

Has COVID-19 Taxed How We Deliver Acute and Chronic Care to Patients with Kidney Disease?

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**Mount
Sinai**

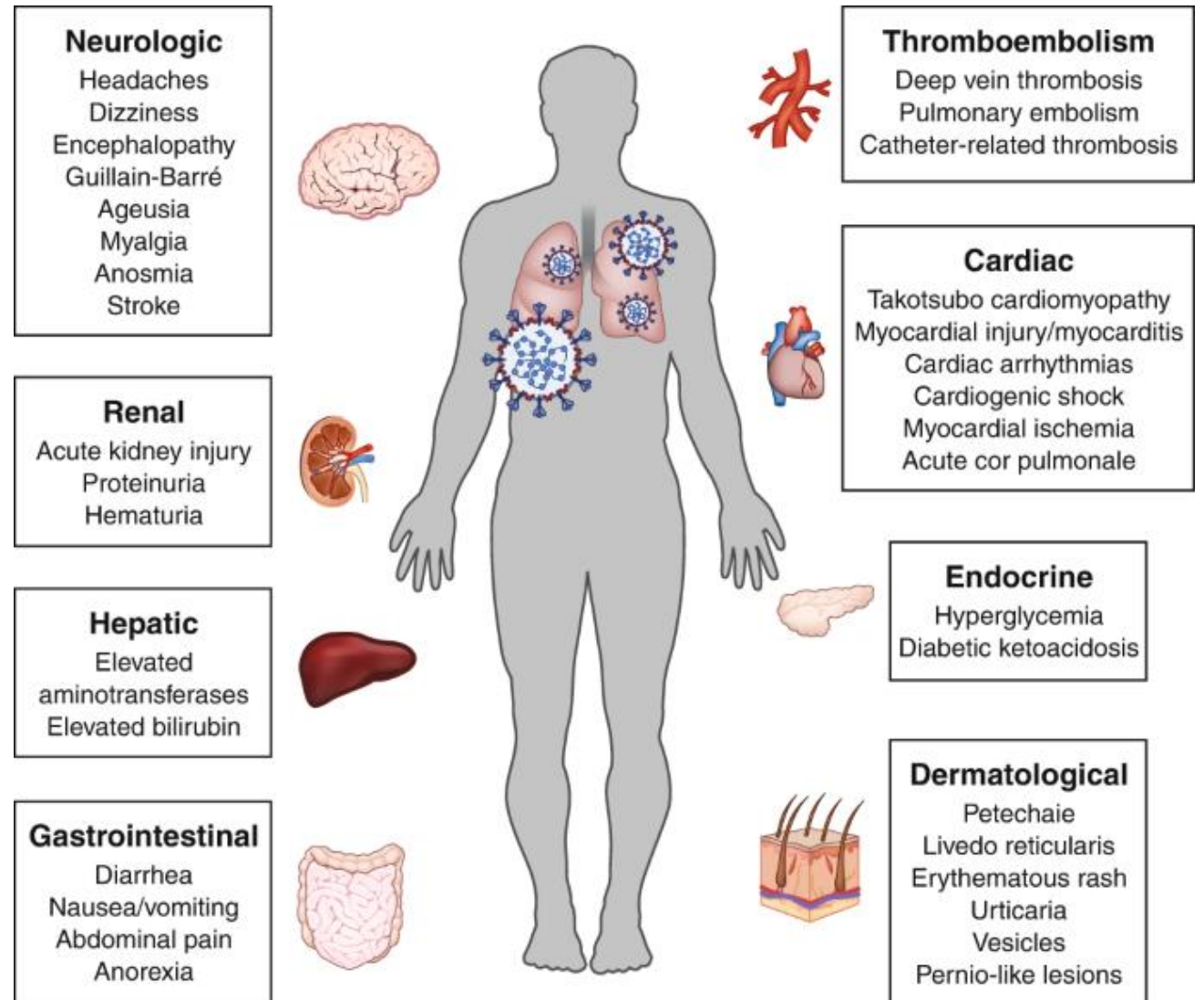
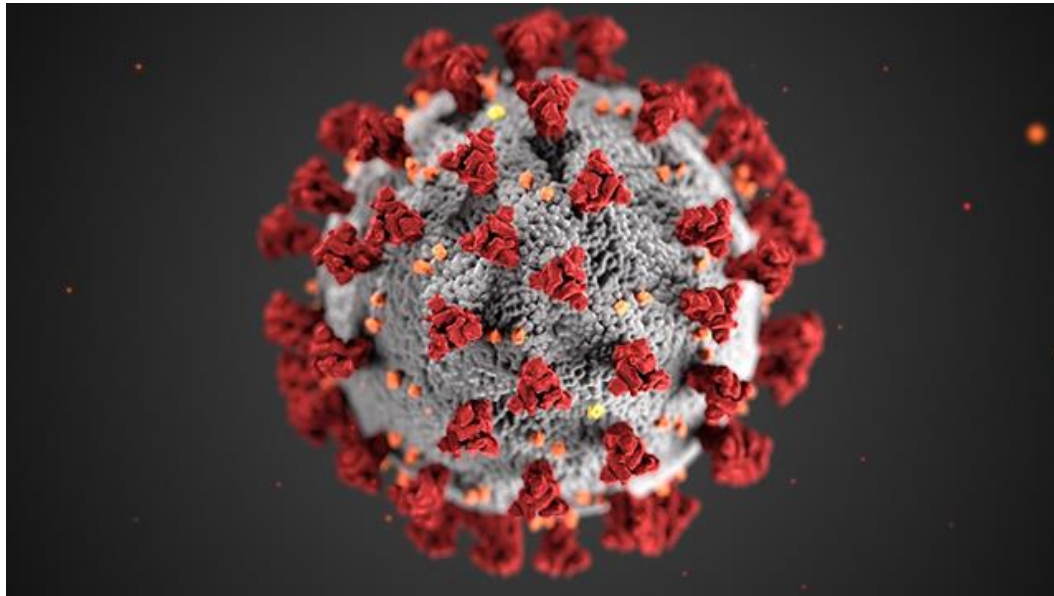
Disclosures

- ▶ Consultant for Vifor Pharma, INC
- ▶ Honorarium from Fresenius Medical Care
- ▶ Grant from NIH/NIDDK

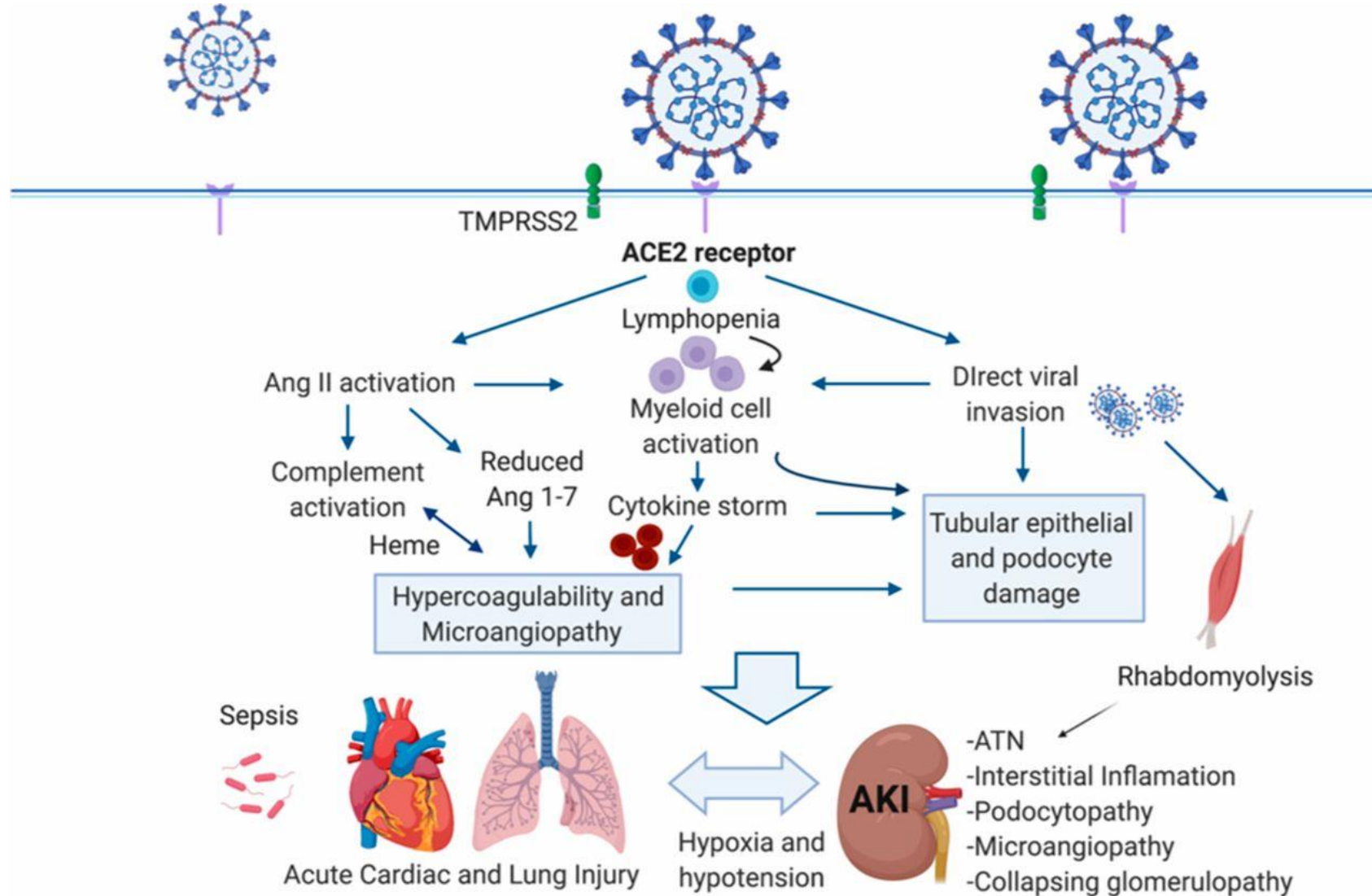
Learning Objectives

- ▶ Overview of incidence and outcomes of COVID-19 associated AKI
- ▶ Management of COVID-19 associate AKI during the initial surge
- ▶ Discuss outcomes of ESKD patients hospitalized with COVID-19
- ▶ Review care of patients on ESKD during the pandemic
- ▶ COVID-19 Vaccination in ESKD patients

Not just a respiratory disease



Multiple potential mechanisms of AKI in COVID-19



Rates of AKI range from 0.5-24%

Cohort/study	Population	No. of cases	Mortality (%)	AKI N (%)
Cai et al.	Hospitalized	298	3 (1)	17 (5.7)
Guan et al.	All	1099	15 (1.4)	6 (0.5)
Pei et al.	Hospitalized, CKD excluded	333	29 (8.7)	22 (6.6)
Qiu et al.	Hospitalized	104	1 (1)	2 (1.9)
Wang et al.	Deceased + discharged	107	19 (17.8)	14 (13.1)
Xiao et al.	Hospitalized	287	19 (6.6)	55 (19)
Yan et al.	Hospitalized	168	6 (3.6)	6 (3.6)
Zhang et al.	Hospitalized	663	25 (3.8)	68 (10)
Zhou et al.	Deceased + discharged	191	54 (28.3)	28 (14.7)
Zhou et al.	Discharged	197	28 (14.2)	16 (8.1)
Chen et al.	Deceased + discharged	274	113 (14)	29 (11)
Cheng et al.	Hospitalized	701	113 (16.1)	36 (5.1)
Shi et al.	Hospitalized	416	57 (13.7)	8 (1.9)
Shi et al.	Deceased	101	101 (100)	24 (23.8)
Wang et al.	Hospitalized + age > 60 yr	339	65 (19.2)	27 (8.1)
Wang et al.	Hospitalized	138	6 (4.3)	5 (3.6)

