MERCYHEALTH

COVID-19 Update

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"All the News That's Fit to Print"

The New York Times

Late Edition

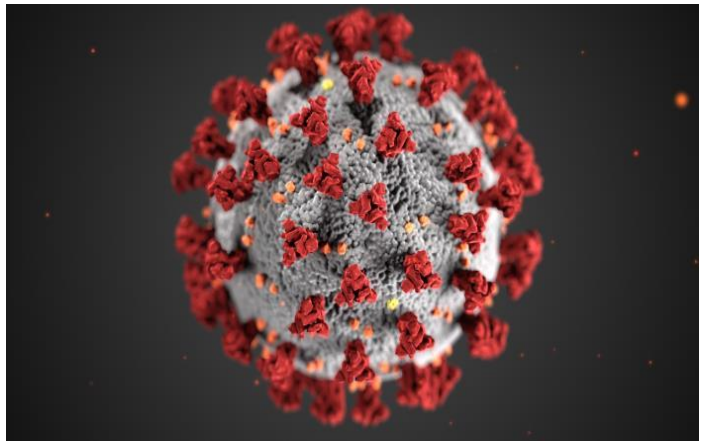
VOL. CLXIX ... No. 58,703 — NEW YORK, SUNDAY, MAY 24, 2020 — $6.00

U.S. DEATHS NEAR 100,000, AN INCALCULABLE LOSS

They Were Not Simply Names on a List. They Were Us.

"The pandemic is over. If you notice, no one's wearing masks"

President Joe Biden, Sept. 19, 2022



- 300-400 deaths/day from COVID in US
- 88% of patients dying are >age 65
- Virus spreads too quickly
- Virus evolves too rapidly
- Immunity to COVID fades too quickly
- Anticipating 100,000 deaths per year (triple deaths from influenza in an average year)
- We have pushed the risk of *individuals* down to a flu-like level, but COVID kills so many more because it sickens so many more.

COVID-19 Pandemic: 2 Years and Counting

- Early in pandemic focused on epidemiology
- Testing continues to lag
- Many repurposed medications suggested-none effective
- Steroids helpful in cases of severe pneumonia associated with hypoxemia (need to treat 8 patients to save one life)
- Best supportive care; no effective interventions for most severe
- 4 major surges
- Masking, social distancing and improved air handling are effective in limiting transmission

Masking to prevent transmission of SARS-CoV-2.

- Source control to block exhaled virus (decreases risk of transmission 70%)
- Filtration for wearer protection (fine droplets and particles < 10 microns)
- At least ten studies have confirmed the benefit of universal masking in community level analyses
- Safe and is not associated with clinically significant impacts on respiration or gas exchange
- No clear evidence that masking impairs emotional or language development in children

cdc.gov/coronavirus Dec. 6, 2021


People who reported always wearing a mask in indoor public settings were less likely to test positive for COVID-19 than people who didn't*
WEARING A MASK LOWERED THE ODDS OF TESTING POSITIVE
Among 534 participants reporting mask type†
NO MASK
CLOTH MASK‡
SURGICAL MASK
RESPIRATOR (N95/KN95)
56% lower odds
66% lower odds
83% lower odds
CDC
bit.ly/MMWR7106
* Matched case-control study, 1,828 people, Feb 10–Dec 1, 2021
† Compared people with similar characteristics (e.g., vaccination)
‡ Not statistically significant
MMWR

Vaccines

- Ad26.COV2.d: adenovirus-vectored vaccine (Johnson & Johnson-Janssen)
- mRNA-1273: messenger RNA vaccine (Moderna)
- BNT162b2: messenger RNA vaccine (Pfizer-BioNTech)
- Novavax Protein Subunit Vaccine
- Moderna and Pfizer-BioNTech Bivalent Vaccine

Neutralizing Monoclonal Antibodies

- Tixagevimab-Cilgavimab EVUSHELD
- Bebtelovimab

Immune Modulators

- Baricitinib
- Dexamethasone
- Tocilizumab

Antivirals

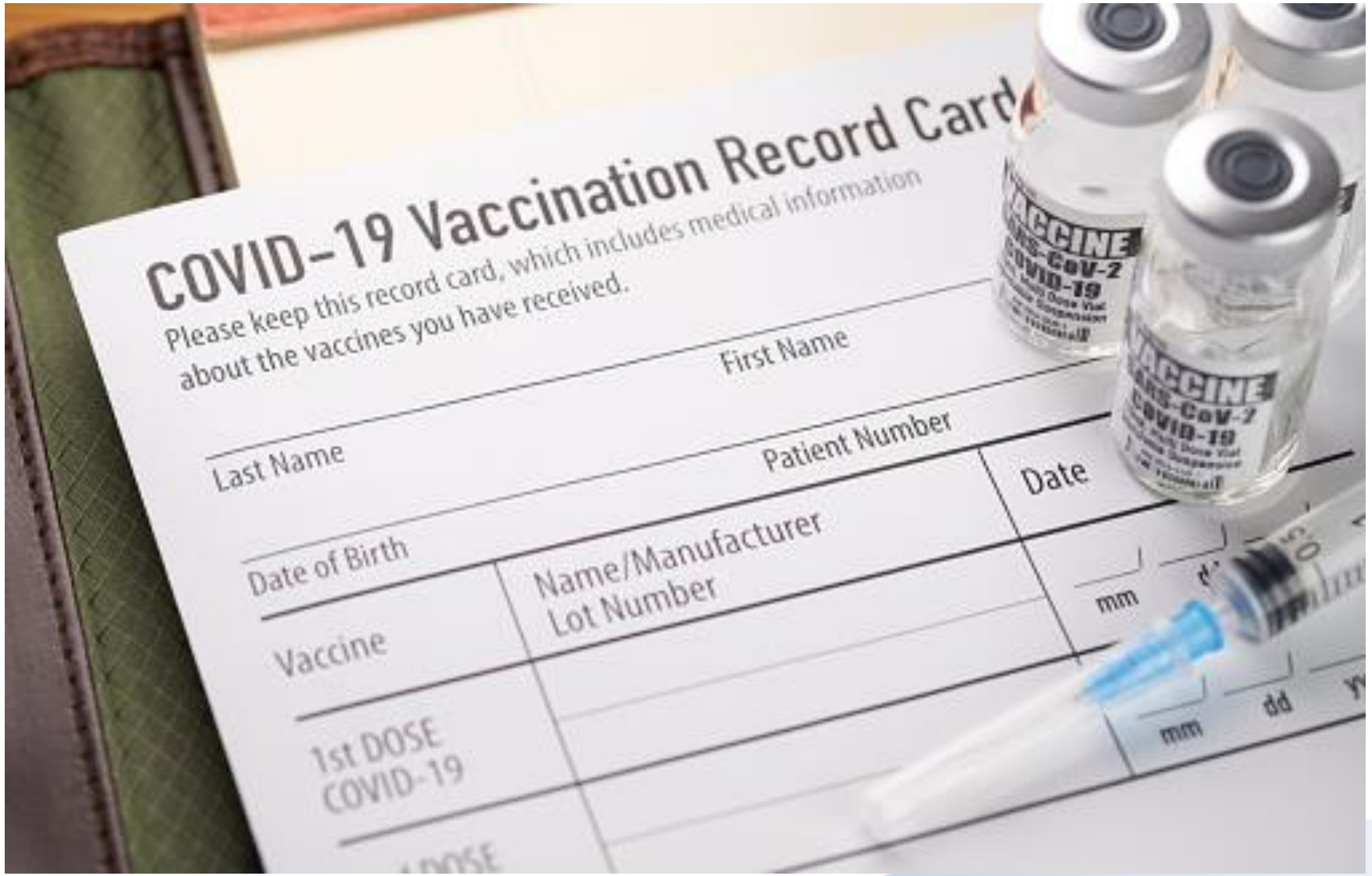
- Nirmatrelvir-ritonavir (Paxlovid)
- Remdesivir
- Molnupiravir
- Remdesivir

Uninfected

Immunocompromised
Not Exposed, Uninfected

Infected with SARS-CoV-2

Adapted from Heil,E 10.1056/NEJMe118579


COVID-19 Vaccination Record Card
Please keep this record card, which includes medical information about the vaccines you have received.
Last Name
First Name
Patient Number
Date of Birth
Vaccine
Name/Manufacturer
Lot Number
Date
1st DOSE COVID-19
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VACCINE
SARS-CoV-2
COVID-19

Vaccines

- mRNA Vaccines (Pfizer and Moderna)
- Adenovirus vaccine (Johnson and Johnson)
- Novavax vaccine (CEPI)
- Highly effective at preventing severe disease and death-*in all groups tested* including pregnancy
- Less effective at preventing infection (omicron variant)
- Optimal immune response requires third dose (“ bivalent booster”)
- Likely yearly vaccines will be required

