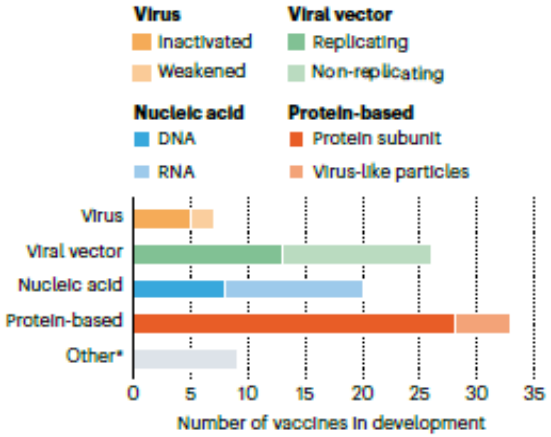
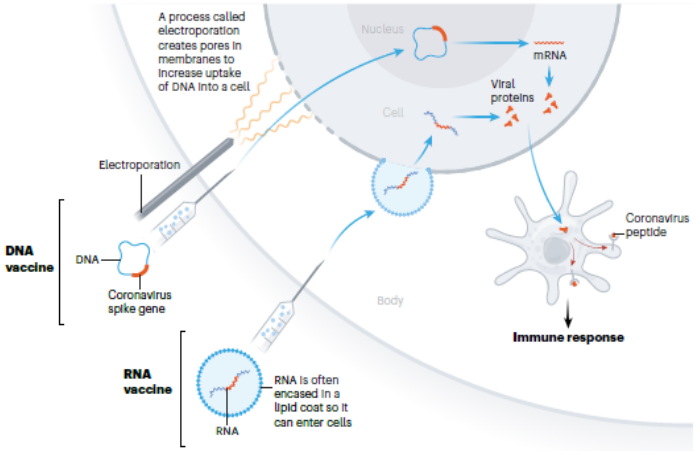
# SARS-CoV-2 Vaccine Candidates:




## NUCLEIC-ACID VACCINES

At least 20 teams are aiming to use genetic instructions (in the form of DNA or RNA) for a coronavirus protein that prompts an immune response. The nucleic acid is inserted into human cells, which then churn out copies of the virus protein; most of these vaccines encode the virus's spike protein.

RNA- and DNA-based vaccines are safe and easy to develop: to produce them involves making genetic material only, not the virus. But they are unproven: no licensed vaccines use this technology.

## VIRUS VACCINES

At least seven teams are developing vaccines using the virus itself, in a weakened or inactivated form. Many existing vaccines are made in this way, such as those against measles and polio, but they require extensive safety testing. Sinovac Biotech in Beijing has started to test an inactivated version of SARS-CoV-2 in humans.

**Weakened virus**
A virus is conventionally weakened for a vaccine by being passed through animal or human cells until it picks up mutations that make it less able to cause disease. Codagenix in Farmingdale, New York, is working with the Serum Institute of India, a vaccine manufacturer in Pune, to weaken SARS-CoV-2 by altering its genetic code so that viral proteins are produced less efficiently.

**Inactivated virus**
In these vaccines, the virus is rendered uninfectious using chemicals, such as formaldehyde, or heat. Making them, however, requires starting with large quantities of infectious virus.

## VIRAL-VECTOR VACCINES

Around 25 groups say they are working on viral-vector vaccines. A virus such as measles or adenovirus is genetically engineered so that it can produce coronavirus proteins in the body. These viruses are weakened so they cannot cause disease. There are two types: those that can still replicate within cells and those that cannot because key genes have been disabled.

**Replicating viral vector (such as weakened measles)**
The newly approved Ebola vaccine is an example of a viral-vector vaccine that replicates within cells. Such vaccines tend to be safe and provoke a strong immune response. Existing immunity to the vector could blunt the vaccine's effectiveness, however.

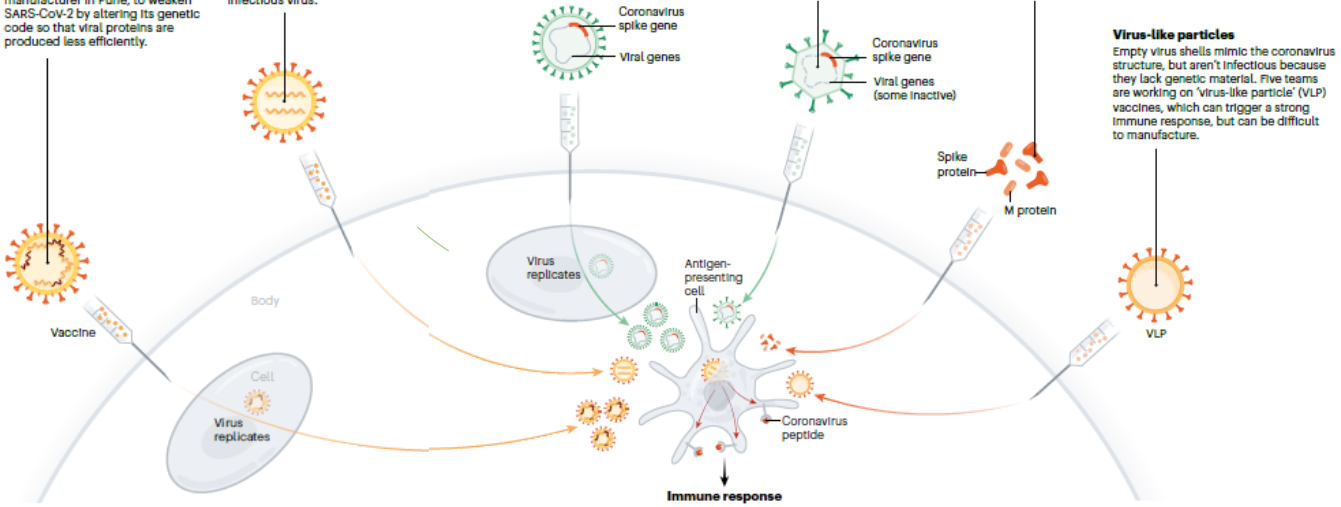
**Non-replicating viral vector (such as adenovirus)**
No licensed vaccines use this method, but they have a long history in gene therapy. Booster shots can be needed to induce long-lasting immunity. US-based drug giant Johnson & Johnson is working on this approach.

## PROTEIN-BASED VACCINES

Many researchers want to inject coronavirus proteins directly into the body. Fragments of proteins or protein shells that mimic the coronavirus's outer coat can also be used.