Shortages of dialysis during COVID-19 peak in NYC

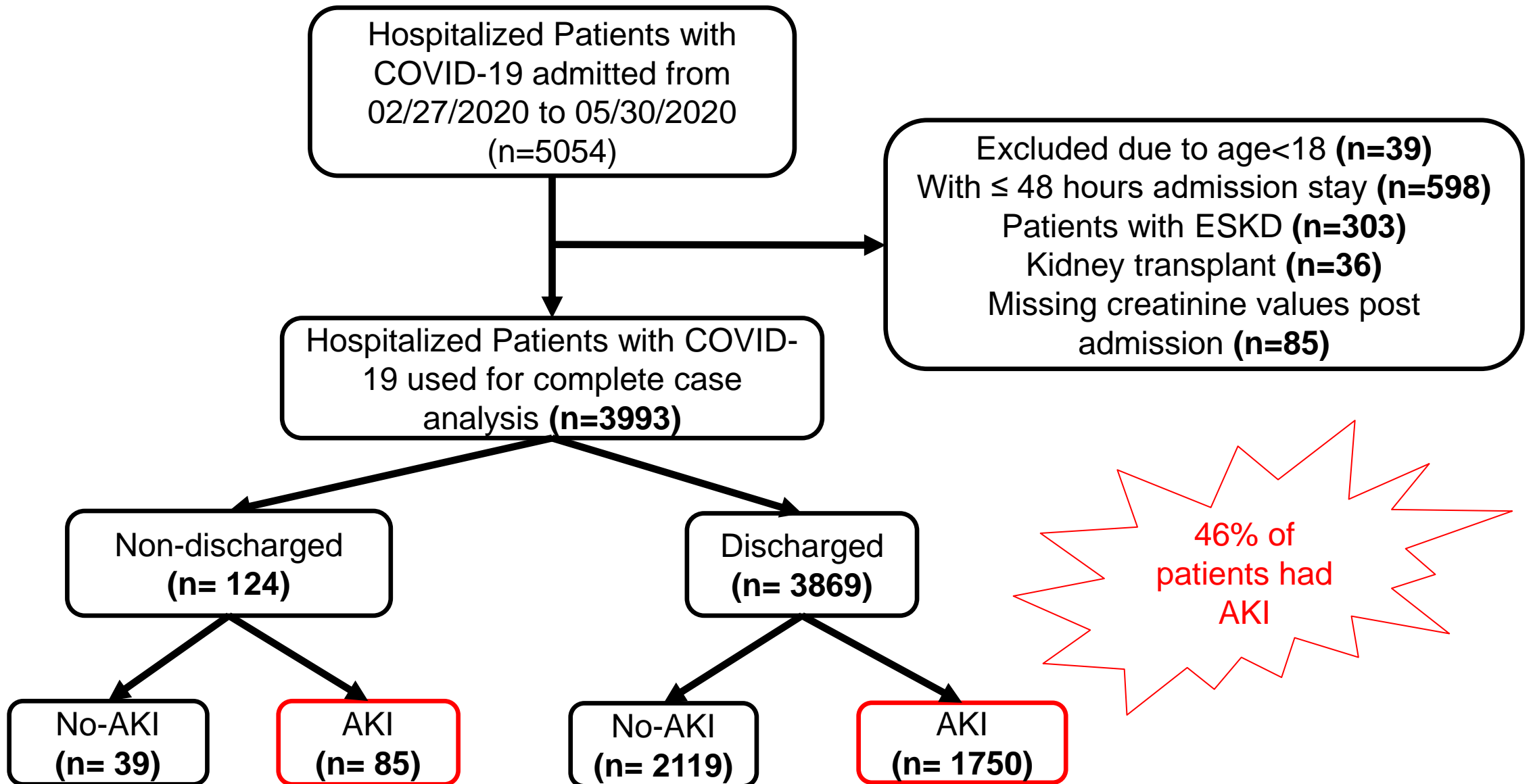
An Overlooked, Possibly Fatal Coronavirus Crisis: A Dire Need for Kidney Dialysis

Ventilators aren't the only machines in intensive care units that are in short supply. Doctors have been confronting an unexpected rise in patients with failing kidneys.

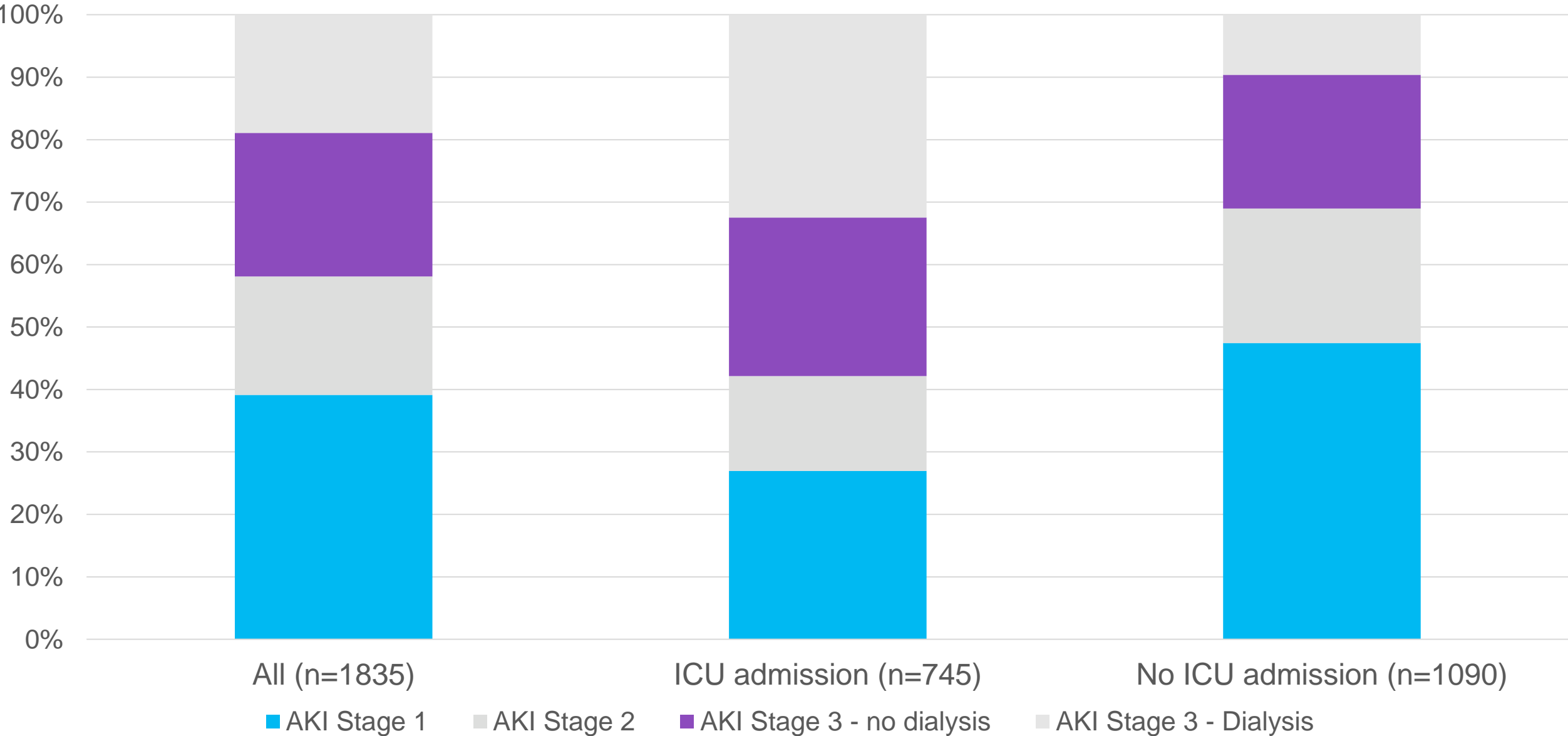


Miriam Figueroa, a dialysis nurse at the Brooklyn Hospital Center, tended to a patient in the intensive care unit on Thursday. Victor J. Blue for The New York Times

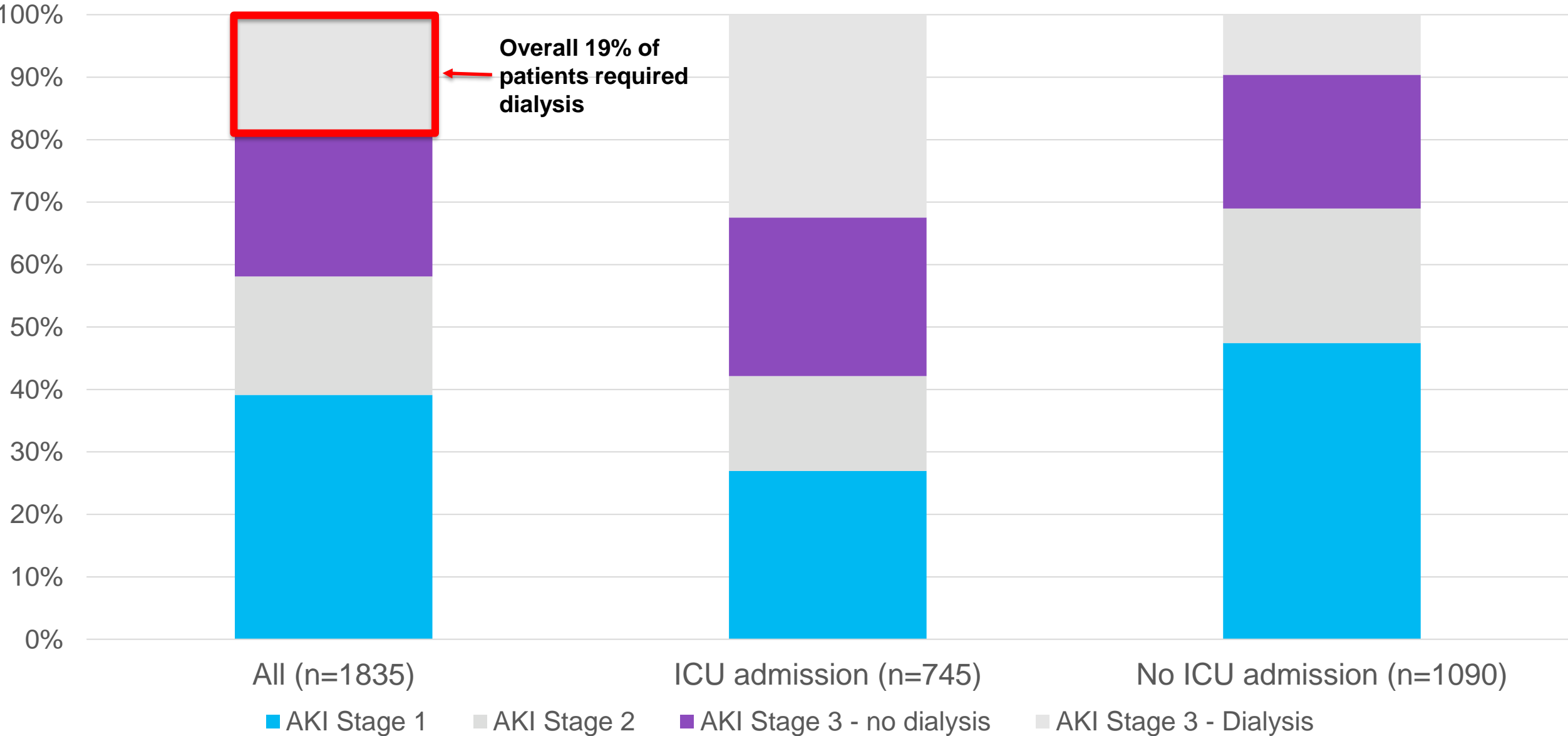
AKI in hospitalized COVID-19



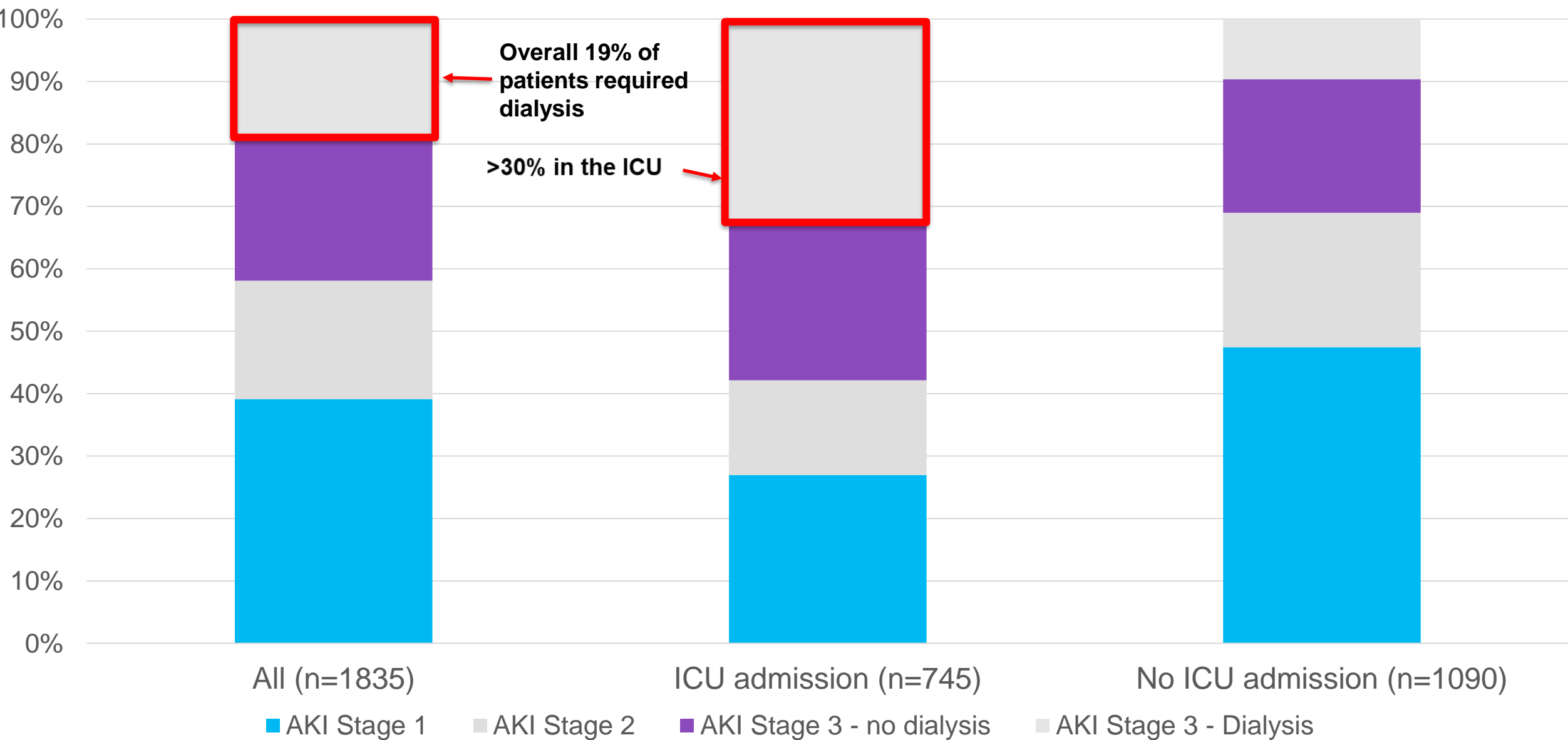
Stages of AKI Overall and by ICU Admission