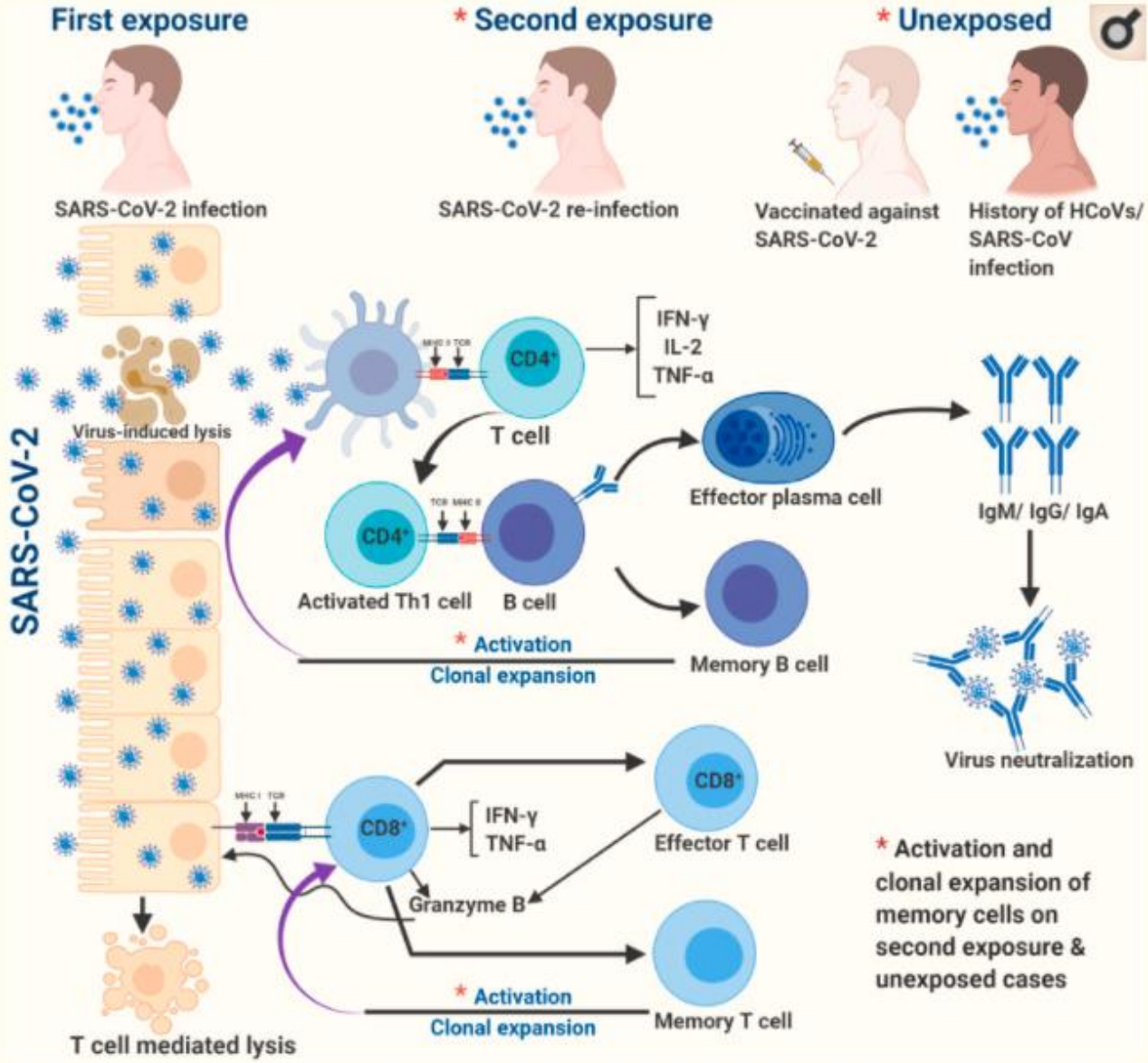

Fig. 1

A hypothetical illustration of protective immunity against COVID-19.

What We Know about Vaccine Breakthrough Infections

- Vaccine breakthrough infections are expected. COVID-19 vaccines are effective at preventing most infections. However, like other vaccines, they are not 100% effective.
- Fully vaccinated people with a vaccine breakthrough infection are less likely to develop serious illness than those who are unvaccinated and get COVID-19.
- Even when fully vaccinated people develop symptoms, they tend to be less severe symptoms than in unvaccinated people. This means they are much less likely to be hospitalized or die than people who are not vaccinated.
- People who get vaccine breakthrough infections can be contagious.

Dec. 17, 2021National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases

Effectiveness of Maternal Vaccination with mRNA COVID-19 Vaccine During Pregnancy Against COVID-19–Associated Hospitalization in Infants Aged <6 Months — 17 States, July 2021–January 2022

Weekly / February 18, 2022 / 71(7);264–270

On February 15, 2022, this report was posted online as an MMWR *Early Release.*

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View suggested citation

- Effectiveness of vaccination during pregnancy 61%
- Early in pregnancy 32%
- Late in pregnancy 80%

Evusheld - tixagevimab and cilgavimab for pre-exposure prophylaxis of COVID-19

- Indicated in patients not currently infected or recent exposure
- EUA
- Moderate to severe immunosuppression or history of severe AE to vaccine
- IM as 2 consecutive injections
- Provides protection for 6 mos
- Supply limited

Anti-SARS-CoV-2 Monoclonal Antibodies (mAb)

Investigational medications approved for emergency use in patients by the FDA

May reduce progression to severe disease and shorten recovery in high-risk patients

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Last updated February 16, 2022

INDICATIONS

- For **treatment** of patients (≥12 years) with **mild to moderate** COVID-19 and **NOT requiring hospitalization or supplemental oxygen**
- For **post-exposure prophylaxis (PEP)** in patients (≥12 years) who are nonvaccinated, incompletely vaccinated, or immunocompromised
- Must be given **within 10 days** of first symptoms of COVID-19 (or exposure for PEP)
- Treatment is usually IV; good evidence for SC administration for PEP and can be given SC if IV not feasible for treatment. **Efficacy varies depending on circulating variant.**

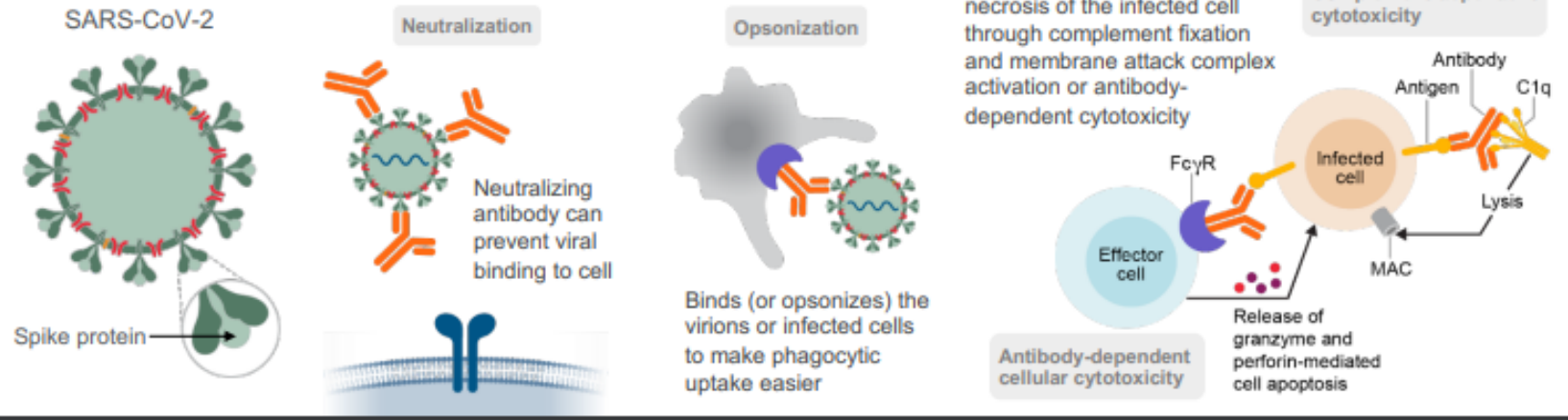
EXISTING MONOCLONAL ANTIBODY THERAPIES

Sotrovimab	Targets an epitope conserved between SARS-CoV-1 and SARS-CoV-2. **Active against Omicron**.
Bebtelovimab	Recombinant neutralizing human mAb that binds to spike protein of SARS-CoV-2. **Active against Omicron**.
Casirivimab plus imdevimab (REGEN-COV)	Recombinant human mAbs that bind to nonoverlapping epitopes in the spike protein of SARS-CoV-2. **EUA updated 1/24/2022 - not active against Omicron.**
Bamlanivimab plus etesevimab	Neutralizing mAbs that bind to different, but overlapping, epitopes in the spike protein of SARS-CoV-2. **EUA updated 1/24/2022 - not active against Omicron.**

NIH GUIDELINES: WHO SHOULD GET mAb THERAPY?