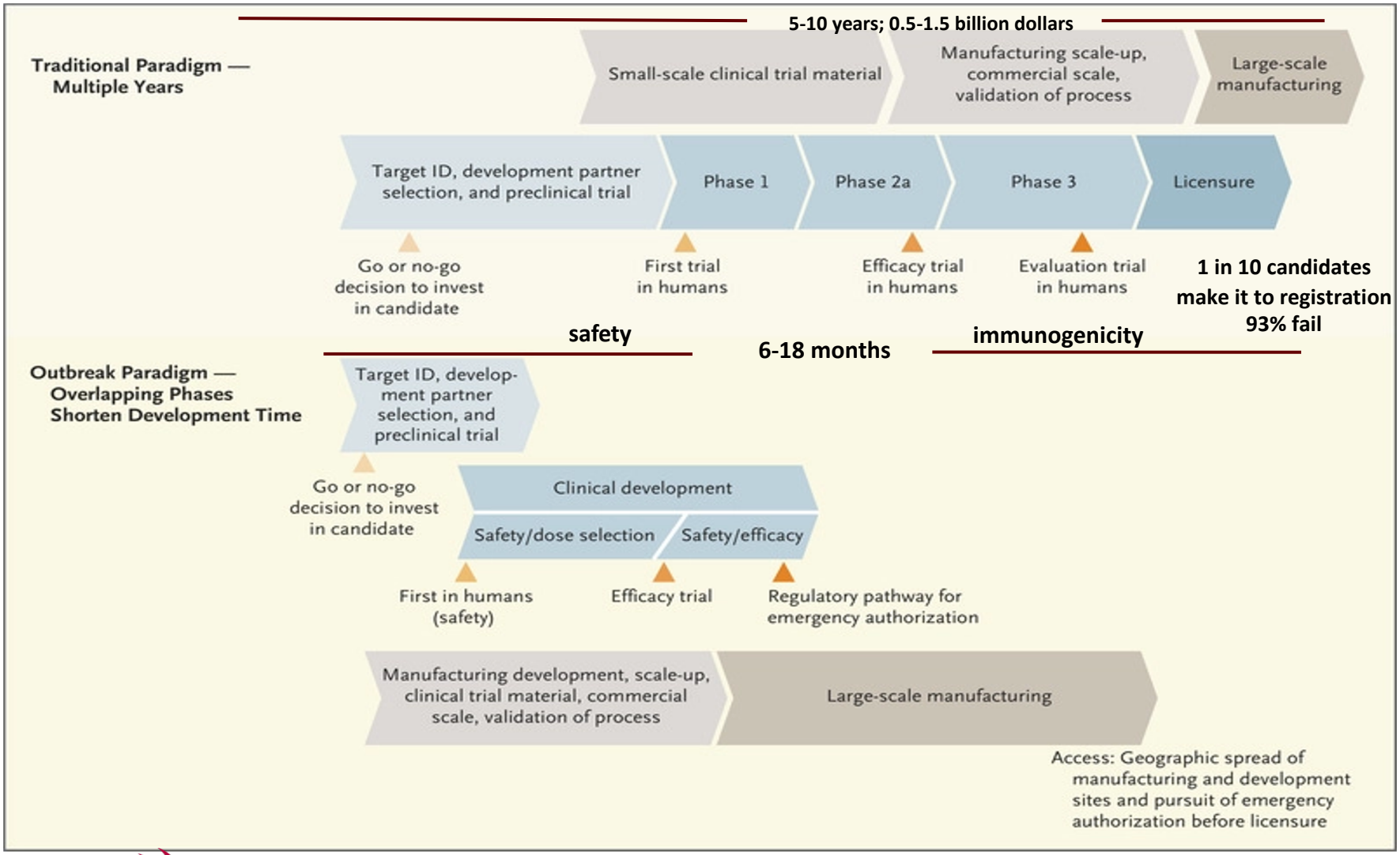
**Protein subunits**
Twenty-eight teams are working on vaccines with viral protein subunits — most of them are focusing on the virus's spike protein or a key part of it called the receptor binding domain. Similar vaccines against the SARS virus protected monkeys against infection but haven't been tested in people. To work, these vaccines might require adjuvants — immune-stimulating molecules delivered alongside the vaccine — as well as multiple doses.

**Virus-like particles**
Empty virus shells mimic the coronavirus structure, but aren't infectious because they lack genetic material. Five teams are working on 'virus-like particle' (VLP) vaccines, which can trigger a strong immune response, but can be difficult to manufacture.




Nature 2020; 580: 576-7

# Traditional Vaccine Development vs. Development Using a Pandemic Paradigm

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N Engl J Med 2020; 382:1969-1973

# WHO Target Product Profile

| Criterion | Preferred (wish list) | Critical / Minimal |
|---|---|---|
| Target population | All ages, pregnant women | Adults, elderly |
| Safety / Reactigenicity | No serious Aes, transient AE, favorable fisk / benefit ratio context of known efficacy | Safety and reactogenicity outweighs risk; Long-term safety and reactogenicity |
| Measure of Efficacy | 70% efficacy (on population basis with consistent results in the elderly)<br>Endpoint may be assessed vs. disease; severe disease; and/or shedding/transmission** | ~50% point estimate (vaccine efficacy)<br>Endpoint may be assessed vs disease; severe disease; and/or shedding / transmission |
| Schedule | 1 dose | 2 doses |

** Measurable endpoints will be defined as symptoms consistent with COVID infection and a positive RT-PCR (given multiple comparable trials)

# Vaccines updates as of 10/13…

- **Johnson & Johnson (Janssen)** vaccine study placed on hold due to SAE in participant
  - The company did not disclose what the illness was, citing the participant's privacy. The illness is still under investigation
- **AstraZeneca** study still on hold in US
- **Pfizer** announced this week that it has received FDA approval to enroll children as young as 12 years old in its COVID-19 vaccine trial
- Moderna's chief executive officer, Stephane Bancel, said this week that he expects the company to submit the data to the U.S. Food and Drug Administration (FDA) for emergency use authorization (EUA) on November 25
- In terms of more broad availability, Bancel indicated late March or early 2021
- More than 28,000 of the planned 30,000 people have enrolled in the **Moderna** study


C. Zimmer, *New York Times* 10/12/2020

# Recent case…

- 60 y/o male with PMHx HTN, asthma, and bladder cancer (s/p BCG 2005) who presented on 10/5 w/ SOB, peripheral edema, weight gain, and found to have newly significantly reduced LVEF w/ concern for non-ischemic etiologies.
- Work up significant for BNP on admission 4513, echo with LVEF 28%, and SARS-COV2 antibody positive. Cardiac catheterization 10/6 with nonobstructive CAD and elevated filling pressures consistent with Group 2 pulmonary hypertension.
- Cardiac MRI 10/8 with nonischemic pattern and small areas of LGE which may be consistent with prior viral illness as etiology.
- Interestingly, Covid PCR found to be positive as well.