Stages of AKI Overall and by ICU Admission



Stages of AKI Overall and by ICU Admission



Similar increase in patient burden reported by other NYC hospitals

	March 10–16	March 17–23	March 24–30	March 31–April 6
Weekly AKI consults	12	38	62	78
Weekly acute RRT	4	10	52	75
Weekly hospital COVID-19 patient census	2–18	26–163	233–560	625–877
Expansion of intensive care units	7	7	9	16
Expansion of nephrology services	6	6	8	10

Medical Management of AKI patients with COVID-19

- **Potassium binders**
 - Sodium zirconium cyclosilicate
 - Patiromer
- **Diuretics**
 - High dose of diuretics to maintain euvolemia
- **Alkali supplementation**
 - Sodium bicarbonate for metabolic acidosis

Dialytic Management

- **Cohorting:**
 - Initially COVID-19 patients were treated bedside
 - Then COVID-19 shifts if they were able to travel
- **Acute PD:**
 - Surgeons placed PD catheters bedside, can be started in 2-3 days post placement
 - Cyclor for PD to limit exposure
- **PIRRT:**
 - Treat patients for 6-12 hours to increase capacity

CRRT with extended lines

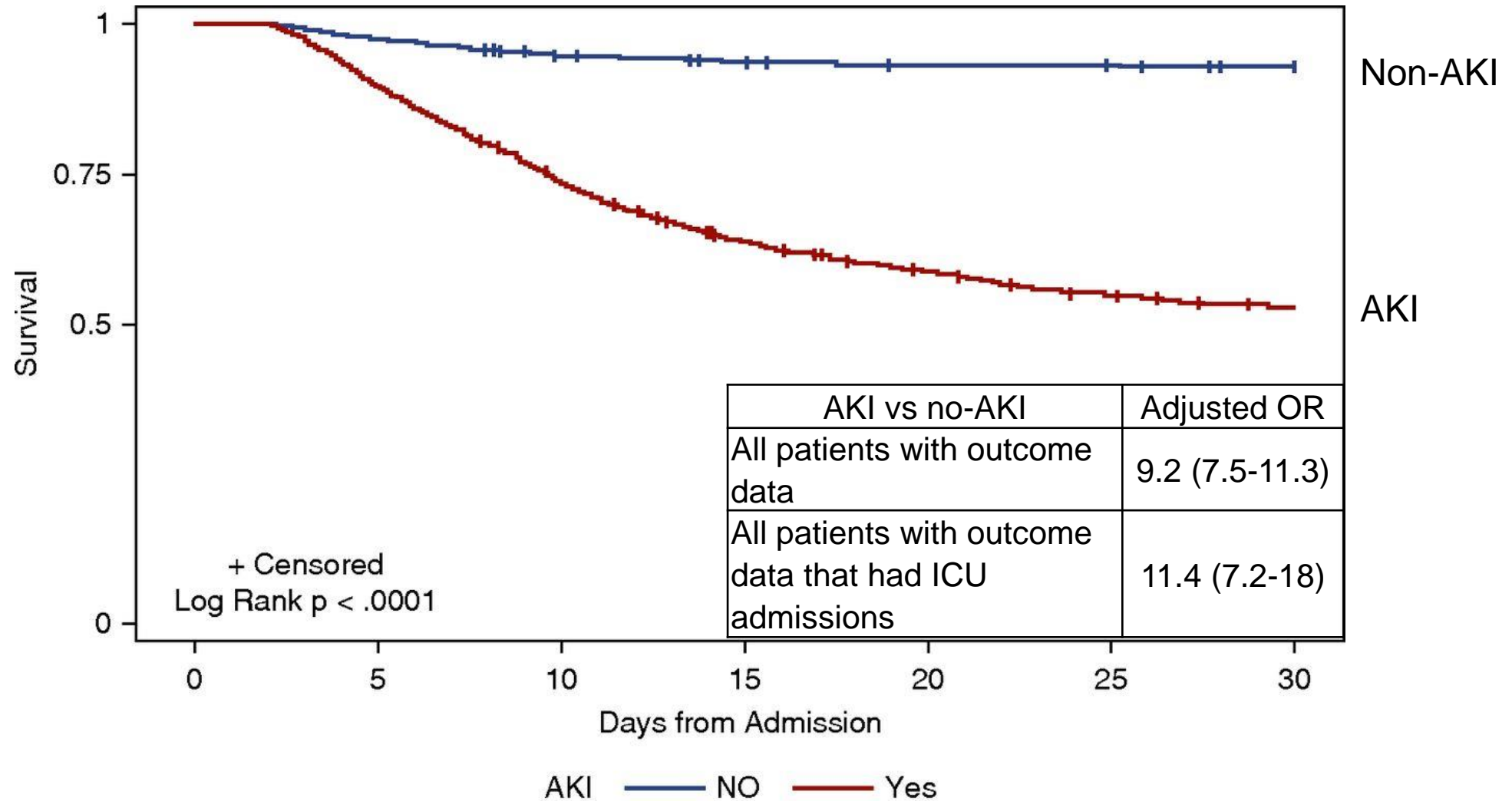


c/o Ashita Tolwani MD, UAB, AL

Outcomes in patients

Outcomes, n (%)	AKI	No AKI	p-value
Full cohort	N=1835	N=2158	
ICU admission	745 (41)	231 (11)	<0.001
Mechanical ventilation	803 (44)	126 (6)	<0.001
Vasopressor use	783 (43)	210 (10)	<0.001
Length of stay for those discharged, median(IQR)	10 (6-18)	7 (4-11)	<0.001
In-hospital Mortality	918 (50)	167 (8)	<0.001

Lower survival in patients with AKI

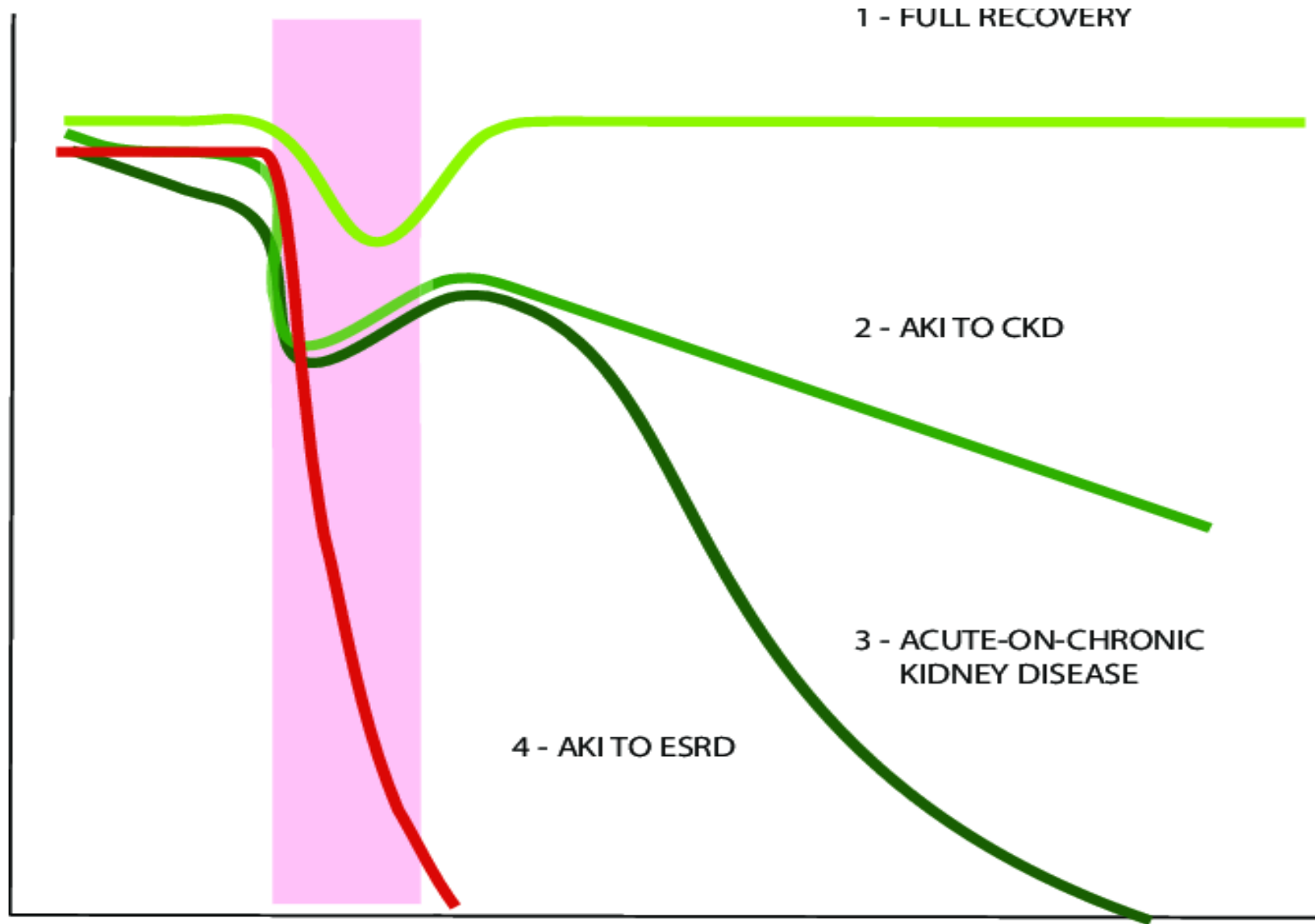


No AKI	2158	2103	2037	2011	2000	1994	1982
AKI	1835	1643	1344	1159	1060	986	945

Path to recovery?