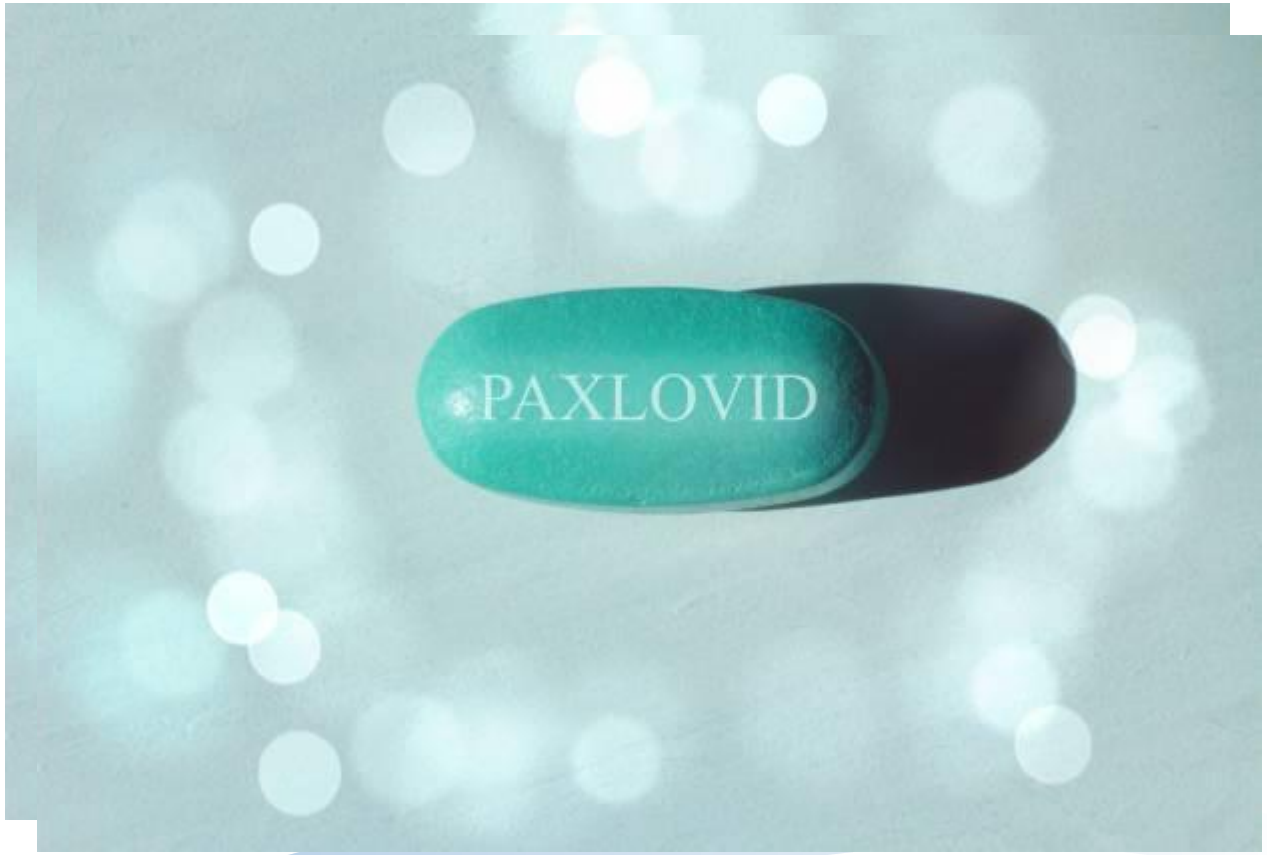
- Aged ≥65 years
- Obesity (BMI >30)
- Diabetes mellitus
- Cardiovascular disease
- Chronic lung diseases
- An immunocompromising condition or immunosuppressive treatment (eg, transplant, rheumatic diseases, HIV infection)
- Chronic kidney disease
- Pregnancy
- Sickle cell disease
- Neurodevelopmental disorders (eg, cerebral palsy) or other conditions that confer medical complexity (eg, genetic or metabolic syndromes and severe congenital anomalies)
- Medical-related technological dependence (eg, tracheostomy, gastrostomy, or positive pressure ventilation that is not related to COVID-19)

SEVERAL MECHANISMS OF ACTION



NIH | COVID-19 Treatment Guidelines

- Indicated those at high risk for severe disease (>65, obese, DM, etc)
- Must be given within 5 days of onset of symptoms
- Most common side-effect: metallic taste
- Rebound infection 1-7%. Poorly understood
- Drug-drug interactions: avoid rifampin, phenytoin, Xarelto, Plavix and sildenafil (CYP3A)
- Avoid in severe renal failure
- Generally, well tolerated and shortens duration of illness
- Molnupiravir not rec in pregnancy



Early Remdesivir to Prevent Progression to Severe Covid-19 in Outpatients

- Symptom onset within 7 days + risk factors for progression
- 200mg IV day 1 and 100mg IV day 2 & 3
- 562 patients randomized
- End points: hospitalization or death
- 1.6% hosp/ED in treated v 8.3% controls
- No deaths at 28 days
- Adverse events similar (42% treated v 46% control)
- Risk reduction 87%
- Covered by Medicare and Medicaid
- Commercial insurance may require precert

Heil,E 10.1056/NEJMe2118579

COVID-19: ICU FOR THE NON-INTENSIVIST

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INFECTION CONTROL

- Hand hygiene before and after all patient encounters and when changing PPE
- Use airborne, contact, and droplet precautions for patients with confirmed/suspected COVID-19, including:
  - N95 respirator or PAPR/CAPR
  - Eye protection, preferably a face shield
  - Gloves & gowns
- N95 respirators or PAPRs/CAPRs must be used for all aerosol-generating procedures, including:
  - Endotracheal intubation
  - Deep suctioning
  - Nebulizer treatments
  - Bronchoscopy
  - Noninvasive ventilation
  - Chest compressions
  - Chest physiotherapy

- Patients should be placed in negative-pressure rooms, as able, or in geographic cohorts, if necessary
- Minimize aerosolizing procedures whenever possible

RISK FACTORS FOR SEVERE DISEASE

Demographics

- Age >55
- Male sex
- Obesity
- Racial and ethnic minority groups
- Residents of long-term care facilities

Comorbid conditions

- Chronic lung diseases: COPD, lung cancer, cystic fibrosis, pulmonary fibrosis, moderate to severe asthma
- Heart disease
- Diabetes
- Obesity
- Chronic liver or kidney disease
- Immunocompromised/malignancy

INITIAL LABORATORY WORK-UP

- CBC w/ differential
- BMP, Mg, Phos
- LFTs, troponin & CPK, NT-proBNP
- LDH, CRP, D-dimer, procalcitonin
- PTT/INR, ferritin

COVID-19-SPECIFIC MEDICATIONS

- **Dexamethasone** 6 mg IV/PO q24h for up to 10 d
  - **Mortality benefit** seen in hypoxemic patients, including those on mechanical ventilation
  - Avoid in patients without hypoxemia (room air SpO_2 ≥94%)
- **Remdesivir** 200 mg IV loading dose, then 100 mg IV q24h for 5 d
  - Benefit greatest in patients receiving supplemental O_2 but limited in patients requiring mechanical ventilation
  - Shortens time to recovery but no apparent mortality benefit in most ICU patients
- **Therapies with inconsistent evidence of benefit:**
  - Convalescent plasma
  - Tociluzimab
- **Therapies shown to be ineffective or harmful:**
  - Hydroxychloroquine
  - Monoclonal antibodies (ineffective in hospitalized patients, may have a role in high-risk outpatients)
  - Azithromycin
  - Lopinavir-ritonavir

RESPIRATORY

Start PRONING patient early if PaO_2/FiO_2 <150
Respiratory escalation (Target SpO_2: 92%-96%)

1. Nasal cannula: Up to 6 LPM
2. Venturi mask: 9-12 LPM with FiO_2 30%-60%
3. Trial HHFNC if available: 100% to start at 20-30 L/min, up to 60 L/min flow
4. NIPPV: Trial CPAP or BiPAP with mask & filter EPAP 5 to start, can increase up to 15-20
5. *If mental status deteriorates, hypercarbia or acidosis develops, cardiac instability ensues, or patient has persistent profound hypoxia, tracheal intubation is likely next step*

Utilize lung-protective/ARDSnet recommendations

- Tidal volume: 4-6 mL/kg predicted body weight
- Choose RR (15-20 breaths/min), titrated to blood pH (not pCO_2 allowing for permissive hypercapnea)
- Goals: Titrate PEEP/FiO_2 to target PaO_2 >55 mm Hg or SaO_2 88%-95%
- Goals: pH 7.25-7.35, plateau pressure ≤30 cm H_20

CARDIAC

- Shock common—consider etiology
  - Cardiogenic vs septic vs vasodilatory
  - Empiric antibiotics within first hour
- Consider conservative fluid management strategy (withholding fluid bolus or giving smaller 250 – 500 mL boluses)
- Start norepinephrine as first agent
  - Titrate every 3-5 min
  - 2-20 mcg/min (max 100 mcg/min)
- Next-line agents vasopressin or epinephrine
  - Epi 1-10 mcg/min
  - Vaso 0.01-0.04 units/min
- If not already receiving glucocorticoids, start hydrocortisone 50 mg IV q6h if inadequate response to second vasopressor
- Dobutamine may be considered if cardiac dysfunction playing a large role