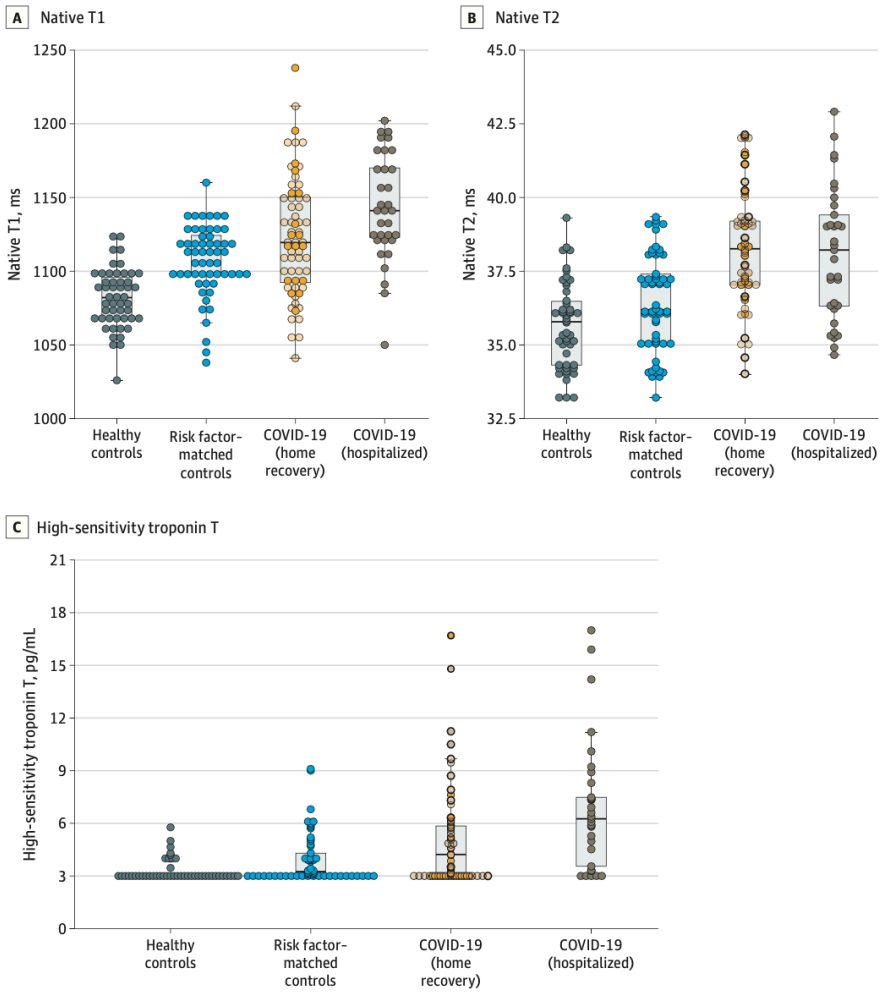
# Outcomes of Cardiovascular Magnetic Resonance Imaging in Patients Recently Recovered From Coronavirus Disease 2019 (COVID-19)

Valentina O. Puntmann, MD, PhD; M. Ludovica Carerj, MD; Imke Wieters, MD; Masia Fahim; Christophe Arendt, MD; Jedrzej Hoffmann, MD; Anastasia Shchendrygina, MD, PhD; Felicitas Escher, MD; Mariuca Vasa-Nicotera, MD; Andreas M. Zeiher, MD; Maria Vehreschild, MD; Eike Nagel, MD

**RESULTS** Of the 100 included patients, 53 (53%) were male, and the mean (SD) age was 49 (14) years. The median (IQR) time interval between COVID-19 diagnosis and CMR was 71 (64-92) days. Of the 100 patients recently recovered from COVID-19, 67 (67%) recovered at home, while 33 (33%) required hospitalization. At the time of CMR, high-sensitivity troponin T (hsTnT) was detectable (greater than 3 pg/mL) in 71 patients recently recovered from COVID-19 (71%) and significantly elevated (greater than 13.9 pg/mL) in 5 patients (5%). Compared with healthy controls and risk factor–matched controls, patients recently recovered from COVID-19 had lower left ventricular ejection fraction, higher left ventricle volumes, and raised native T1 and T2. A total of 78 patients recently recovered from COVID-19 (78%) had abnormal CMR findings, including raised myocardial native T1 (n = 73), raised myocardial native T2 (n = 60), myocardial late gadolinium enhancement (n = 32), or pericardial enhancement (n = 22). There was a small but significant difference between patients who recovered at home vs in the hospital for native T1 mapping (median [IQR], 1119 [1092-1150] ms vs 1141 [1121-1175] ms; $P = .008$) and hsTnT (4.2 [3.0-5.9] pg/dL vs 6.3 [3.4-7.9] pg/dL; $P = .002$) but not for native T2 mapping. None of these measures were correlated with time from COVID-19 diagnosis (native T1: $r = 0.07$; $P = .47$; native T2: $r = 0.14$; $P = .15$; hsTnT: $r = -0.07$; $P = .50$). High-sensitivity troponin T was significantly correlated with native T1 mapping ($r = 0.33$; $P < .001$) and native T2 mapping ($r = 0.18$; $P = .01$). Endomyocardial biopsy in patients with severe findings revealed active lymphocytic inflammation. Native T1 and T2 were the measures with the best discriminatory ability to detect COVID-19–related myocardial pathology.

**CONCLUSIONS AND RELEVANCE** In this study of a cohort of German patients recently recovered from COVID-19 infection, CMR revealed cardiac involvement in 78 patients (78%) and ongoing myocardial inflammation in 60 patients (60%), independent of preexisting conditions, severity and overall course of the acute illness, and time from the original diagnosis. These findings indicate the need for ongoing investigation of the long-term cardiovascular consequences of COVID-19.