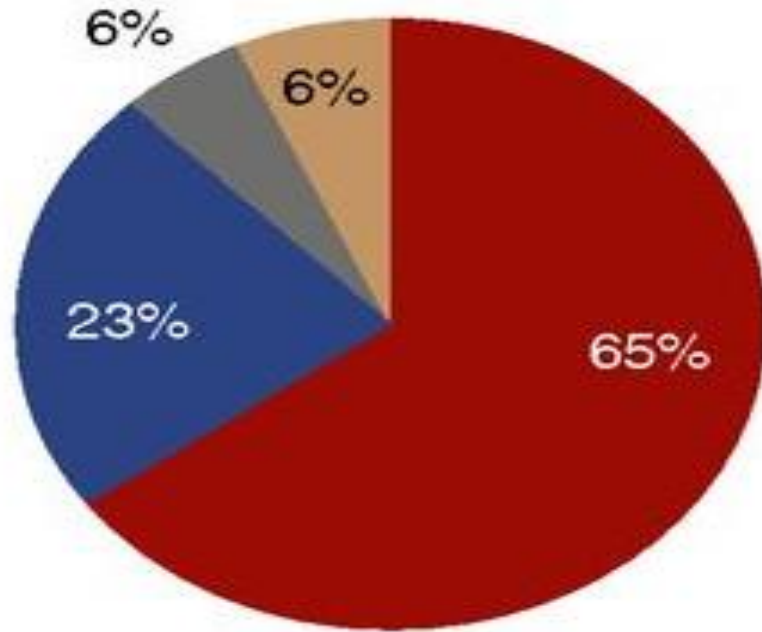


Recovery Patterns After AKI



Approximately a third of patients did not have renal recovery at discharge or post-hospitalization follow up

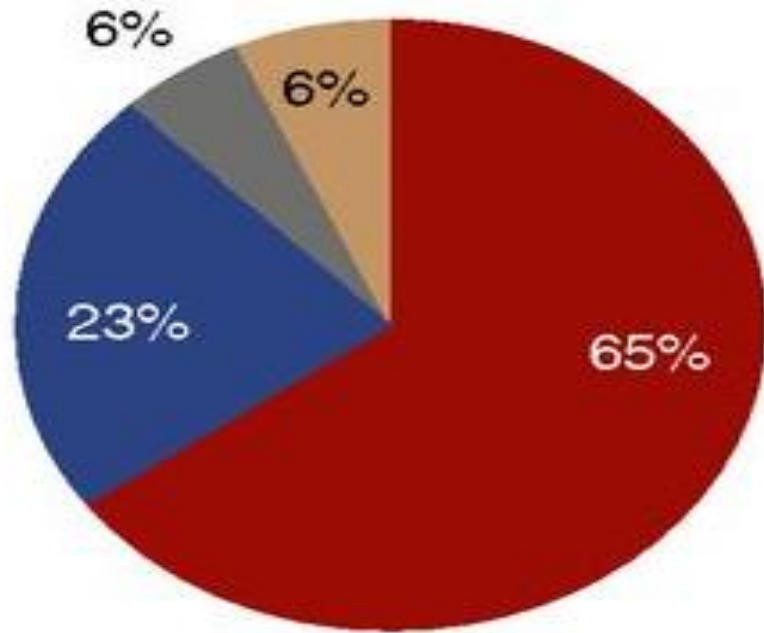
AKI survivors at discharge (N = 832)



- Recovered
- AKD Stage 1
- AKD Stage 2
- AKD Stage 3

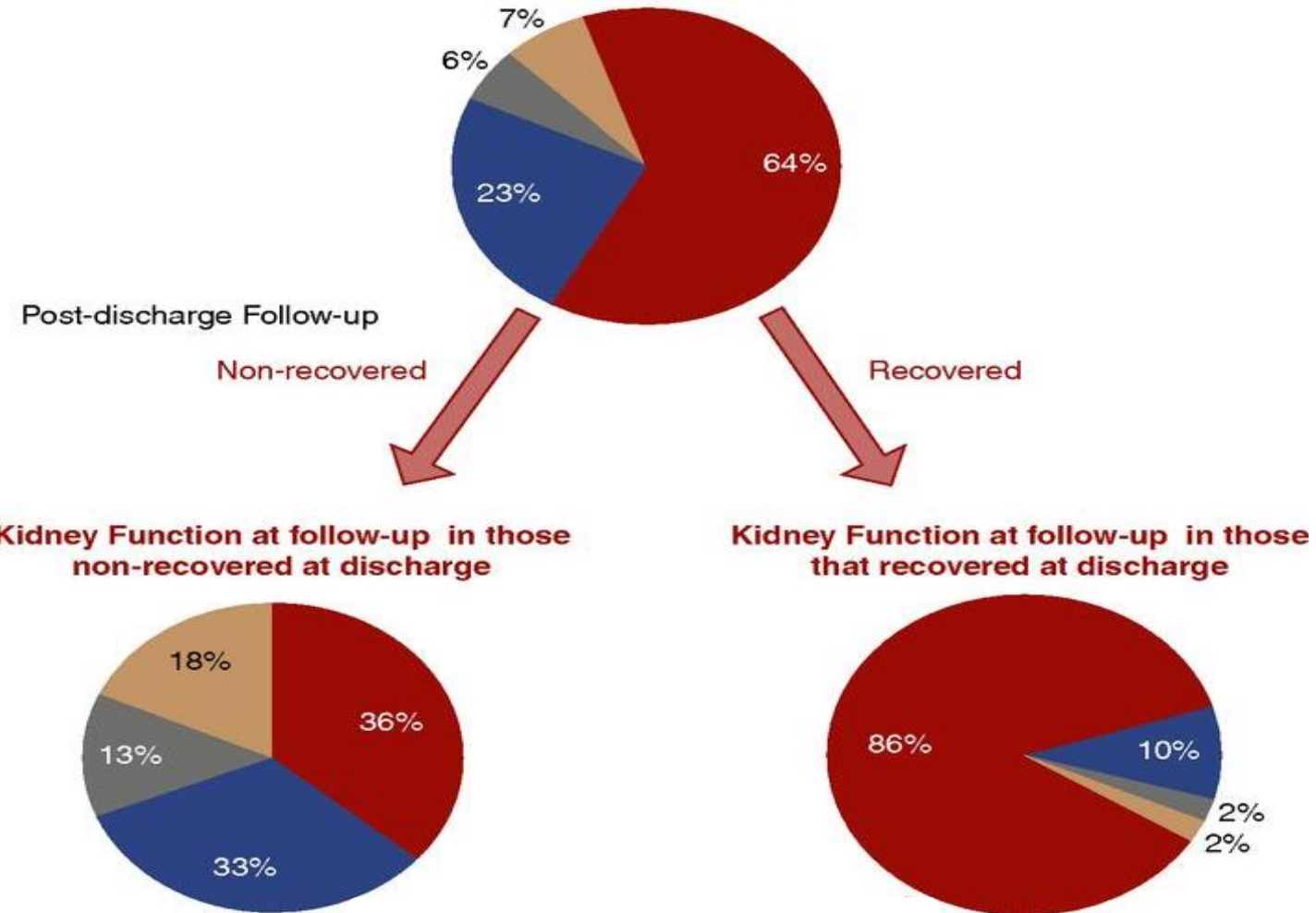
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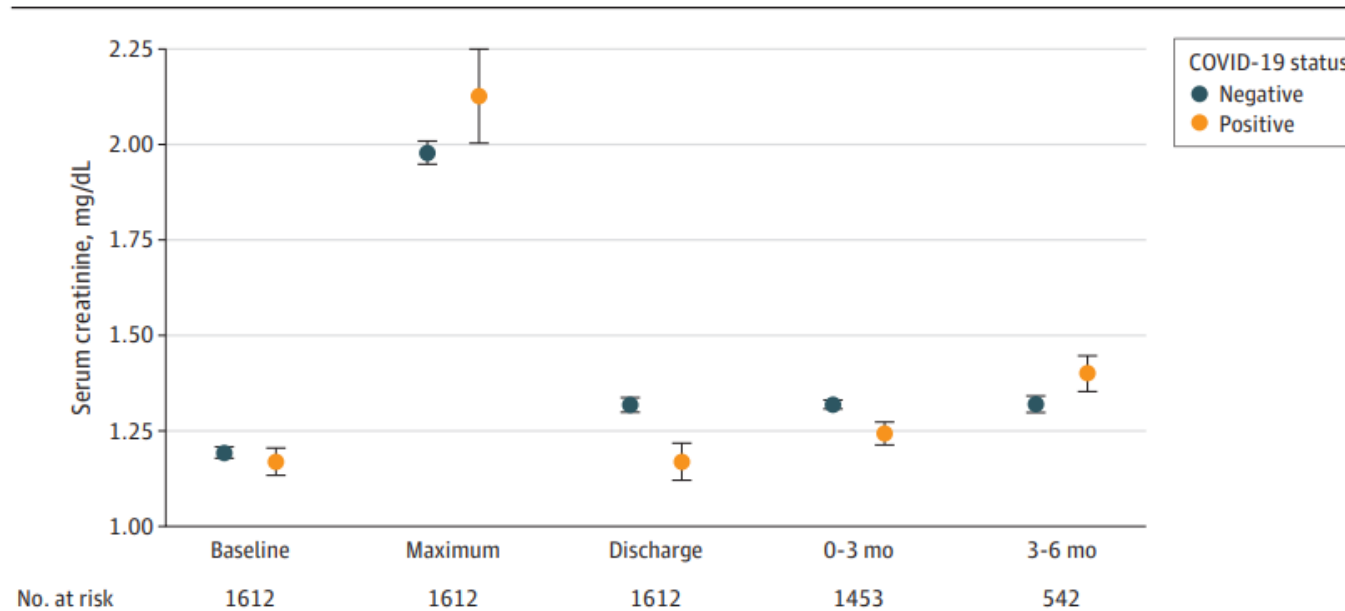


- Recovered
- AKD Stage 1
- AKD Stage 2
- AKD Stage 3

AKI Survivors stratified by recovery status at discharge (N = 212)



COVID-19 associated AKI have greater decrease in eGFR



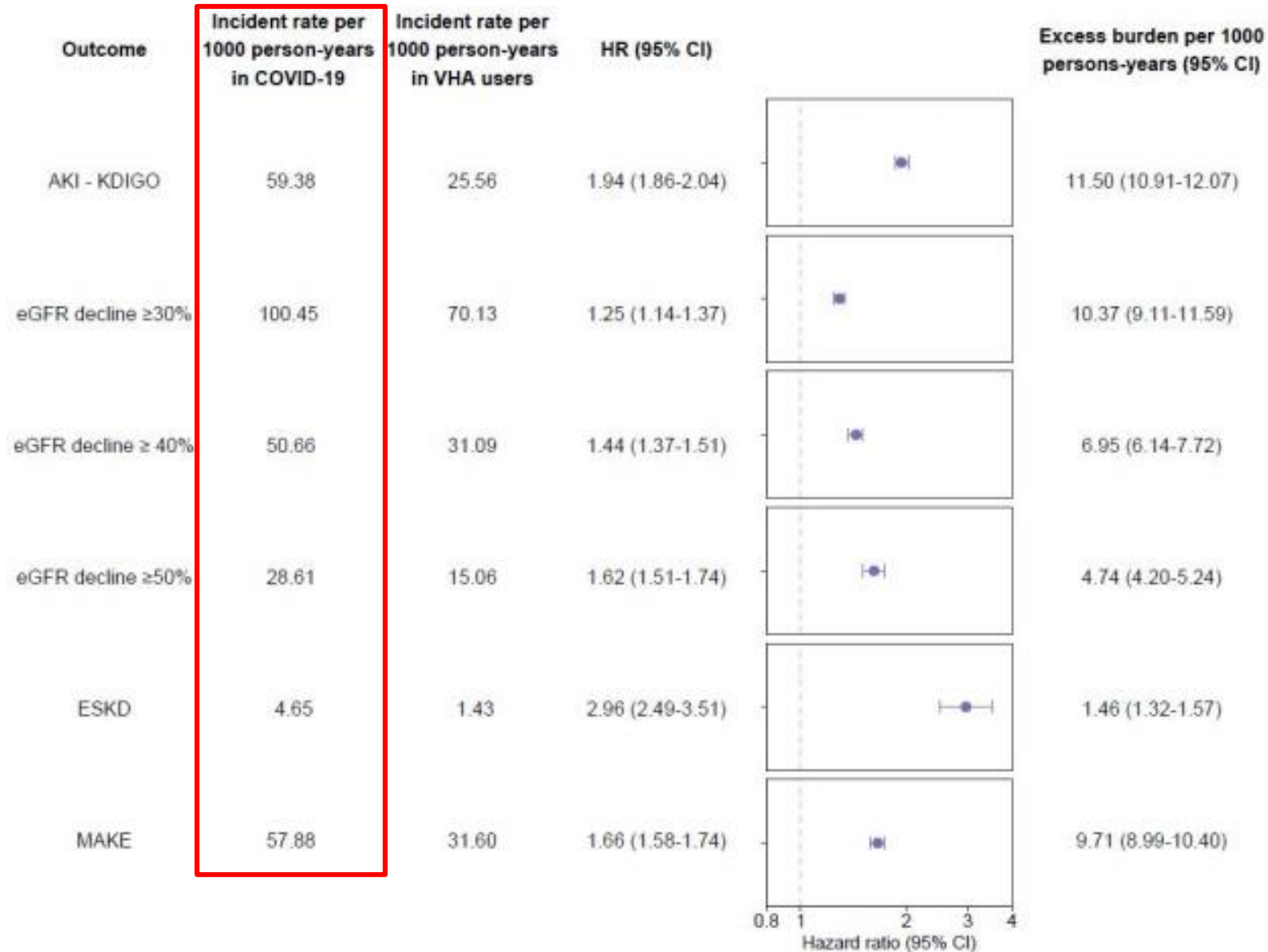
Variable	Unadjusted mean eGFR slope (95% CI)	P value	Adjusted mean eGFR slope ^a (95% CI)	P value	Adjusted mean eGFR slope ^b (95% CI)	P value
Difference in slope	-11.3 (-22.1 to -0.4)		-12.4 (-23.7 to -1.2)		-14.0 (-25.1 to -2.9)	
AKI with COVID-19	-12.1 (-22.2 to -2.0)	.04	-15.0 (-42.0 to 12.0)	.03	-16.7 (-43.4 to 10.0)	.01
AKI without COVID-19	-0.8 (-4.9 to 3.2)		-2.6 (-26.9 to 21.8)		-2.7 (-26.8 to 21.4)	

Abbreviations: AKI, acute kidney injury; COVID-19, coronavirus disease 2019; eGFR, estimated glomerular filtration rate (mL/min/1.73 m²/y).