HEMATOLOGIC

High incidence of thromboemboli and hypercoagulability

- Suggested prophylaxis of all patients if no contraindications
  - If CrCl >30: Enoxaparin 40 mg SC daily
  - If CrCl <30 or AKI: Heparin 5000 units SC TID
  - Hold if platelets <30,000 or bleeding; start TEDs and SCDs
  - If the patient is on direct oral anticoagulants or warfarin, switch to full dose anticoagulation with enoxaparin or heparin

NEURO/SEDATION

High incidence of neurologic manifestations

- Stroke can occur
- Combination of analgesia and sedation should be employed
- Daily sedation holidays if able/safe
- Sedation should be targeted to facilitate improved oxygenation/ventilation
- Scoring systems such as the RASS should be employed

For greater detail, review the NIH treatment guidelines at https://www.covid19treatmentguidelines.nih.gov

Quick reference for evaluation and management of COVID-19-associated hypercoagulability

Evaluations and monitoring	
Inpatients	▪ Daily PT, aPTT, fibrinogen, D-dimer; frequency may be reduced depending on acuity and trend in values ▪ Diagnostic imaging studies if feasible for clinically suspected DVT or PE; consult PERT team ▪ Alternative evaluations if standard imaging studies are not feasible
Outpatients	▪ Routine coagulation testing is not required
Management	
Abnormal coagulation studies	▪ Use for prognostic information and level of care ▪ Do not intervene solely based on coagulation abnormalities
VTE prophylaxis	▪ Prophylactic dosing preferred over higher dosing in most inpatients, including those in the ICU ▪ Dose adjustments may be made for increased body weight or decreased kidney function ▪ LMW heparin is generally preferred over other anticoagulants ▪ Thromboprophylaxis is generally not continued following discharge, with rare exceptions ▪ Thromboprophylaxis is generally not used in outpatients, with rare exceptions
VTE treatment	▪ Therapeutic (full-dose) anticoagulation for documented VTE or high suspicion for VTE • Initiate in hospital per standard protocols • Continue for at least 3 months ▪ Reserve fibrinolytic agents (eg, tPA) for limb-threatening DVT, massive PE, acute stroke, or acute MI; consult PERT or stroke team
Clotting in vascular catheters or extracorporeal circuits*	▪ Therapeutic (full-dose) anticoagulation ▪ Standard protocols for continuous renal replacement therapy or ECMO
Bleeding	▪ Similar to individuals without COVID-19 • Transfusions for anemia or thrombocytopenia • Anticoagulant reversal and/or discontinuation for anticoagulant-associated bleeding • Specific treatments (eg, factor replacement) for underlying bleeding disorders ▪ Avoid antifibrinolytic agents in individuals with acute decompensated DIC¶

Refer to UpToDate for discussions of COVID-19 management and related topics. Resources are also available from the International Society on Thrombosis and Haemostasis (https://onlinelibrary.wiley.com/doi/10.1111/jth.14853), the American Society of Hematology (https://www.hematology.org/covid-19/covid-19-and-coagulopathy), and the American College of Cardiology (https://www.acc.org/latest-in-cardiology/articles/2020/04/17/14/42/thrombosis-and-coronavirus-disease-

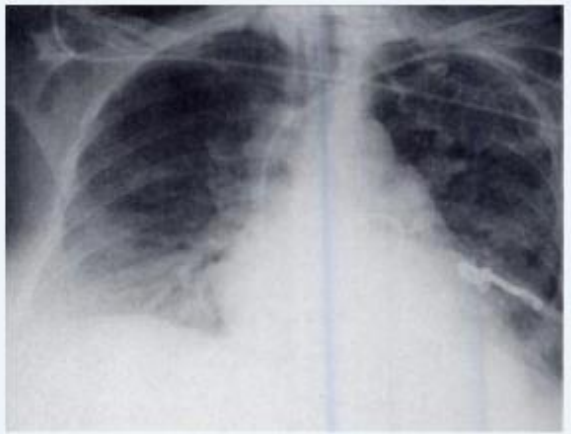
Acute Respiratory Distress Syndrome

Clinical Features

- Progressive dyspnea
- Worsening hypoxemia
- Bilateral infiltrates on chest radiographs
- Acute onset (<7 days) of inciting event

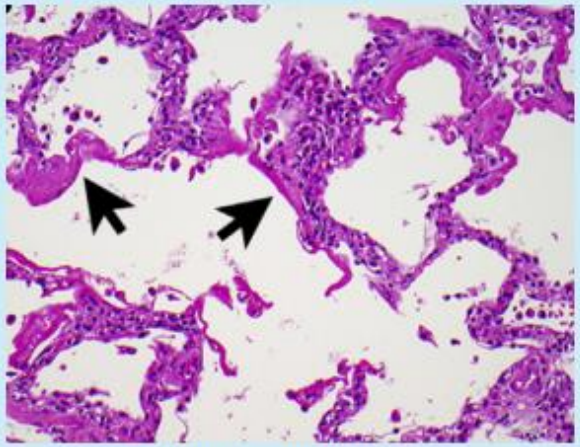
CAUSES

- **Direct:** Pneumonia, Aspiration
- **Indirect:** Sepsis, Trauma



Pathophysiology

- Alveolar injury with diffuse inflammatory response
- Increased pulmonary vascular permeability with excess interstitial and alveolar fluid
- Impaired gas exchange, decreased lung compliance, and increased pulmonary arterial pressure



Diffuse alveolar damage
(arrows represent hyaline membranes)

Diagnosis

A syndrome, not a specific disease. Most recent definition was created by a panel of experts in 2012:

BERLIN DEFINITION

- **Onset within 1 week** of insult or new/worsening respiratory symptoms
- **Respiratory failure** unexplained by cardiac function or volume overload
- **Bilateral CXR opacities** unexplained by other etiology (eg, effusion, collapse, nodules)
- **Hypoxemia**

	PaO_2/Fio_2
Mild ARDS	200-300
Moderate ARDS	100-200
Severe ARDS	<100

Treatment

In addition to treatment of the inciting etiology, consider the following in a stepwise fashion:

- **Ventilation strategies**:
  - Target tidal volume of 4-8 mL/kg ideal body weight
  - Plateau pressures <30 cm H_2O (or transpulmonary pressure < 20 cm H_20)
  - Conservative oxygen strategy (target PaO_2 55-80)
  - PEEP: Consider a high PEEP strategy in moderate-severe ARDS
- Prone positioning
- Neuromuscular blockade
- Consider transfer to ECMO center if symptoms do not continue to improve.

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CHEST. 1990;98(4):1032-1034. DOI: 10.1378/chest.98.4.1032
CHEST. 2018;153(4):825-833. DOI: 10.1016/j.chest.2017.12.007

Additional references:
JAMA. 2012;307(23):2526-33. DOI: 10.1001/jama.2012.5669
CHEST. 2020;158(6):2381-2393. DOI: 10.1016/j.chest.2020.06.080