Figure 2. Scatterplots of Native T1, Native T2, and High-Sensitivity Troponin T Measures by Group




*JAMA Cardiol*. doi:10.1001/jamacardio.2020.3557

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New Online | Views 29,257 | Citations 0 | Altmetric 643 | Comments

Viewpoint

ONLINE FIRST FREE

October 5, 2020

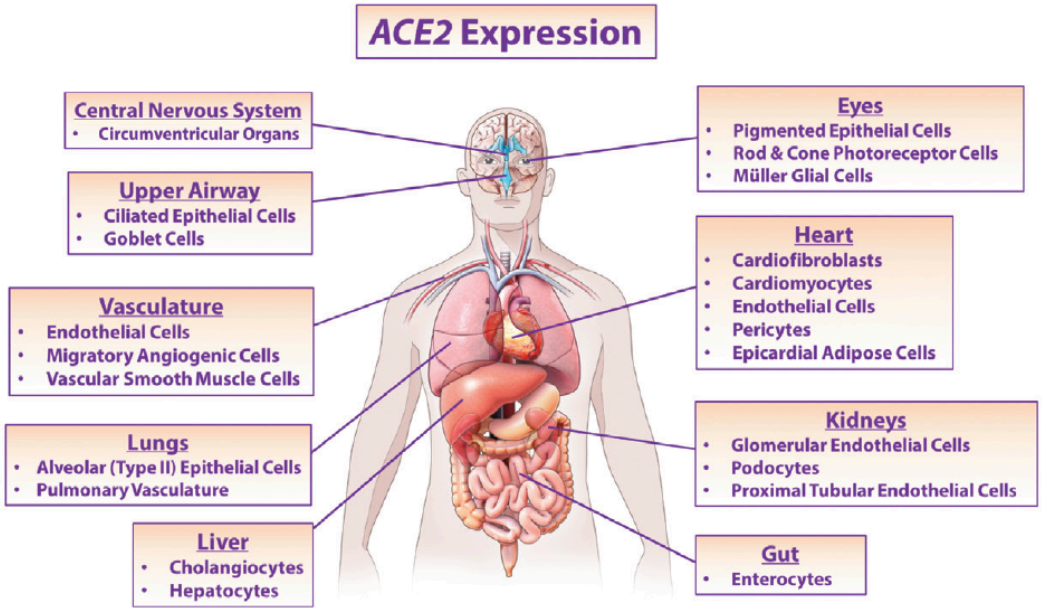
# Long-term Health Consequences of COVID-1

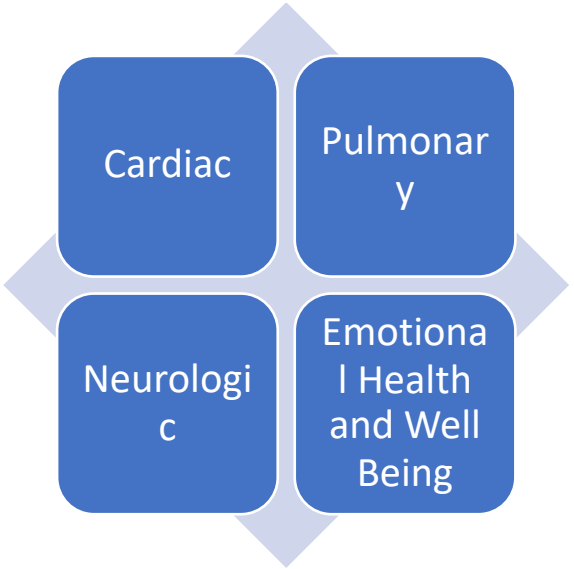
Carlos del Rio, MD[1]; Lauren F. Collins, MD[1]; Preeti Malani, MD, MSJ[2,3]

» Author Affiliations | Article Information

*JAMA*. Published online October 5, 2020. doi:10.1001/jama.2020.19719

- Definitions:
  - Post-acute COVID-19 = extends beyond 3 weeks
  - Chronic COVID-19 = extends beyond 12 weeks
- Pathogenesis
  - Direct tissue invasion
  - Profound inflammation/cytokine storm
  - Immune system damage
  - Hypercoagulable state
  - Combination of factors

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Research Letter

ONLINE FIRST FREE

July 9, 2020

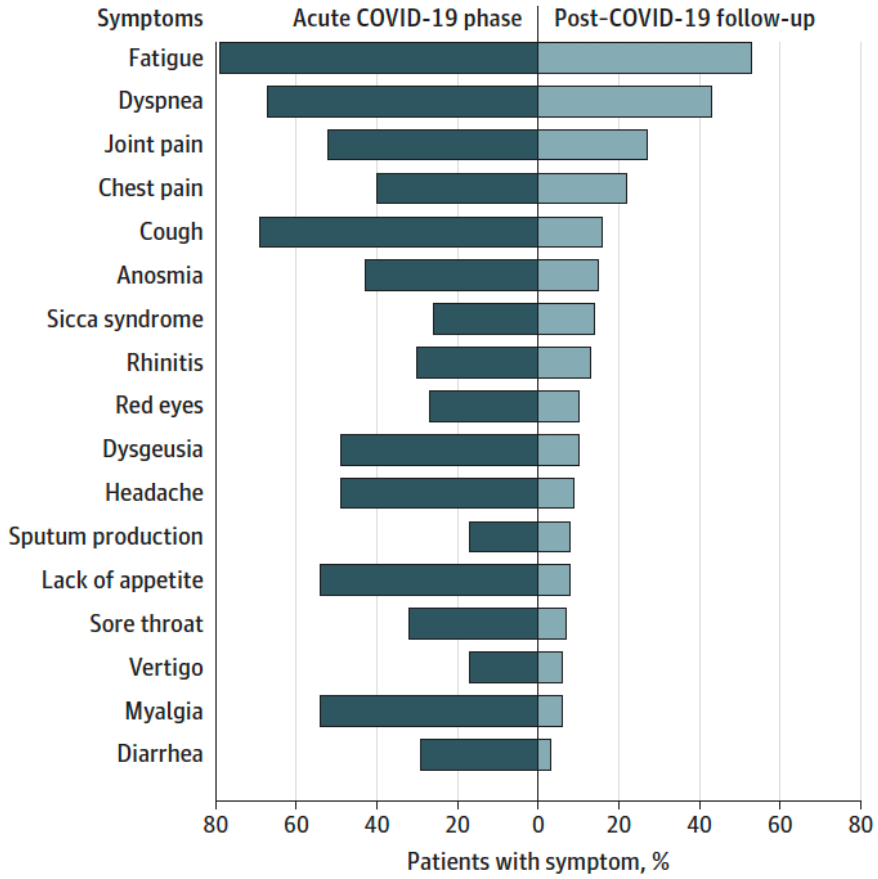
# Persistent Symptoms in Patients After Acute COVID-19

Angelo Carfì, MD[1]; Roberto Bernabei, MD[1]; Francesco Landi, MD, PhD[1]; et al

- Post-hospital discharge outpatient service for COVID-19 patients in Italy
- **143 patients total, mean age 56y (19-84y)**
- 72% of patients had interstitial pneumonia in the hospital
- Mean LOS 13.5 days, 15% NIV, 5% invasive ventilation
- Assessed **mean of 60d** after onset of first symptom
- **32% had 1-2 symptoms and 55% had 3+**
- Worsened quality of life in 44%

Carfi A JAMA. Published online July 9, 2020.
doi:10.1001/jama.2020.12603

Figure. COVID-19–Related Symptoms




The figure shows percentages of patients presenting with specific coronavirus disease 2019 (COVID-19)–related symptoms during the acute phase of the disease (left) and at the time of the follow-up visit (right).