^a Adjusted for age, sex, race, body mass index, hospital of admission, baseline eGFR, Elixhauser comorbidity score, congestive heart failure, hypertension, and diabetes.

^b Adjusted for factors above plus peak creatinine level and dialysis requirement.

Increased kidney outcomes post COVID-19



**What about our patients on
maintenance HD?**

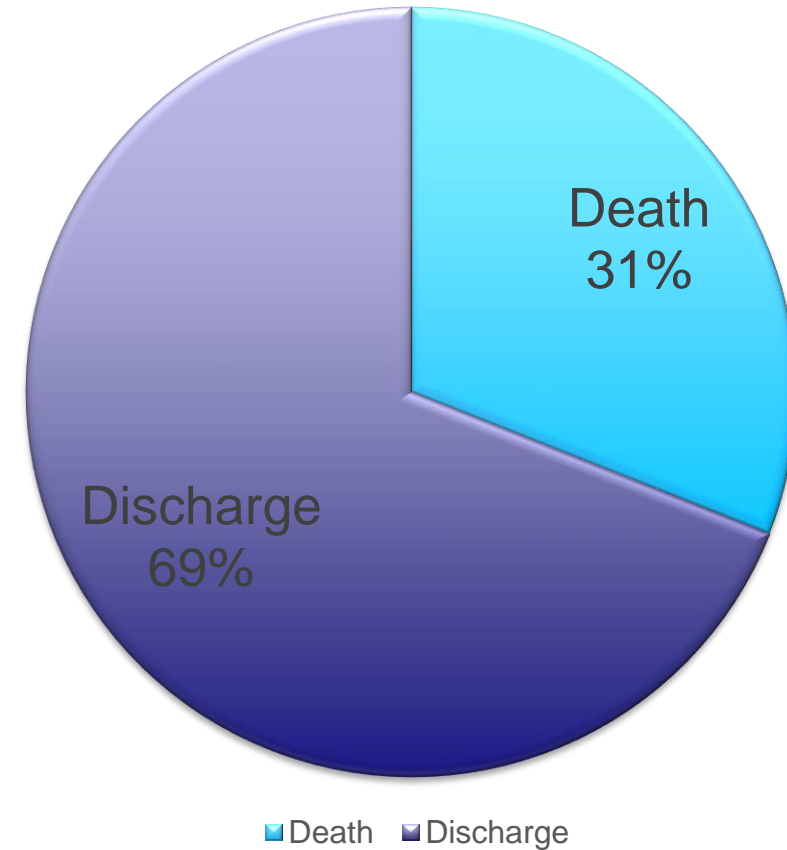
ESKD patients not able to socially distance



- Median age of HD patients is 62 years.
- Require going to a hemodialysis center 3 times a week.
- Dialysis spots not necessarily 6 feet apart.
- Get hospitalized on average 1.7 times per year.

High mortality in hospitalized US ESKD patients

Symptom	Proportion (N=59)
Fever	49%
Cough	39%
Dyspnea	36%



Outcomes of ESKD patients hospitalized with COVID-19

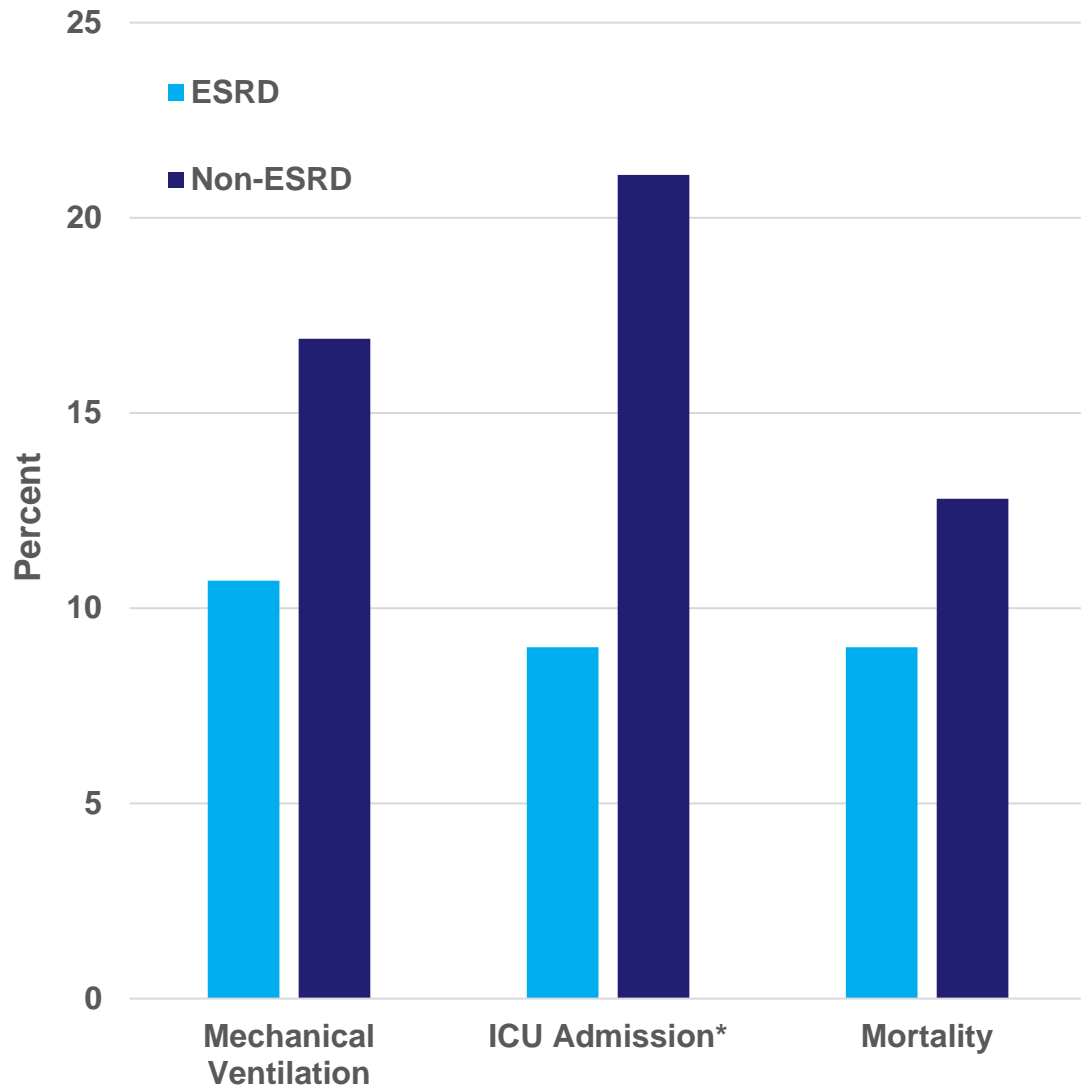
122 ESKD patients
admitted between
March 15-June 7



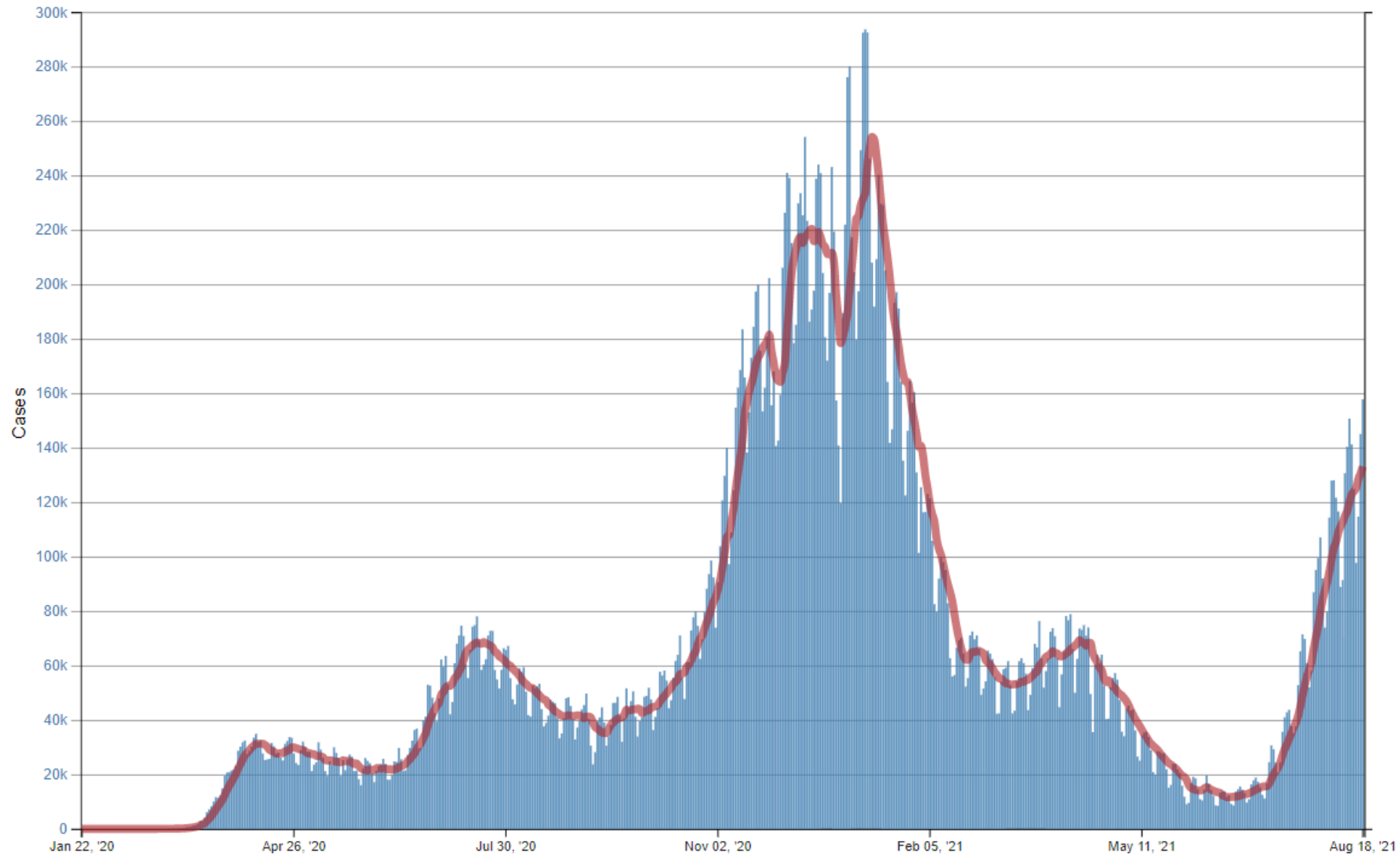
610 non-ESKD patient

- age in years
- sex
- race/ethnicity (Black, white, Asian, Hispanic, other)
- comorbidities (atrial fibrillation, coronary artery disease, cancer, congestive heart failure, diabetes, hypertension, chronic obstructive pulmonary disease, asthma, peripheral vascular disease, stroke, and liver disease)
- body mass index (kg/m²)
- admission facility
- week of hospital admission