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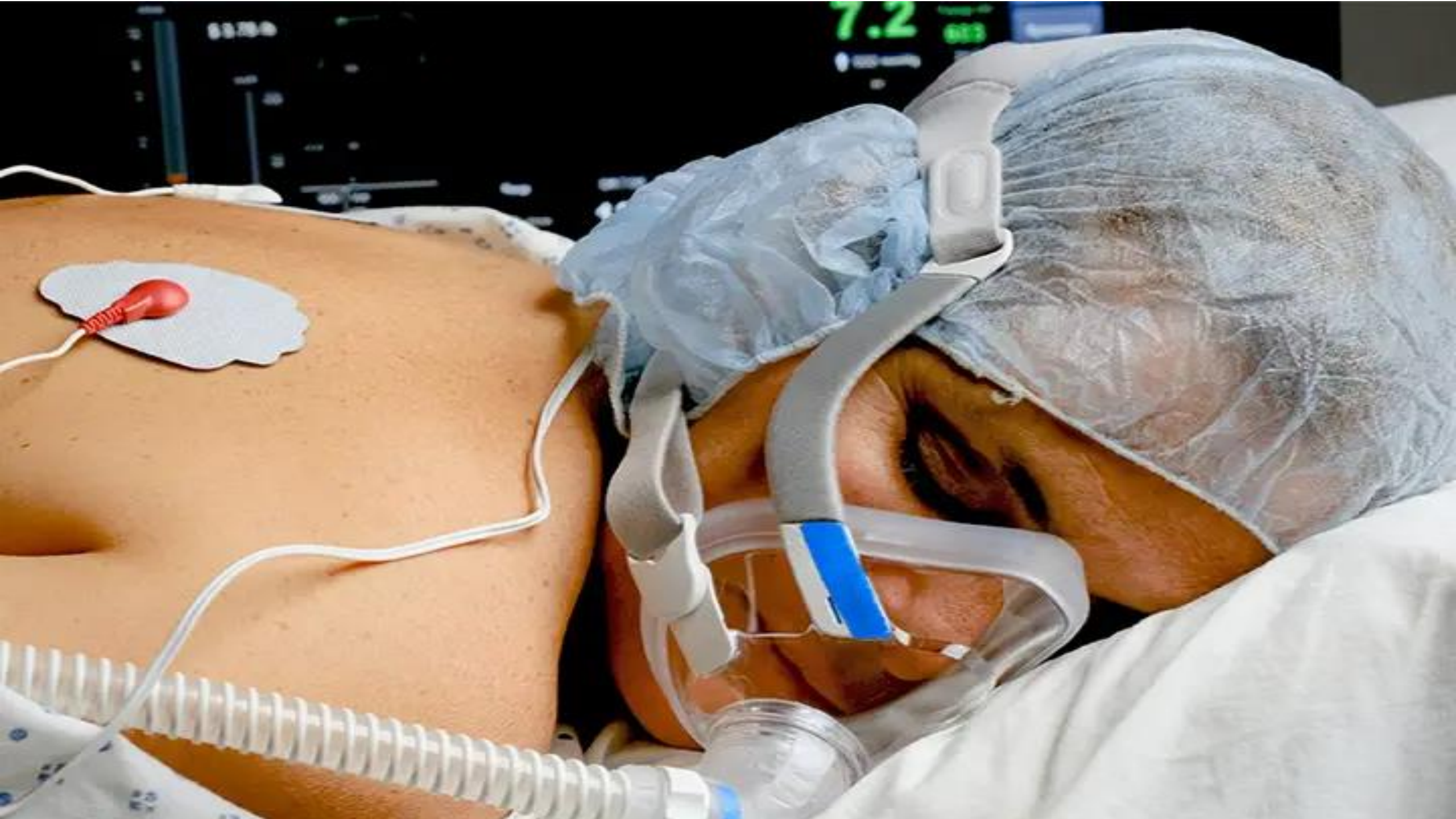
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JAMA

QUESTION What is the effect of continuous positive airway pressure (CPAP) or high-flow nasal oxygen (HFNO) vs conventional oxygen therapy on the risk of tracheal intubation or mortality in patients with acute hypoxemic respiratory failure due to COVID-19?

CONCLUSION Among patients with acute hypoxemic respiratory failure and COVID-19, an initial strategy of CPAP significantly reduced the risk of tracheal intubation or mortality vs conventional oxygen therapy but there was no significant difference with HFNO.

POPULATION

844 Men
429 Women

Adults with COVID-19-related acute hypoxemic respiratory failure

Mean age: **57** years

LOCATIONS

48 Acute care hospitals in the UK and Jersey

INTERVENTION

1273 Patients randomized
1260 Patients analyzed

380
CPAP
Administered per local protocols

418
HFNO
Administered per local protocols

475
Conventional oxygen therapy
Standard of care; oxygen via nasal cannula

PRIMARY OUTCOME

A composite of tracheal intubation or mortality within 30 days

FINDINGS

Tracheal intubation or mortality within 30 days

CPAP: 36.3% (137 of 377 patients)

HFNO: 44.3% (184 of 415 patients)

Conventional oxygen therapy
vs CPAP: 44.4% (158 of 356 patients)
vs HFNO: 45.1% (166 of 368 patients)

CPAP vs conventional therapy was significant.
Absolute difference, −8% (95% CI, −15% to −1%)

HFNO vs conventional therapy was not significant.
Absolute difference, −1% (95% CI, −8% to 6%)

Perkins GD, Ji C, Connolly BA, et al; RECOVERY-RS Collaborators. Effect of noninvasive respiratory strategies on intubation or mortality among patients with acute hypoxemic respiratory failure and COVID-19: the RECOVERY-RS randomized clinical trial. *JAMA*. Published January 24, 2022. doi:10.1001/jama.2022.0028


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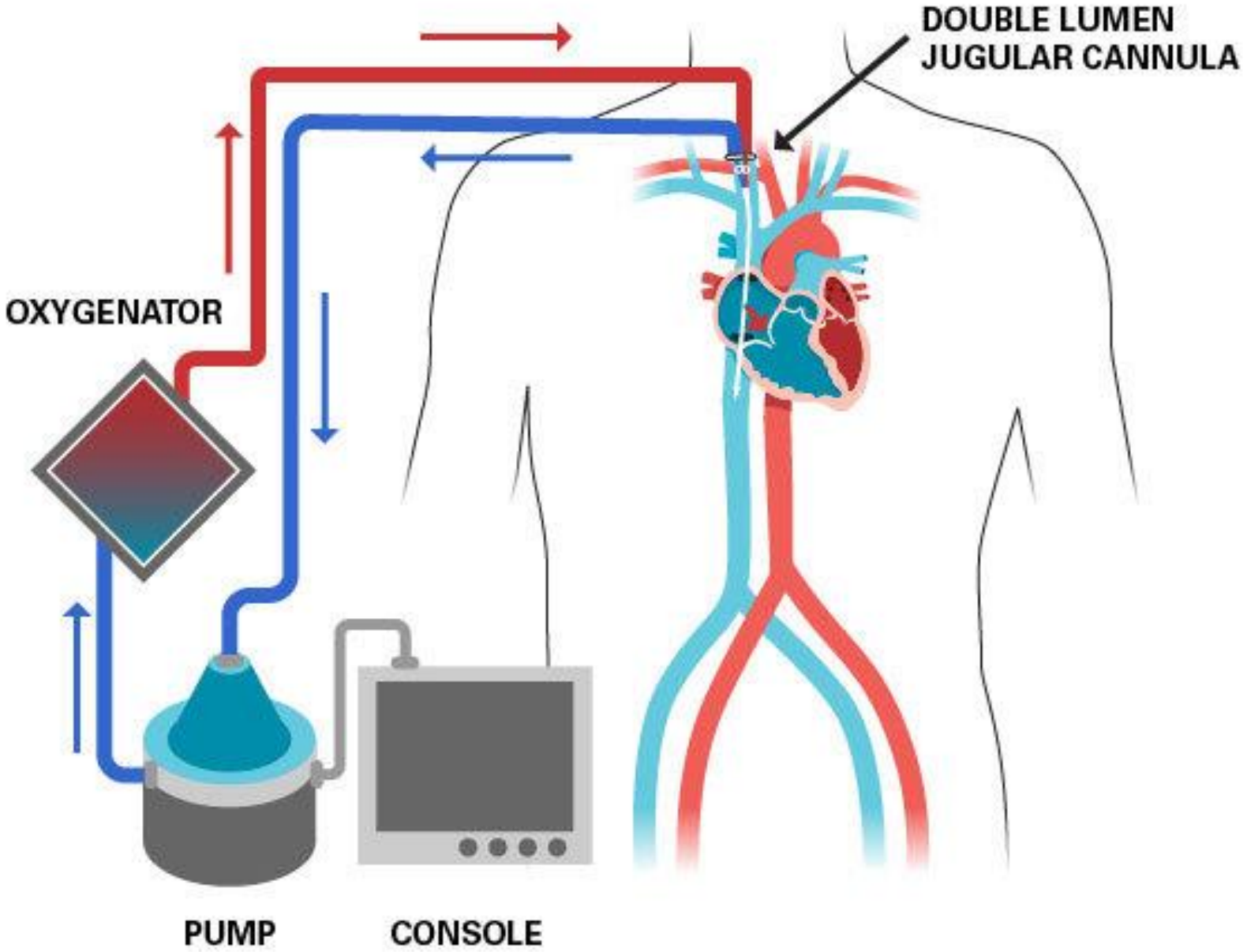