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Journal Pre-proof

Follow-up of adults with non-critical COVID-19 two months after symptoms' onset

Claudia Carvalho-Schneider, Emeline Laurent, Adrien Lemaignen, Emilie Beaufils, Céline Bourbao-Tournois, Saïd Laribi, Thomas Flament, Nicole Ferreira-Maldent, Franck Bruyère, Karl Stefic, Catherine Gaudy-Graffin, Leslie Grammatico-Guillon, Louis Bernard

- 150 patients with non-critical COVID-19
- 68% (n=103/**150**) reported at least one symptom at day 30
- 66% (86/**130**) at day 60

**Table I. Patient symptoms at COVID-19 onset and at day 30 (D30) and 60 (D60).**

| | Onset n=150 | | D30 n=150 | | D60 n=130 | |
|---|---|---|---|---|---|---|
| Fever (>38°C temperature) | 76 | (51.4) | 5 | (3.6) | 0 | (0.0) |
| Dyspnea/shortness of breath[1] | 49 | (42.2) | 16 | (10.7) | 10 | (7.7) |
| Chest pain | 15 | (14.0) | 27 | (18.0) | 17 | (13.1) |
| Abnormal auscultation | 46 | (39.3) | - | | - | |
| Flu-like symptoms[2] | 129 | (87.2) | 54 | (36.0) | 28 | (21.5) |
| Digestive disorders[3] | 48 | (33.1) | 26 | (17.3) | 15 | (11.5) |
| Including diarrhea[4] | 44 | (91.7) | 13 | (50.0) | 5 | (33.3) |
| Weight, mean ± SD | 78.0 ± 19.4 | | 77.2 ± 20.2 | | 75.6 ± 18.0 | |
| Weightloss ≥ 5% | - | | 13 | (15.9) | 15 | (17.2) |
| Anosmia/ageusia | 89 | (59.3) | 40 | (27.8) | 29 | (22.7) |
| Palpitations | - | | 9 | (6.5) | 14 | (10.9) |
| Arthralgia | - | | 13 | (9.8) | 21 | (16.3) |
| Cutaneous signs | - | | 21 | (15.4) | 15 | (11.5) |
| Initial hospitalization | 53 | (35.3) | - | | - | |
| Initial clinical presentation | | | | | | |
| Mild/moderate COVID | 116 | (77.3) | - | | - | |
| Severe COVID | 34 | (22.7) | - | | - | |
| Sickleave | - | | 26 | (19.7) | 14 | (11.2) |

Data are n (%) unless indicated.
1: grade 2-4 dyspnea according the modified Medical Research Council scale
2: myalgia, headache and/or asthenia
3: digestive disorders (i.e., diarrhea, vomiting)
4: denominator is digestive disorders



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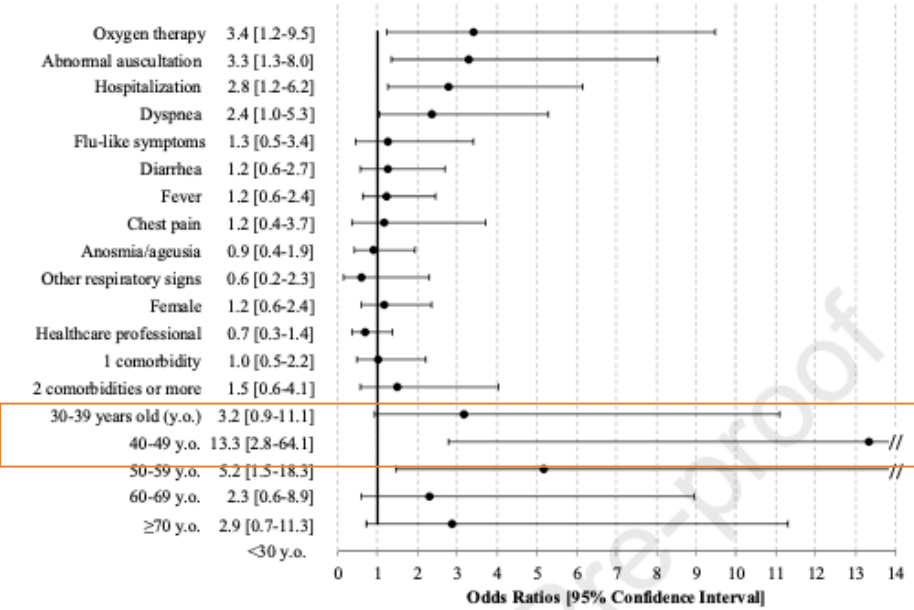
Journal Pre-proof

Follow-up of adults with non-critical COVID-19 two months after symptoms' onset

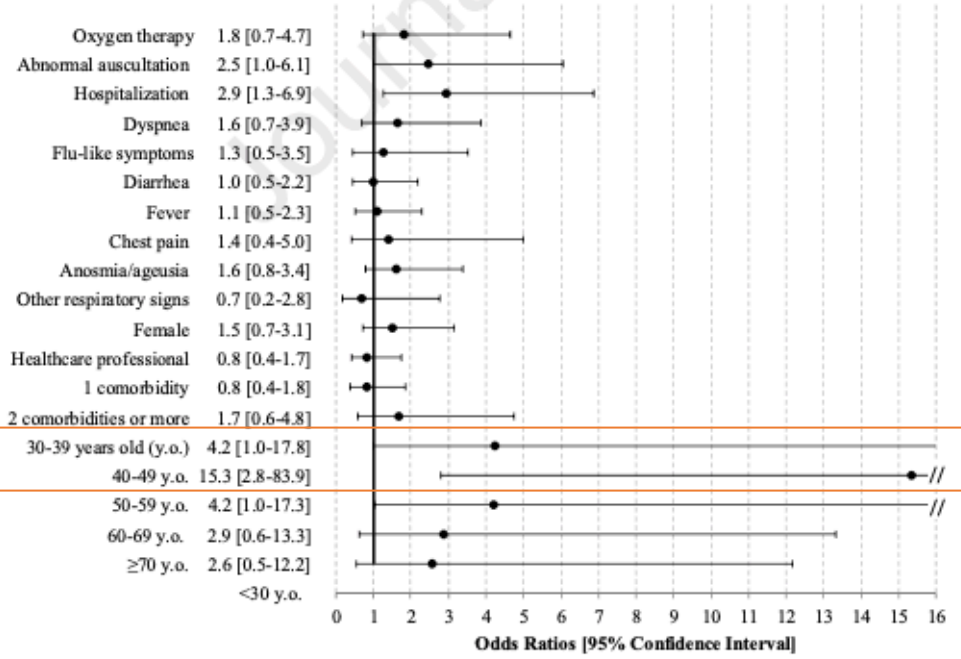
Persistent symptoms at D60 were significantly associated with age 40-60y, hospital admission, and abnormal auscultation at symptom onset