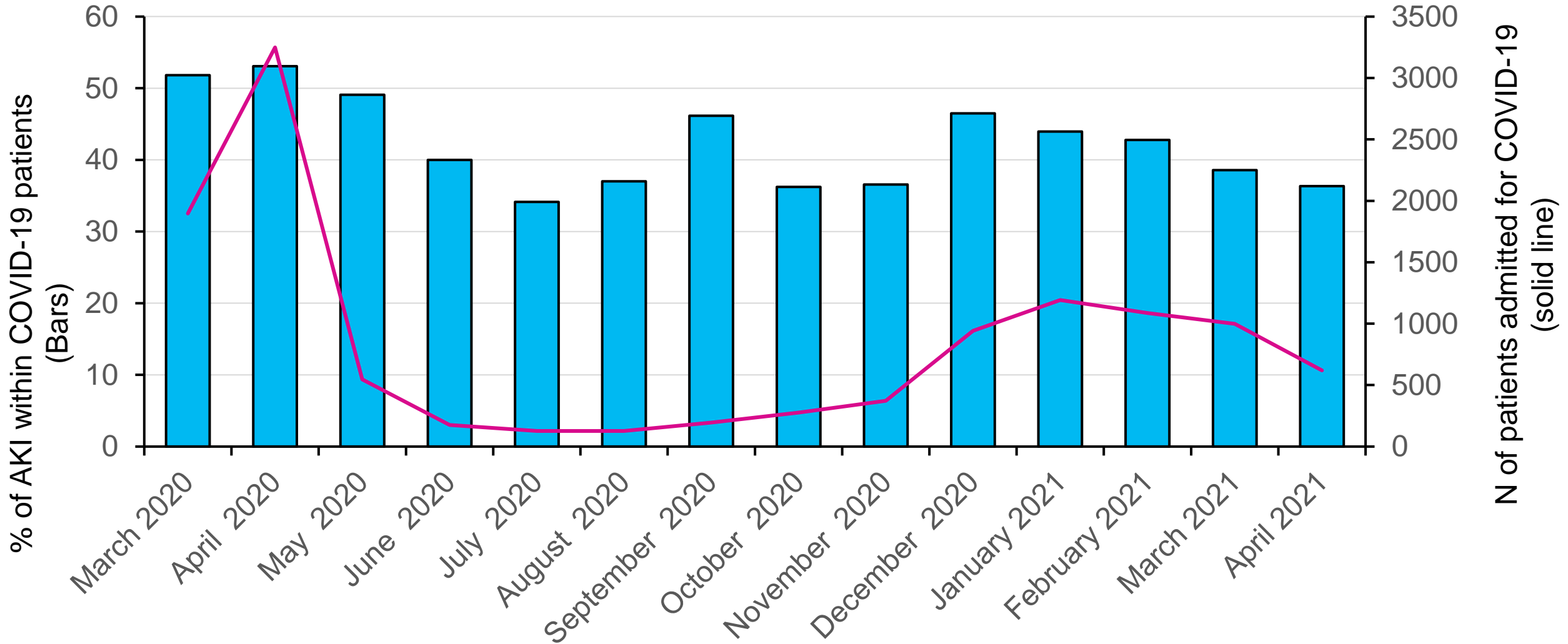
ESKD and non-ESKD had similar outcomes



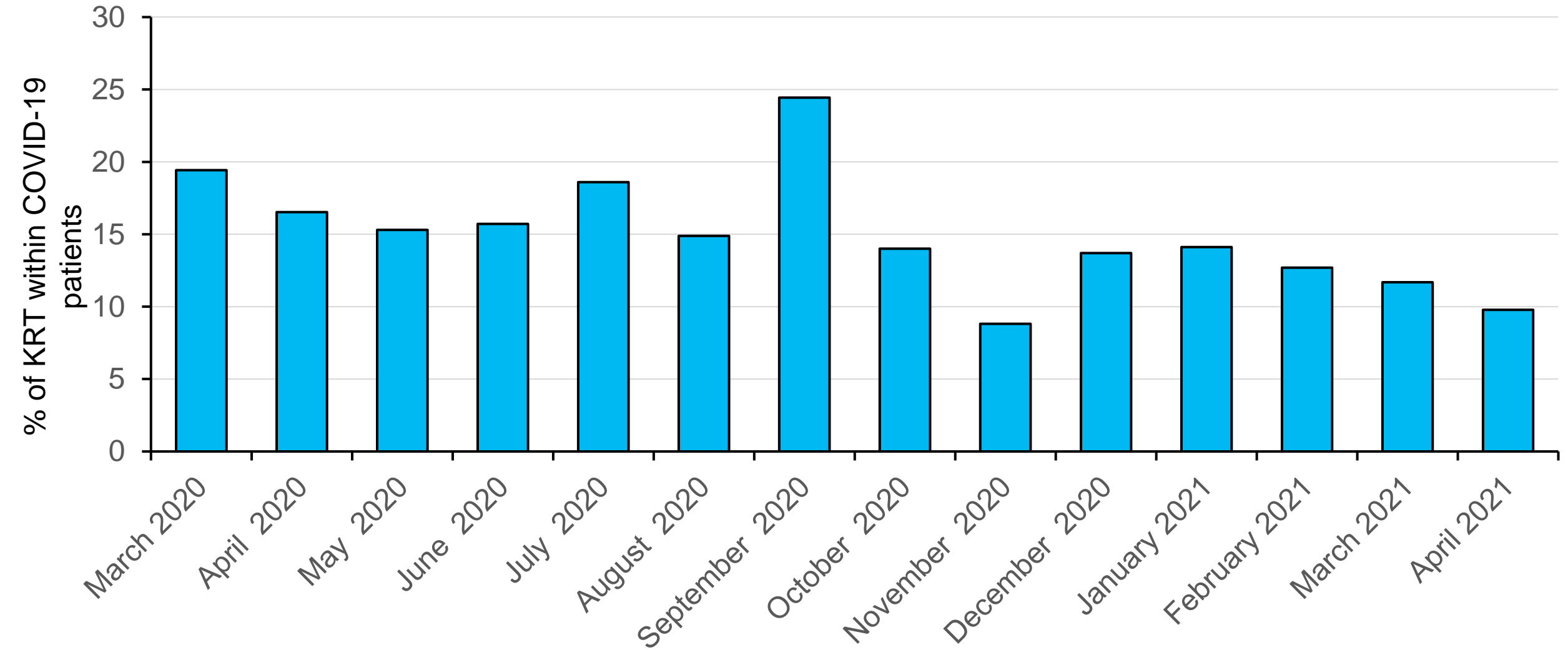
Has COVID Associated AKI Changed?



AKI Rates have Decreased Over Time



Need for Dialysis has Also Decreased Over Time



Do HD patients mount an antibody response?

Prolonged viral shedding in ESKD patients on HD with COVID-19

- 85 patients receiving maintenance HD at the James J

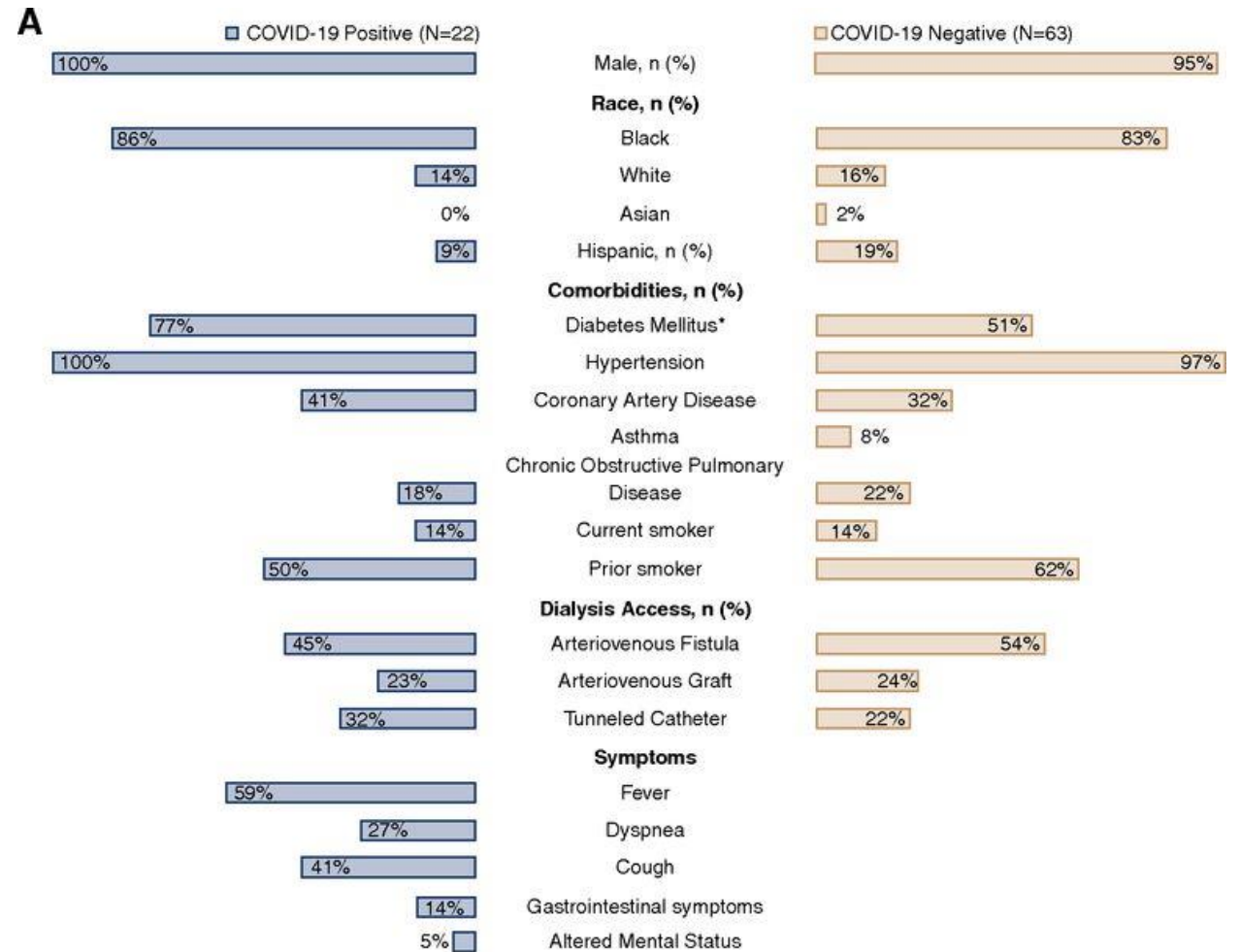
Peters VA in Bronx, NY.

- COVID PCR performed:

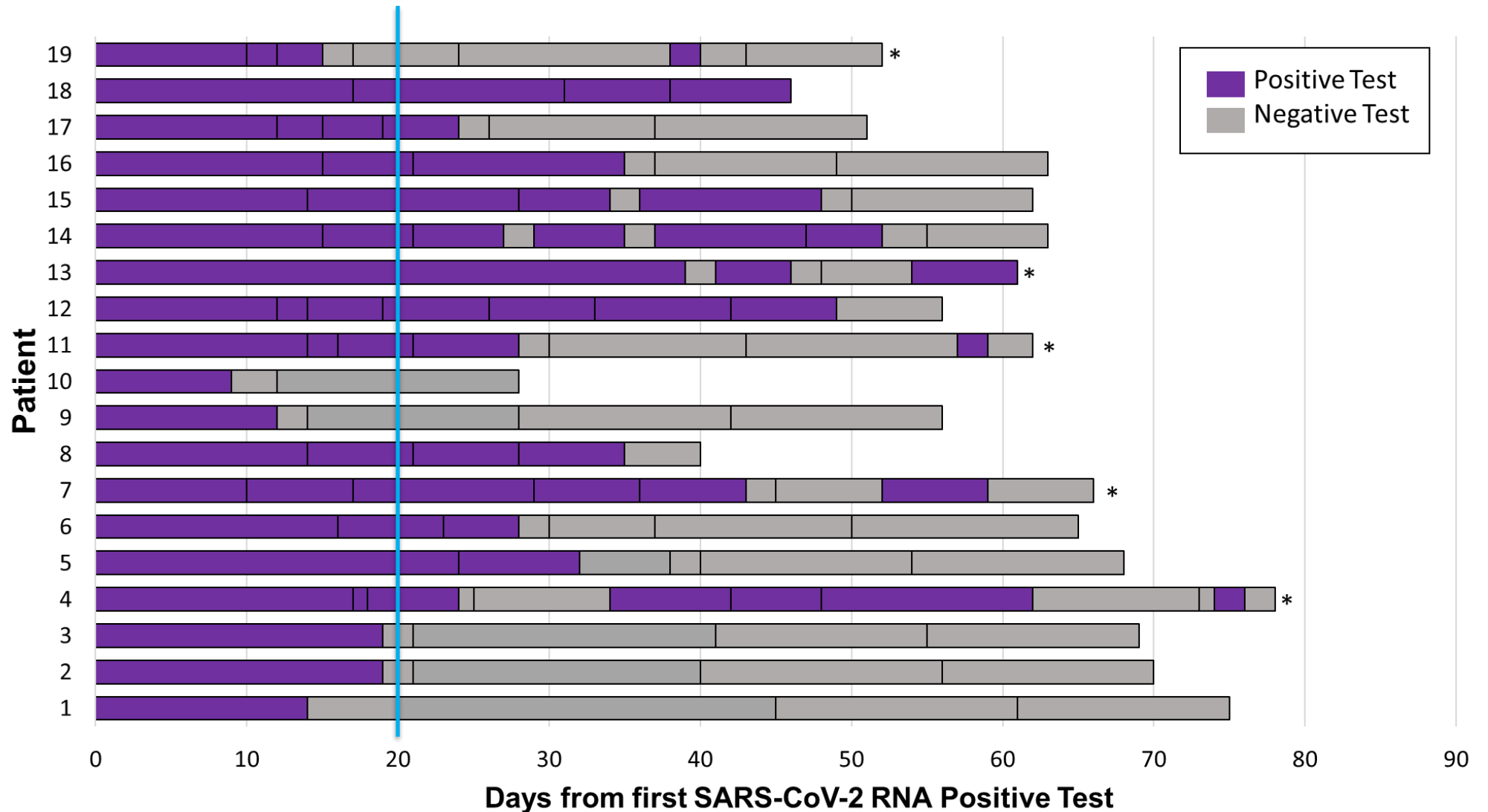
- One time for all asymptomatic patients
- All symptomatic patients
 - Repeated testing until documented clearance