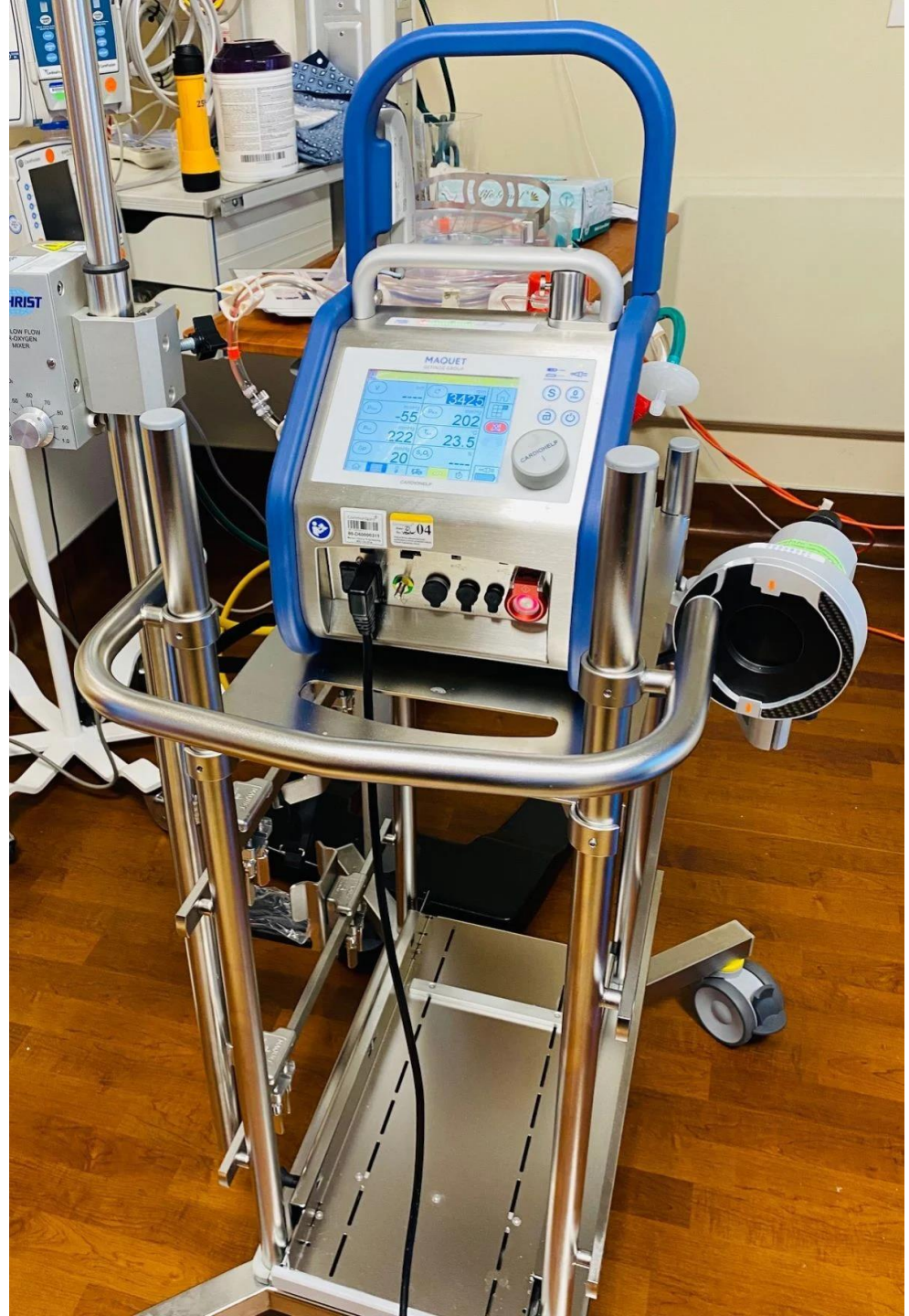
MAQUET
CARDIOHELP
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202
222
23.5
20

COVID-19 Cases on ECMO in the ELSO Registry

Total COVID-19 Cases	COVID-19 Confirmed Cases
	15,394

Total counts of COVID-19 confirmed patients.

COVID-19 ECMO counts by ELSO Chapter

	Still on ECMO	Still Hospitalized at ELSO Center	Total (n)
All ELSO	500	803	15,459
North America	159	265	9,946
Europe	163	239	3,157
Asia Pacific	32	48	320
Latin America	107	177	1,009
SWAAC	39	74	1,027

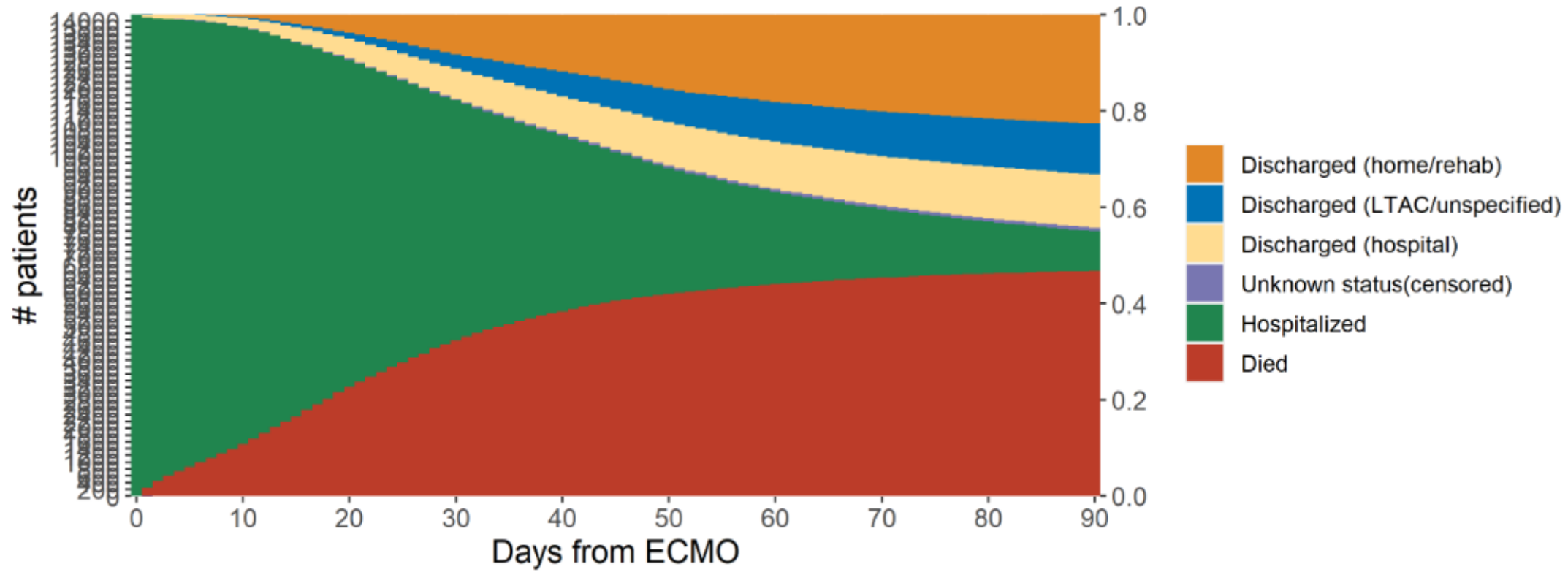
Reports counts of ECMO-supported suspected or confirmed COVID-19 cases by ELSO Chapter

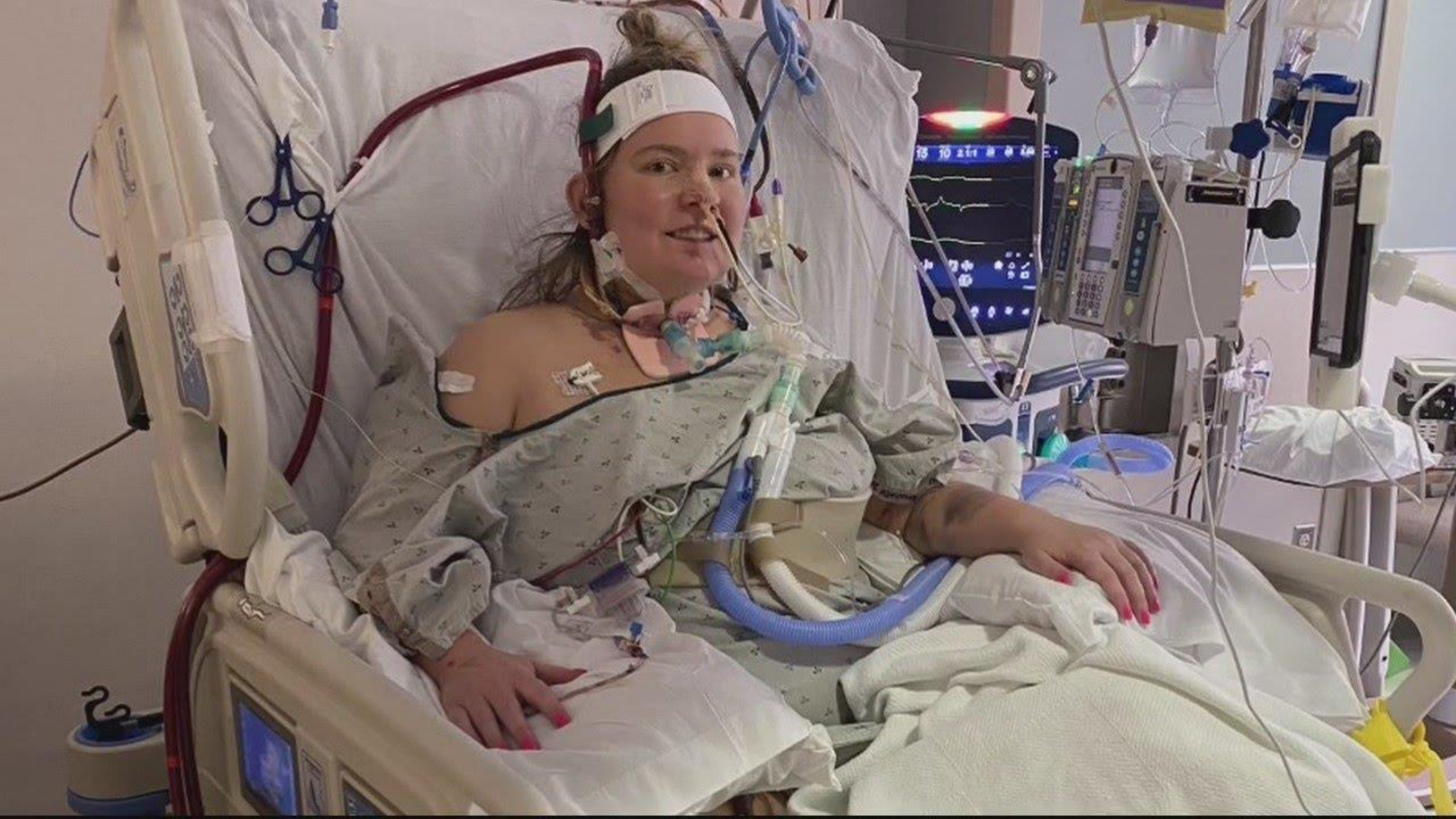
Patients who initiated ECMO at least 90 days ago