**Figure 2.Predictors of persistent COVID-19 symptoms**

**Day 30**




**Day 60**



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CONTEMPORARY REVIEW

# COVID-19 cardiac injury: Implications for long-term surveillance and outcomes in survivors

Raul D. Mitrani, MD, Nitika Dabas, MD, MPH, Jeffrey J. Goldberger, MD, MBA

*From the Cardiovascular Division, Department of Medicine, University of Miami Miller School of Medicine, Miami, Florida.*

JAMA Cardiology | Original Investigation

## Outcomes of Cardiovascular Magnetic Resonance Imaging in Patients Recently Recovered From Coronavirus Disease 2019 (COVID-19)

Valentina O. Puntmann, MD, PhD; M. Ludovica Carerj, MD; Imke Wieters, MD; Masia Fahim; Christophe Arendt, MD; Jedrzej Hoffmann, MD; Anastasia Shchendrygina, MD, PhD; Felicitas Escher, MD; Mariuca Vasa-Nicotera, MD; Andreas M. Zeiher, MD; Maria Vehreschild, MD; Eike Nagel, MD

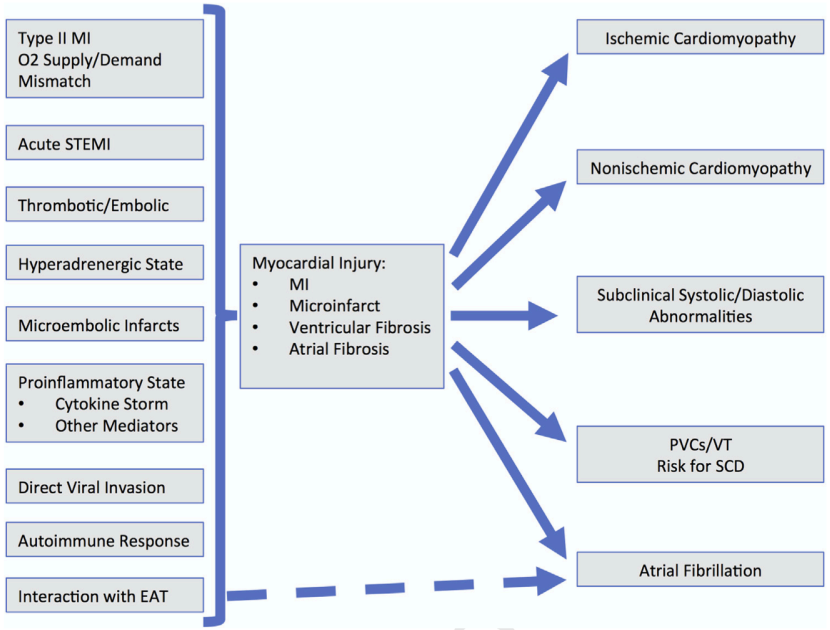
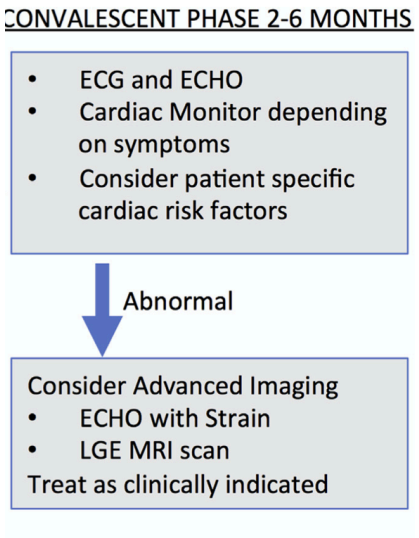



**Figure 1** Flowchart demonstrating the pathophysiology and various mechanisms of cardiac injury during acute coronavirus disease 2019 infection. Possible sequelae after recovery are then demonstrated. EAT = epicardial adipose tissue; MI = myocardial infarction; PVC = XXXX; SCD = sudden cardiac disease; STEMI = ST-segment elevation myocardial infarction; VT = ventricular tachycardia.

- Up to 20-30% of patients hospitalized have increased troponins -> evidence of myocardial involvement
  - Worse prognosis, greater need for mechanical ventilation, higher mortality
- Post-COVID19 monitoring may be appropriate for some patients
- 100 patients received cardiac MRI after recovery from COVID-19 infection
  - Cardiac involvement in 78%; ongoing myocardial inflammation in 60% patients
  - Independent of preexisting conditions, severity and overall course of the acute illness and time from the original diagnosis

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# Cerebral Micro-Structural Changes in COVID-19 Patients – An MRI-based 3-month Follow-up Study

Yiping Lu, MD[a,1], Xuanxuan Li, MD[a,1], Daoying Geng, MD, Prof[a,1], Nan Mei, MD[a,1], Pu-Yeh Wu, PhD[b], Chu-Chung Huang, PhD[c], Tianye Jia, PhD[d], Yajing Zhao, MD[a], Dongdong Wang, MD[a], Anling Xiao, MD, Prof[e,**], Bo Yin, PhD, Prof[a,*]

[a] Department of Radiology, Huashan Hospital, Fudan University, Shanghai, China (Y Lu, X Li, D Geng, N Mei, Y Zhao, D Wang, B Yin)
[b] GE Healthcare, MR Research China, Beijing, China (P Wu)
[c] Institute of Cognitive Neuroscience, School of Psychology and Cognitive Science, East China Normal University, Shanghai, China (C Huang)
[d] Institute of Psychiatry, Psychology & Neuroscience, King's College London, London, England (T Jia)
[e] Department of Radiology, Fu Yang No.2 Hospital, Anhui, China (A Xiao)

- MRI was performed in 60 recovered COVID-19 patients and 39 age- and sex-matched non-COVID-19 controls
- **At 3 months, neurological symptoms were present in 55%**
- **Most common - myalgia, memory loss, mood change, headache**
- **COVID-19 patients had significantly higher bilateral gray matter volume changes compared to controls**
- Interpretation: Possible disruption to micro-structural and functional brain integrity in the recovery stages of COVID-19, suggesting the long-term consequences of SARS-CoV-2.