- Antibody testing:

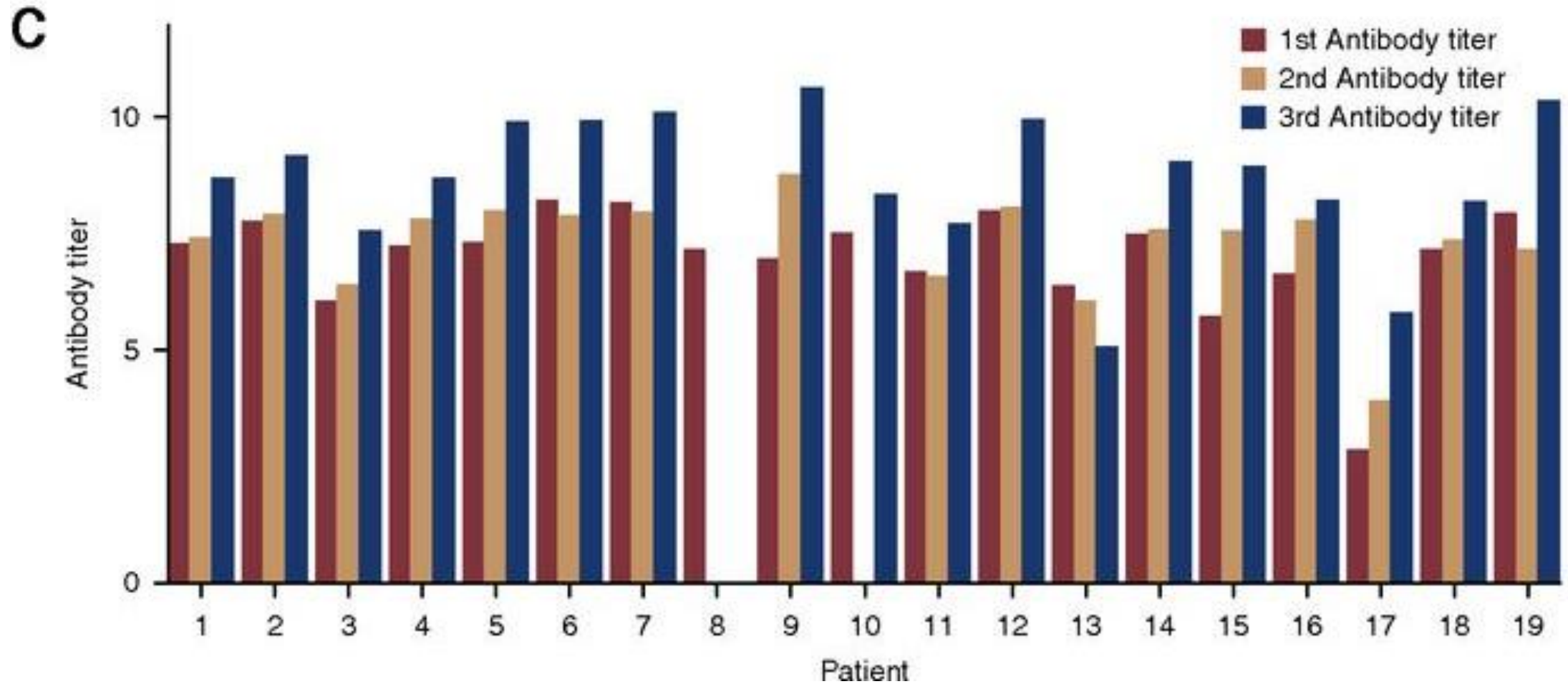
- All patients with confirmed COVID-19
- Every 2 weeks for a total of 4 weeks following initial test



Prolonged viral shedding in ESKD patients on HD with COVID-19



All HD patients developed antibodies to SARS-COV-2



Management of outpatient ESKD Patients

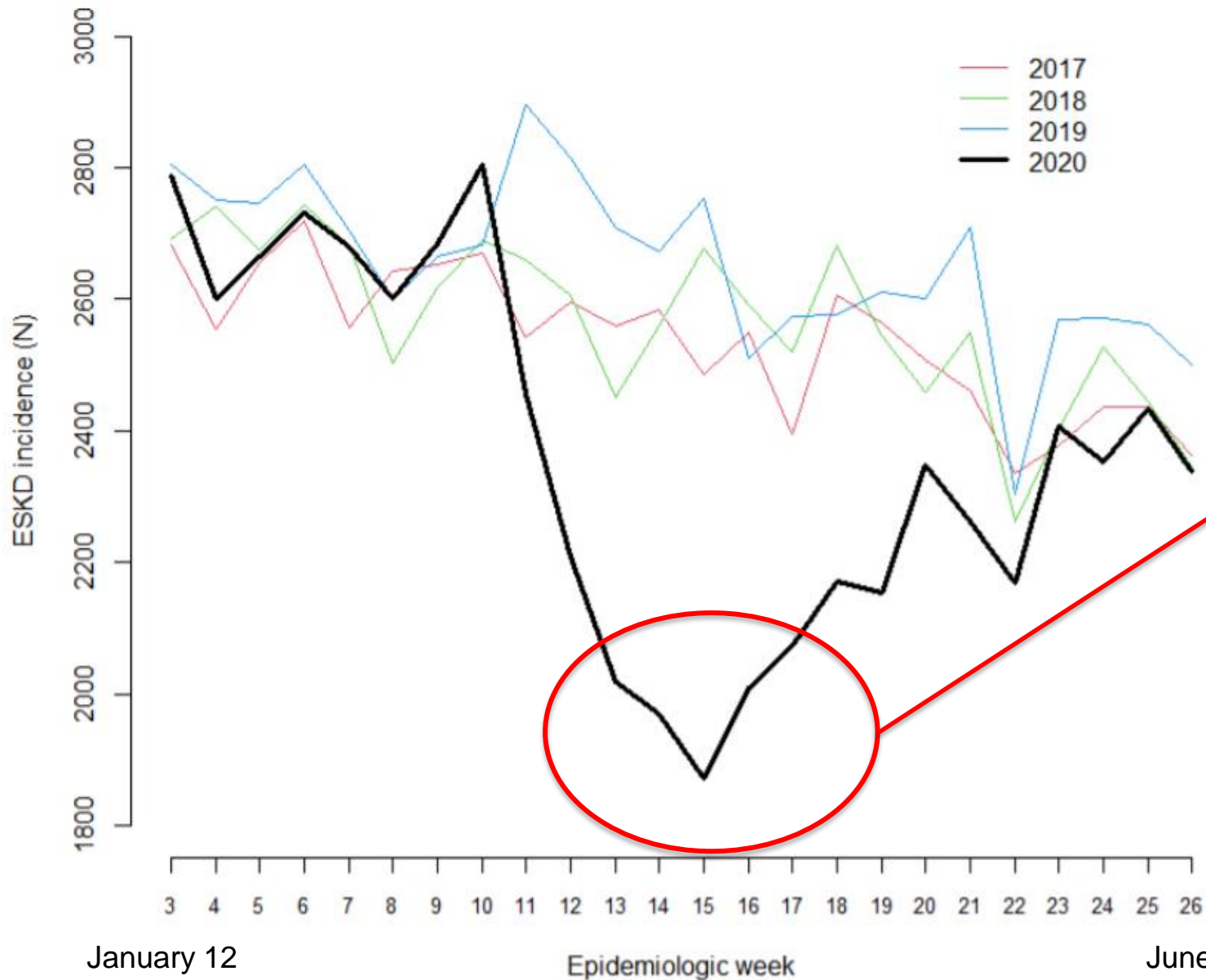
Peritoneal Dialysis

- ▶ Monthly Telehealth Visits
- ▶ Nurses sent out to draw labs from patients
- ▶ One in person visit for every 2 telehealth visits.

Hemodialysis

- ▶ Symptom and temperature screen for every patient and staff
- ▶ Testing availability depended on HD unit
- ▶ Cohorting patients into COVID shifts
- ▶ Dedicated COVID HD units

Decrease in ESKD Incidence During Peak of Pandemic



1. Patients who had advanced CKD and would have needed RRT died prior to diagnosis of ESKD
2. Delayed or deferred diagnosis of ESKD and initiation of maintenance dialysis.

ESKD patients prioritized for vaccine

Dr Tedros Adhanom Ghebreyesus
Director General
WHO Headquarters
Avenue Appia 20
1211 Geneva
Switzerland

12 February 2021

Re: Priority COVID-19 Vaccination for Dialysis Patients

Dear Director General,

I am writing to highlight the plight of the over 2.6 million¹ patients worldwide with advanced chronic kidney disease undergoing dialysis (dialysis patients) during the COVID-19 pandemic, and to call for the WHO's support in prioritizing their vaccination against the virus.

ISN

International Society of Nephrology

www.theisn.org

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American Society of Nephrology Statement Requesting Prioritization of Dialysis Patients and Frontline Dialysis Staff for COVID-19 Vaccination

December 21, 2020: The American Society of Nephrology (ASN) urgently requests that the nation's Governors and State/Tribal/Territorial Departments of Health prioritize patients receiving dialysis as well as the staff working in dialysis environments to provide this life-saving therapy and place them in Tier 1a for receiving vaccination for Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), the virus that causes Coronavirus Disease 2019 (COVID-19).

Statement on Kidney Patient Prioritization for COVID-19 Vaccines and Therapeutics