COVID-19
Confirmed
14,189

COVID-19
In-hospital Mortality
47%

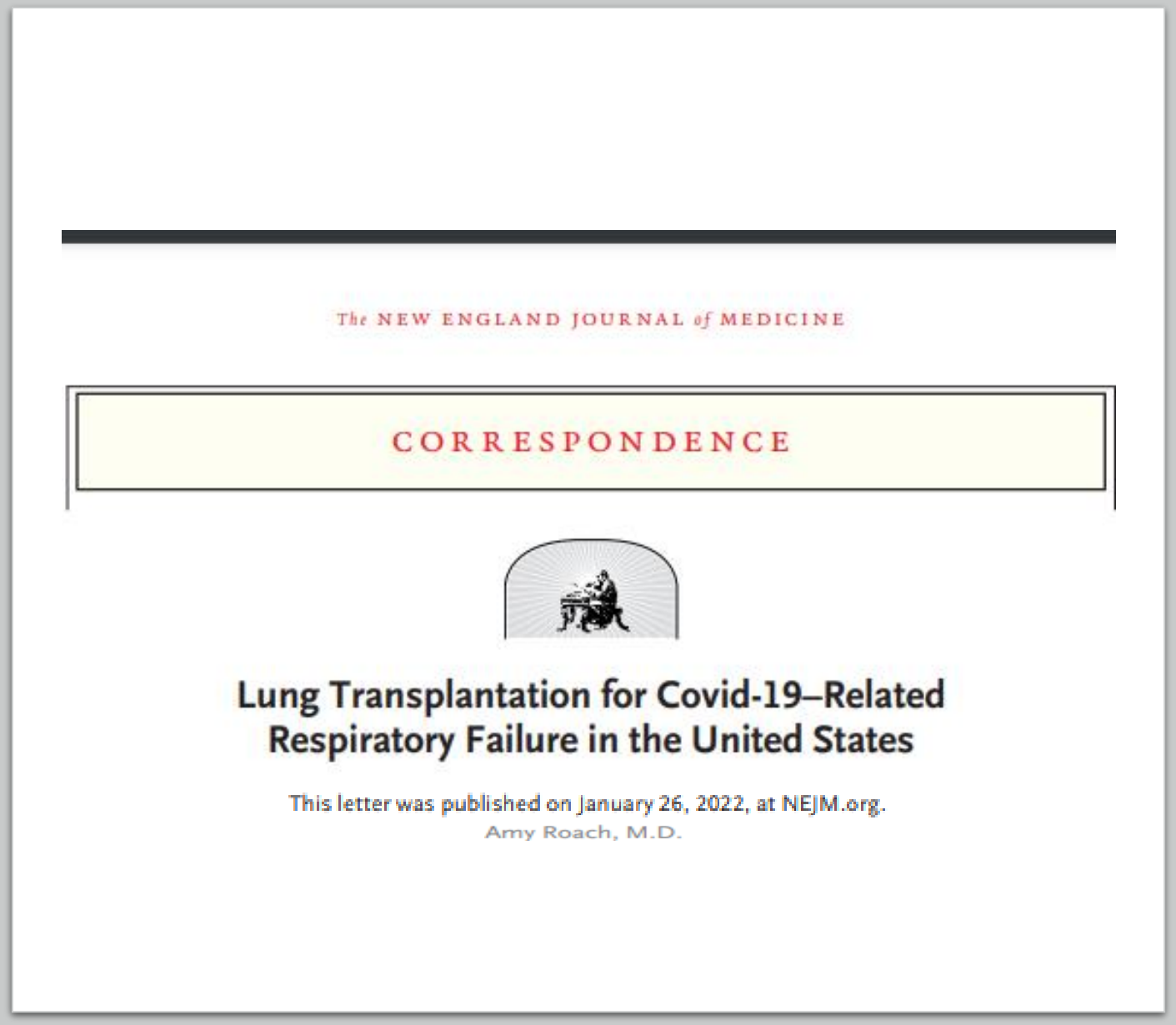
Outcomes





Summary

- 8/20-9/21 7% of lung transplants nationwide were for COVID (214)
- Median age 52
- 21% female; 37% Hispanic
- Bilateral 92%
- 64% received ECMO
- 3-month survival 95.6%
- Complications: stroke(3%), new use of ECMO(12%), rejection (11%)



The NEW ENGLAND JOURNAL of MEDICINE

CORRESPONDENCE

Lung Transplantation for Covid-19–Related Respiratory Failure in the United States

This letter was published on January 26, 2022, at NEJM.org.

Amy Roach, M.D.

POST-INTENSIVE CARE SYNDROME (PICS)

Critical illness survivors suffer from new or worsening impairments in the physical, cognitive, or behavioral domains.

These unintended consequences of critical care are referred to as PICS.

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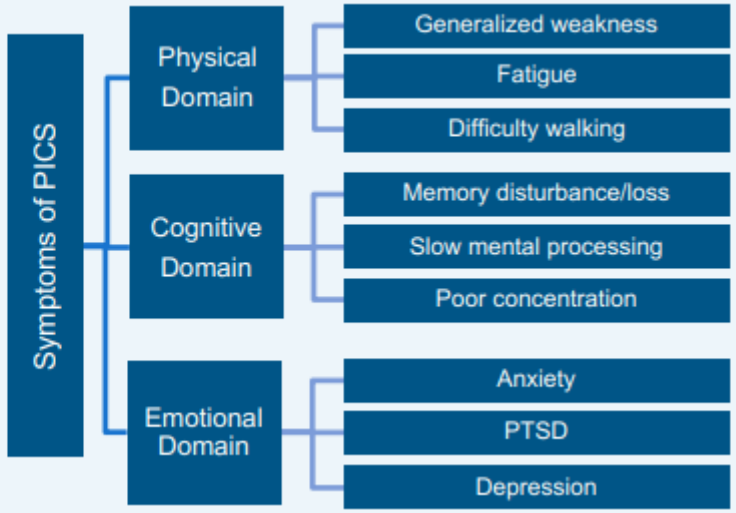

COMMON RISK FACTORS

- ICU length of stay ≥24 hours
- Prolonged immobilization
- Severity of illness
- Older age (≥65)
- Female gender

- Prior psychiatric illnesses
- Prior cognitive impairment
- Lower socioeconomic status
- Exposure to glucocorticoids
- Prolonged use of sedation and/or analgesia drips
- Hyperglycemia

PREVENTION AND SCREENING

Implementation of the ABCDEF bundle

- Spontaneous awakening and breathing trials
- Choice of sedation and analgesics
- Delirium screening and prevention
- Early mobilization
- Family presence at bedside

Use of validated scales to screen and guide targeted treatments

- Delirium screening (CAM-ICU)
- Pain assessment (CPOT, VAS)
- Sedation titration (RASS)

CRITICAL CARE RECOVERY PROGRAMS

Critical care recovery clinics

- Multidisciplinary teams including intensivists, nurses, physical/occupational therapists, pharmacists, spiritual care specialists, palliative care specialists, social workers, and others
- Bridge gaps in transition of care; screen and treat PICS
- Can be conducted in person or via telehealth

Peer-to-peer support groups

- Online or in person

PICS IN CAREGIVERS

- Family and loved ones who provide the needed care and support can also develop some of the same mental and emotional symptoms of PICS; referred to as PICS-family or PICS-F

Original Investigation | Caring for the Critically Ill Patient

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Clinical Outcomes Among Patients With 1-Year Survival Following Intensive Care Unit Treatment for COVID-19

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Table 2. Prevalence of Symptoms in Patients at 1-Year Survival Following Intensive Care Unit Treatment for COVID-19 (N = 246)

	Values at 1-y follow-up, No./total (%) [95% CI]
Physical symptoms	
Reported ≥1 physical symptom	182/245 (74.3) [68.3-79.6]
Clinical Frailty Scale score, median (IQR)[a]	2 (2-3)
Exceeded frailty cutoff[a]	15/245 (6.1) [3.5-9.9]
Checklist Individual Strength-8—fatigue subscale score, median (IQR)[b]	29 (18-39)
Exceeded fatigue cutoff[b]	138/246 (56.1) [49.7-62.4]
New or worsened physical problems, No. of problems, median (IQR)[c]	2 (0-5)
Reported ≥1 physical problem	165/246 (67.1) [60.8-72.9]
Mental symptoms	
Reported ≥1 mental symptom	64/244 (26.2) [20.8-32.2]
HADS scale-anxiety score, median (IQR)[d]	3 (1-6)
Exceeded anxiety cutoff[d]	44/246 (17.9) [13.3-23.3]
HADS scale-depression score, median (IQR)[d]	3 (1-5)
Exceeded depression cutoff[d]	45/246 (18.3) [13.7-23.7]
Impact of Event Scale-6 score, median (IQR)[e]	0.5 (0.2-1.2)
Exceeded posttraumatic stress disorder cutoff[e]	24/244 (9.8) [6.4-14.3]
Cognitive symptoms	
Cognitive Failure Questionnaire-14 score, median (IQR)[f]	24.8 (12.8-37.0)
Exceeded cognitive failure cutoff[f]	39/241 (16.2) [11.8-21.5]

Abbreviation: HADS, Hospital Anxiety and Depression Scale.