**Table 1**
Baseline information of the COVID-19 group and the control group

| | Control Group (n=39) | COVID-19 Group (n = 60) | | *P* value |
|---|---|---|---|---|
| Age, Mean±SD | 45.88±13.90 | 44.10±16.00 | | 0.558 |
| Gender, male(%) | 22 (56.41%) | 34 (56.67%) | | 0.980 |
| Known contact history, n(%) | 0 (0.00%) | 33 (55.00%) | | <0.001* |
| Alcohol, n(%) | 11 (28.21%) | 19 (31.67%) | | 0.834 |
| Smoking, n(%) | 10 (25.64%) | 15 (25.00%) | | 1 |
| **Underlying diseases, n(%)** | | | | |
| Hypertension | 16 (41.03%) | 13 (21.67%) | | 0.142 |
| Diabetes | 1 (2.56%) | 6 (10.00%) | | 0.250 |
| **Clinical type, n(%)** | | | | |
| Mild type | - | 47 (78.33%) | | - |
| Severe type | - | 12 (20.00%) | | - |
| Critical type | - | 1 (1.67%) | | - |
| Hospitalization days, Mean±SD | - | 15.35±6.05 | | - |
| **Symptoms, n(%)** | | | | |
| Fever | - | 53 (88.33%) | | - |
| Cough | - | 34 (56.67%) | | |
| Gastrointestinal | - | 8 (13.33%) | | - |
| **Neurological** | - | **During acute stage** | **At follow-up visit point** | |
| **Total*** | | 41 (68.33%) | 33 (55.00%) | 0.032 |
| Headache | - | 15(25.00%) | 6 (10.00%) | 0.055 |
| Vision change | - | 3 (5.00%) | 1 (1.67%) | 0.619 |
| Hearing loss | - | 1 (1.67%) | 1 (1.67%) | 1 |
| Loss of taste | - | 4 (6.67%) | 1 (1.67%) | 0.364 |
| Loss of smell | - | 2 (3.33%) | 2 (3.33%) | 1 |
| Impaired mobility | - | 7 (11.67%) | 4 (6.67%) | 0.529 |
| Numbness in extremities | - | 4 (6.67%) | 4 (6.67%) | 1 |
| Tremor | - | 4 (6.67%) | 1 (1.67%) | 0.364 |
| Fatigue | - | 16 (26.67%) | 4 (6.67%) | 0.006* |
| Myalgia | - | 9 (15.00%) | 15 (25.00%) | 0.254 |
| Memory loss | - | 8 (13.33%) | 17 (28.33%) | 0.071 |
| Mood change | - | 25 (41.67%) | 10 (16.67%) | 0.005* |
| **Laboratory tests, median (interquartile range)** | | | | |
| WBC count, *10^9/L | - | 4.7 (3.85-6.76) | | - |
| Lymphocyte count, *10^9/L | - | 1.06 (0.77-1.49) | | - |
| LDH, U/L | - | 223 (189.5-279.5) | | - |
| **Treatment** | | | | |
| Oxygen therapy | | 37 (61.67%) | | |
| Anti-viral therapy | | 58 (96.67%) | | |
| Interferon | | 9 (15.00%) | | |
| Antibiotics | | 21 (35.00%) | | |
| Hormonotherapy | | 2 | | |

Abbreviations: SD: Standard Deviation; WBC: White Blood Cell; LDH: Lactate Dehydrogenase.
* **Total count and percentage of patients that presented any of the following neurological symptoms during the acute stage and at the follow-up visit point respectively. One patient possibly had one or more types of symptoms.**

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Research Paper

# Follow-up study of the pulmonary function and related physiological characteristics of COVID-19 survivors three months after recovery

Yu-miao Zhao[a,b,1], Yao-min Shang[c,1], Wen-bin Song[d,1], Qing-quan Li[e], Hua Xie[e], Qin-fu Xu[f], Jun-li Jia[f], Li-ming Li[f], Hong-li Mao[g], Xiu-man Zhou[b], Hong Luo[d,2,***], Yan-feng Gao[b,2,**], Ai-guo Xu[a,2,*]

[a] Department of Respiratory and Critical Care Medicine, The First Affiliated Hospital of Zhengzhou University, Zhengzhou 450051, China
[b] School of Life Sciences, Zhengzhou University, Zhengzhou 450001, China
[c] Department of Respiration, Henan Provincial Chest Hospital, Zhengzhou 450003, China
[d] Department of Respiratory and Critical Care Medicine, Guangshan People's Hospital, Xinyang 465400, China
[e] Department of Respiratory and Critical Care Medicine, Xixian People's Hospital, Xinyang 464200, China
[f] Department of Radiology, The First Affiliated Hospital of Zhengzhou University 450051, China
[g] Clinical Laboratory, The First Affiliated Hospital of Zhengzhou University 450051, China

- 55 recovered patients
- 3 months after discharge
  - SARS-CoV-2 infection related symptoms were detected 35/55
- Radiologic abnormalities in 39/55
- Lung function abnormalities 14/55
  - Impaired DLCO was associated with D-dimer levels at admission (P=0.031)

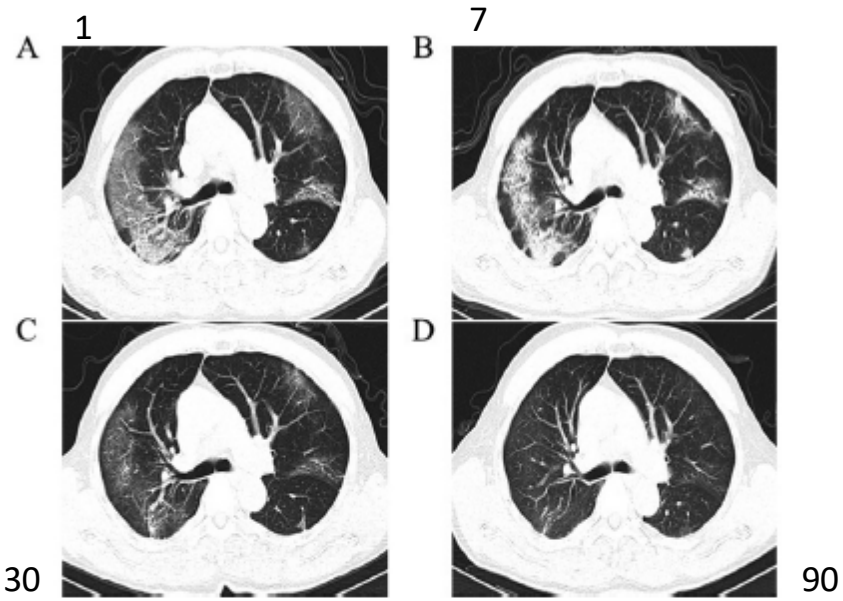


**Fig. 2.** Follow-up thin-section CT imaging of 63-year-old man with confirmed COVID-19 pneumonia with dry cough. (A) First thin-section chest CT in hospital on February 2, 2020 (7 days after symptoms onset). CT imaging shows GGO associated with smooth interlobular and intralobular septal thickeing (crazy paving). (B) Crazy paving with some consolidations were observed over 7 days. (C) On March 4, 2020, scans showed that the previous lesion was absorbed and parenchymal bands with residual GGO were observed. (D) On May 2, 2020, intenstitial thickeing and residual GGO were observed. CXR: chest radiography.