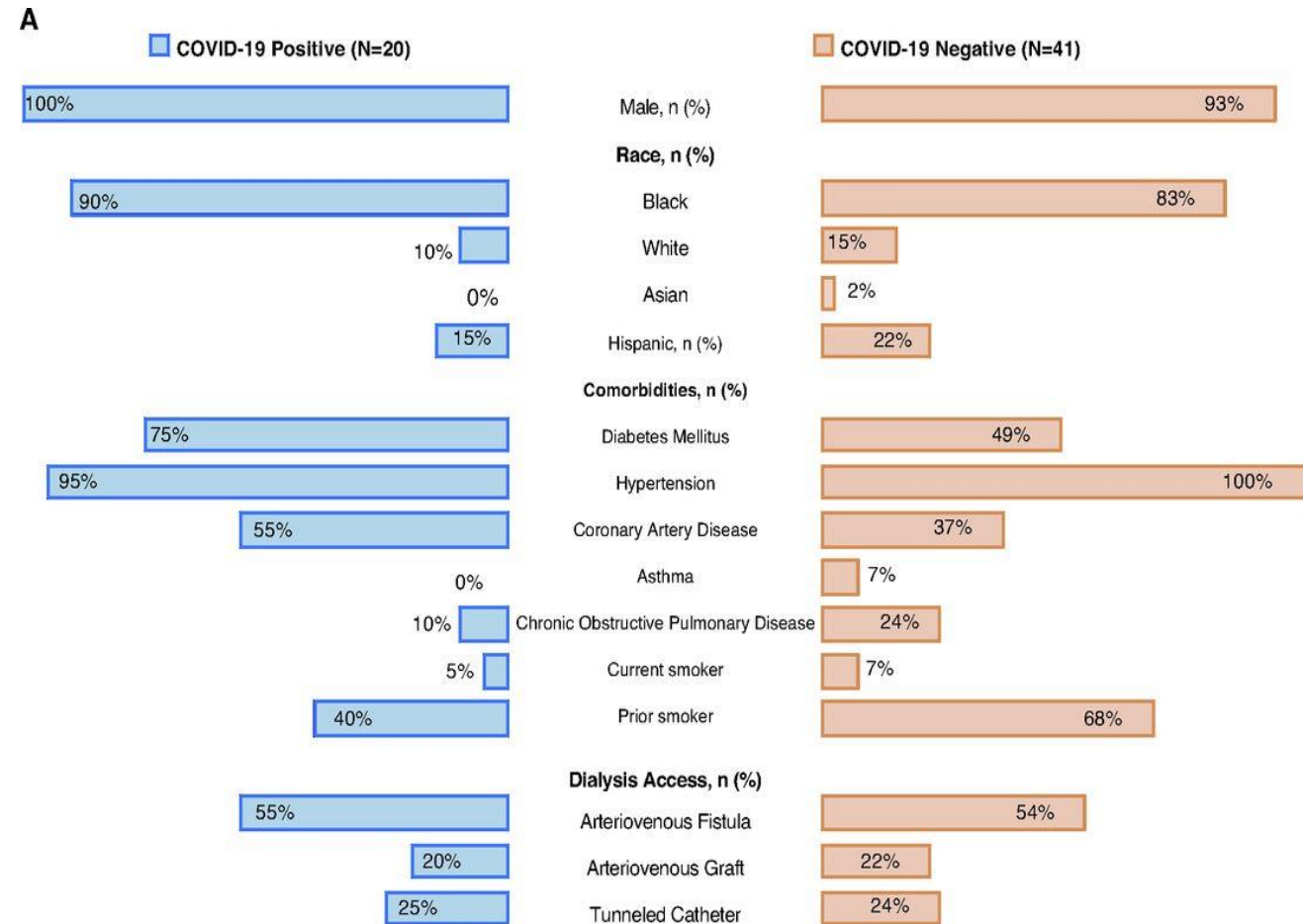


December 17, 2020 All content for attribution to National Kidney Foundation

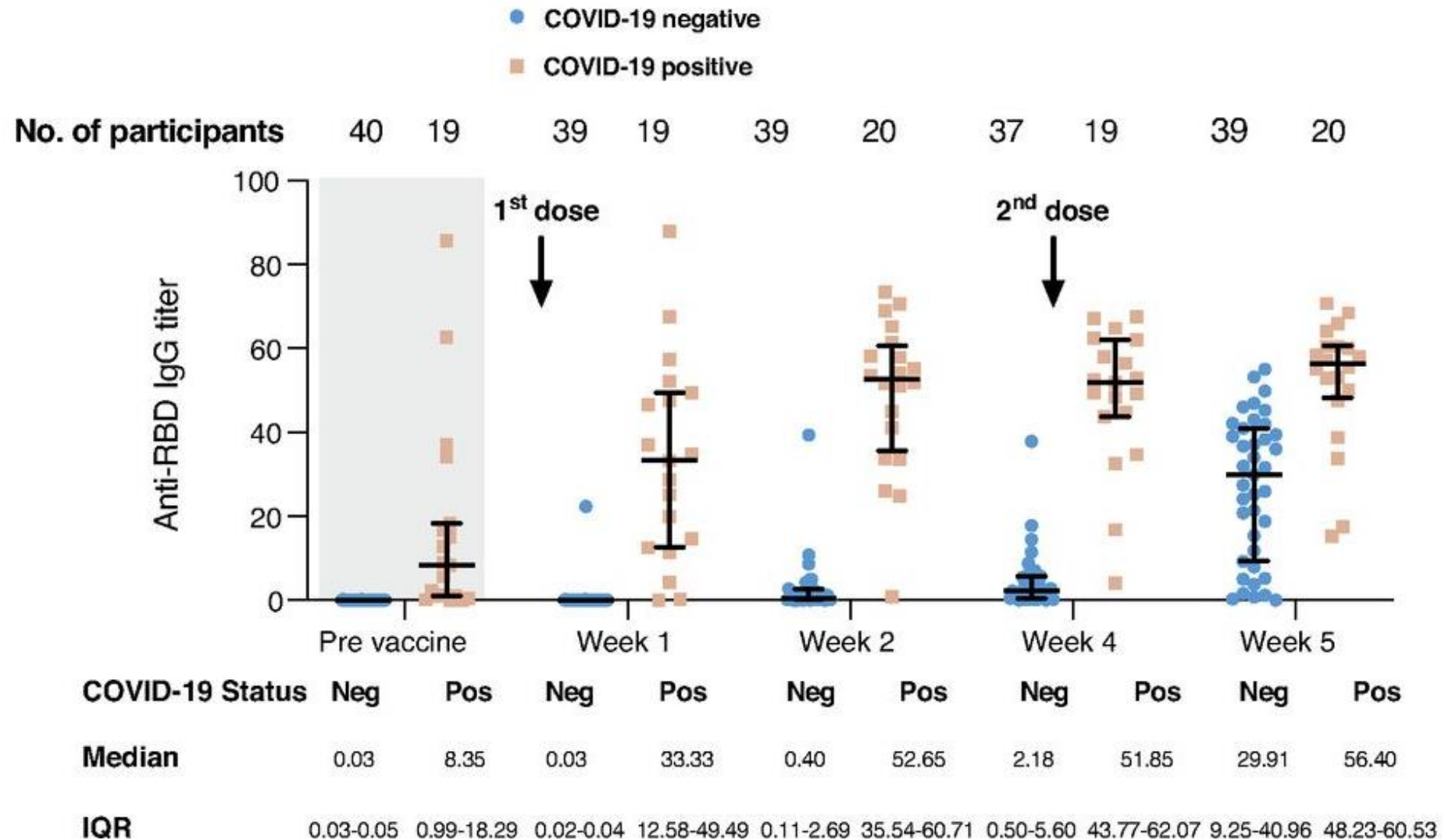
The National Kidney Foundation (NKF), representing the more than 37 million adults in the U.S. with kidney disease, their families, and the professionals who care for them, believes that a key principle of ethical vaccine allocation must be that the vaccine is made available to patients at the *highest risk* of severe outcomes from COVID-19 infection.

Antibody response to mRNA vaccine in ESKD patients on HD

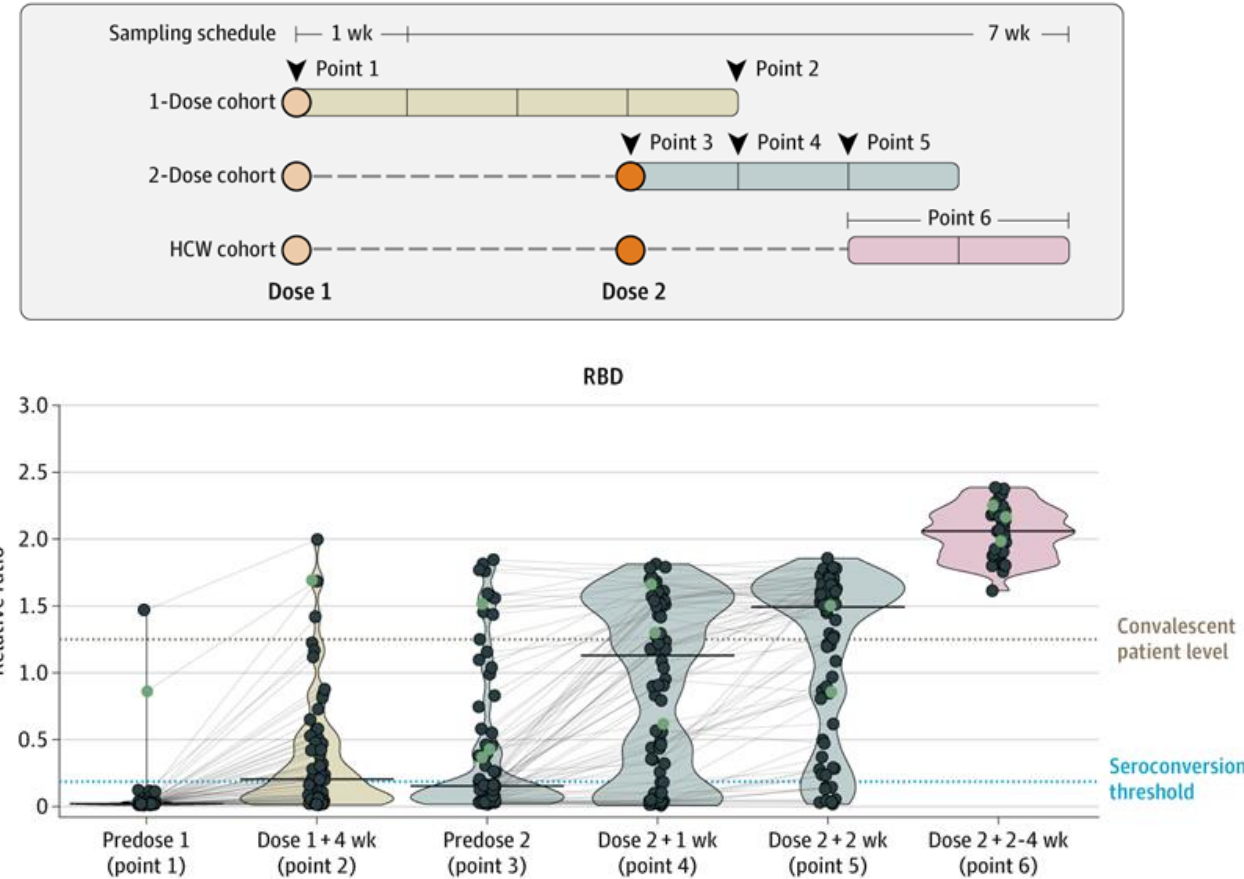
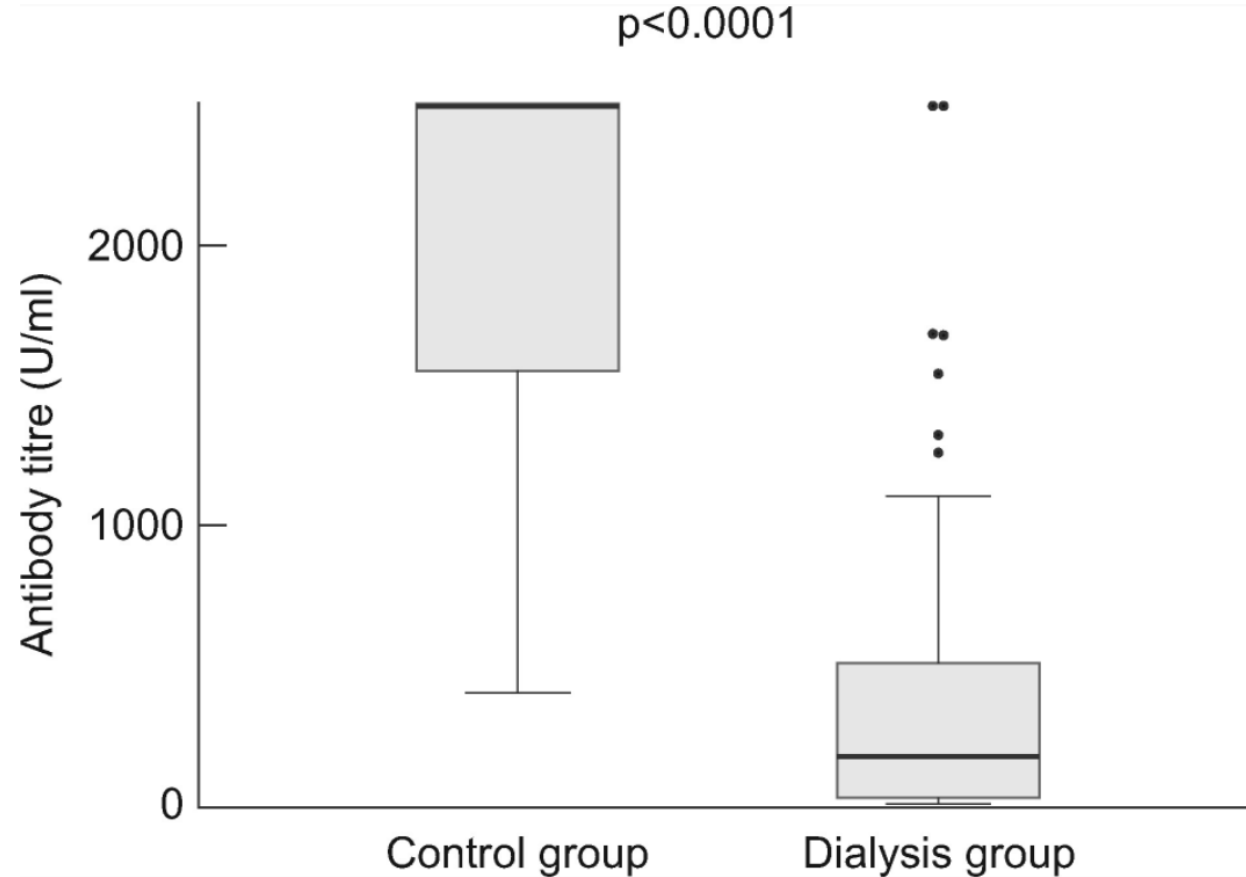
- 61 maintenance HD patients received two doses of mRNA vaccine at the James J Peters VA in Bronx, NY.
- Antibody testing:
 - 4 weeks pre-Vaccine
 - 1, 2, 4, and 5 weeks after the first vaccine dose



95% of Patients mounted antibody response



HD patients have lower antibody titers than control patients



Conclusion

- ▶ The COVID-19 pandemic strained nephrology resources leading to changes in clinical practice
- ▶ AKI associated COVID-19 is associated with adverse in-hospital outcomes and increased kidney outcomes
- ▶ ESKD patient are particularly vulnerable to COVID-19
- ▶ Most patients on ESKD do seroconvert after vaccination, however antibody response to lower than healthy controls

Thank you

▶ Mentors:

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