[a] Score range, 1 (very fit) to 9 (terminally ill), with a score of 5 or greater indicating frailty. A score of 2 describes a person who is fit, and higher scores indicate being more frail.

[b] A 7-point rating subscale of the Checklist Individual Strength-20 (score range, 8-56, with a score of 27 or greater indicating abnormal fatigue) and consisting of 8 statements.

[c] Physical problems were objectified by a list of 30 symptoms and were present if at least 1 symptom was moderate or severe.

[d] Score range, 0 (best) to 21 (worst), with higher scores indicating worse symptoms, with the presence of anxiety or depression symptoms defined by a subscale score of 8 or greater.

[e] Score range, 0 (not at all symptomatic) to 4 (extremely symptomatic), with a score of 1.75 or greater indicating presence of symptoms.

[f] Score range, 0 (never) to 100 (very often), with a score of 43 or greater indicating symptoms of daily life cognitive failure.

Table 1. Demographic and Clinical Characteristics of Patients With COVID-19 Treated in the Intensive Care Unit (N = 246)

	COVID-19 ICU survivors, No./total (%)
Patient characteristics[a]	
Age, mean (SD), y	61.2 (9.3)
Men	176/246 (71.5)
Women	70/246 (28.5)
Questionnaire completed by patient	221/246 (89.8)
Ancestry other than Dutch	26/233 (11.2)
High education level[b]	78/240 (32.5)
Body mass index, mean (SD)[c]	28.0 (4.5)
Body mass index ≥30	62/239 (25.2)
Chronic condition, ≥1[d]	58/246 (23.6)
ICU characteristics	
APACHE IV score, mean (SD)[e]	58.9 (16.6)
Patients received IMV[f]	132/162 (81.5)
Duration of IMV, median (IQR), d	14 (8-22)
Duration of ICU stay, median (IQR), d	18.5 (11-32)
Duration of hospital stay, median (IQR), d	30 (20-46)

Abbreviations: APACHE IV, Acute Physiology and Chronic Health Evaluation; ICU, intensive care unit; IMV, invasive mechanical ventilation.

[a] Patients were admitted to the ICU between March 1, 2020, and July 1, 2020 (the first COVID-19 surge in the Netherlands).

[b] Higher vocational education and university education were classified as high education level dichotomized vs lower education levels.

[c] Body mass index was calculated by the weight in kilograms divided by height in meters squared. Cutoff value of ≥30 for obesity was based on the World Health Organization's definition.

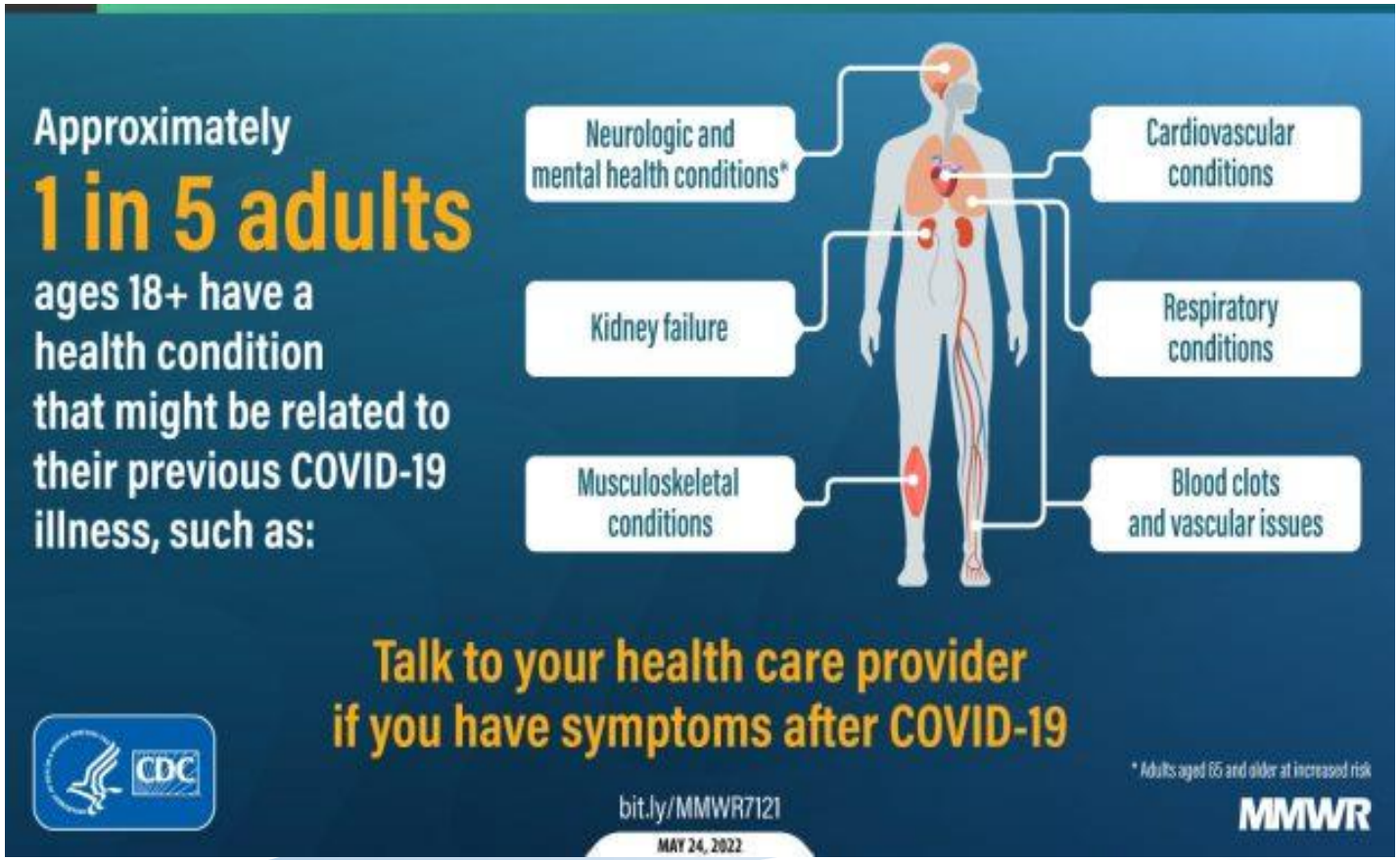
[d] Immunological insufficiency, AIDS, hematological malignancy, metastatic neoplasm, cirrhosis, cardiovascular insufficiency, respiratory insufficiency, COPD, and chronic dialysis or kidney failure.

[e] The APACHE IV scale measures severity of illness in critically ill patients (score range, 0-286, with higher scores indicating worse outcomes). For example, a patient in the ICU treated for COVID-19 with an APACHE IV score of 60 who is already in the hospital for 5 days prior to ICU admission without a chronic health condition has an estimated mortality rate of approximately 16%.

[f] Of the 11 participating hospitals, 4 were not able to provide data regarding use of mechanical ventilation.

Post COVID Condition

- Affects 10-30% of patients with COVID infection
- Defined as symptoms lasting > 4 weeks
- Most common: Dyspnea, racing heart, fatigue, "brain fog" dysautonomia, HA
- Absence of objective findings does not invalidate symptoms.
- Avoid excessive testing. 6 min walk test good screen for intrinsic lung disease
- Breathing exercises, gentle exercise, reassurance
- Generally, resolves but time course may be prolonged



The Future

- Estimated that 90% of US population has immunity either through infection or vaccination.
- Those not vaccinated or immunocompromised will remain at high risk
- Large human and animal reservoirs
- Endemic
- The virus will continue to mutate
- Large human and societal costs (mental health, substance abuse, loss of healthcare workers, post COVID syndrome, political upheaval)
- Promise of new vaccines and therapeutics