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Case Series of Multisystem Inflammatory Syndrome in Adults Associated with SARS-CoV-2 Infection — United Kingdom and United States, March–August 2020

*Early Release* / October 2, 2020 / 69

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# MIS-A

- 27 cases from the US and UK
- Patients 21-50 years old
- 21/22 patients with ethnicity data available belonged to minority groups
- Of cases reported to CDC and single cases (n=16)
  - 8 had documented respiratory illness before developing symptoms of MIS-A 2-5 weeks later
  - 8 without any preceding respiratory symptoms
- Case series (n=11)
  - 7 patients 20-42 years presenting with mixed cardiovascular and vasoplegic shock with hyperinflammation
  - 2 patients p/w large vessel strokes
  - 2 patients with cardiac dysfunction, abdominal signs/sx and rash

- Presenting symptoms
  - Fever (12/16)
  - **Cardiac symptoms/evidence of cardiac effects (16/16)**
  - GI symptoms (13/16)
  - Dermatologic symptoms (5/16)
- Diagnosis
  - Recommend both PCR and AB testing to diagnose
- Treatment
  - IVIG, corticosteroids, tocilizumab
- Outcomes
  - 10/16 required ICU level care
  - 2 patients died

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MIS-A Case Definition

1) A severe illness requiring hospitalization in a person aged>21 years
2) Positive test result for current or previous SARS-CoV-2 infection (nucleic acid, antigen or antibody) during admission or in the previous 12 weeks
3) Severe dysfunction of one or more extrapulmonary organ systems (e.g., hypotension or shock, cardiac dysfunction, arterial or venous thrombosis or thromboembolism or acute liver injury)
4) Laboratory evidence of severe inflammation (e.g., elevated CRP, ferritin, D-dimer or interleukin-6)
5) Absence of severe respiratory illness (to exclude patients in which inflammation or organ dysfunction might be attributable simply to tissue hypoxia.

**Patients with mild respiratory symptoms who met these criteria were included, but those with suspected alternative diagnoses (e.g., bacterial sepsis), were identified.

# Surgical masks vs. N95s

Coronavirus Disease 2019 (COVID-19) MENU >

4. **Put on NIOSH-approved N95 filtering facepiece respirator or higher (use a facemask if a respirator is not available).** If the respirator has a nosepiece, it should be fitted to the nose with both hands, not bent or tented. Do not pinch the nosepiece with one hand. Respirator/facemask should be extended under chin. Both your mouth and nose should be protected. Do not wear respirator/facemask under your chin or store in scrubs pocket between patients.*
   - **Respirator:** Respirator straps should be placed on crown of head (top strap) and base of neck (bottom strap). Perform a user seal check each time you put on the respirator.
   - **Facemask:** Mask ties should be secured on crown of head (top tie) and base of neck (bottom tie). If mask has loops, hook them appropriately around your ears.

- Indirect data from SARS and other respiratory viral infections
- Wearing ANY mask (surgical or N95) reduces risk of developing infection
- Studies comparing N05 respirators with surgical masks fail to show or exclude a beneficial effect on rates of SARS infections (OR 0.86; 95% CI:0.22, 3.33)

**Recommendations 1 and 2: N95 Masks and Respirators (Routine Patient Care)** —

**Recommendations**

In CONVENTIONAL settings:

- **Recommendation 1:** The IDSA guideline panel recommends that health care personnel caring for patients with suspected or known COVID-19, use either a surgical mask or N95 (or N99 or PAPR) respirator compared with no mask as part of appropriate PPE*. (Strong recommendation, moderate certainty of evidence)

In CONTINGENCY or CRISIS CAPACITY settings:

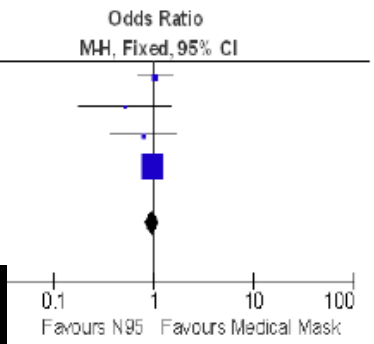
- **Recommendation 2:** During contingency or crisis capacity settings (respirator shortages), the IDSA guideline panel recommends that health care personnel caring for patients with suspected or known COVID-19 use a surgical mask or reprocessed respirator instead of no mask as part of appropriate PPE*. (Strong recommendation, moderate certainty of evidence)

*Appropriate personal protective equipment includes, in addition to a mask or respirator, eye protection, gown and gloves.

**Figure s2.** Forest Plot adapted from Bartoszko et al. N95 compared with Medical Mask on Transmission of Laboratory Confirmed Viral Respiratory Tract Infection

| Study or Subgroup | N95 Events | N95 Total | Medical mask Events | Medical mask Total | Weight | Odds Ratio M-H, Fixed, 95% CI |
|---|---|---|---|---|---|---|
| Loeb 2009 | 70 | 221 | 70 | 225 | 15.6% | 1.03 [0.69, 1.53] |
| MacIntyre 2011 | 7 | 475 | 7 | 246 | 3.0% | 0.51 [0.18, 1.47] |
| MacIntyre 2013 | 18 | 665 | 12 | 347 | 5.1% | 0.78 [0.37, 1.63] |
| Radonovich 2019 | 298 | 1103 | 327 | 1171 | 76.3% | 0.96 [0.78, 1.15] |
| **Total (95% CI)** | | **2464** | | **1989** | **100.0%** | **0.94 [0.80, 1.11]** |
| Total events | 393 | | 416 | | | |

Heterogeneity: Chi² = 1.74, df = 3 (P = 0.63); I² = 0%
Test for overall effect: Z = 0.70 (P = 0.49)




OR 0.94=NO difference

Use reprocessed or surgical masks if N95 not available. Avoid re-using masks if at all possible

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