

Outcomes in patients with ESRD and Covid-19

Maria Coco, MD, MS
Montefiore Medical Center
Albert Einstein College of Medicine
Bronx, New York
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ESRD and Covid-19

- Patients with ESRD are more vulnerable to Covid-19 than general population.
- Mortality: 9-16% in non-ESRD patients
- Mortality: 2-32% in ESRD patients
- 11-26% infection rate in patients with ESRD, with a mortality of 24-26% world-wide

Factors predisposing to infection

- Crowded urban areas with high case rate
- Epicenters: Nursing Homes
- Early Surge: 42% of fatalities were from nursing homes, even though they represent only 0.6% of US population.
- Dialysis Centers: population density, lack of social distancing, public transportation

Characteristics common to all ESRD patients with Covid-19 across the continents

- Advanced age
- Male gender
- Race: black and Hispanic race
- High comorbidity burden
- Group Residencies: Nursing Home, urban centers
- Incenter Dialysis units
- Dialysis Vintage

Around the world

- China in late 2019: older, high comorbidities, worse prognosis if on life support in ICU
- Italy early 2020: 27-52% mortality in hospitalized ESRD patients (*Alberici, Grasselli*)
- France early 2020: 24-27% mortality (*Tortonese, Keller*)
- Spain: 25-31% mortality (*Goicoechea, Sanchez-Alvarez*)
- UK: 20% mortality (*Corbett*)

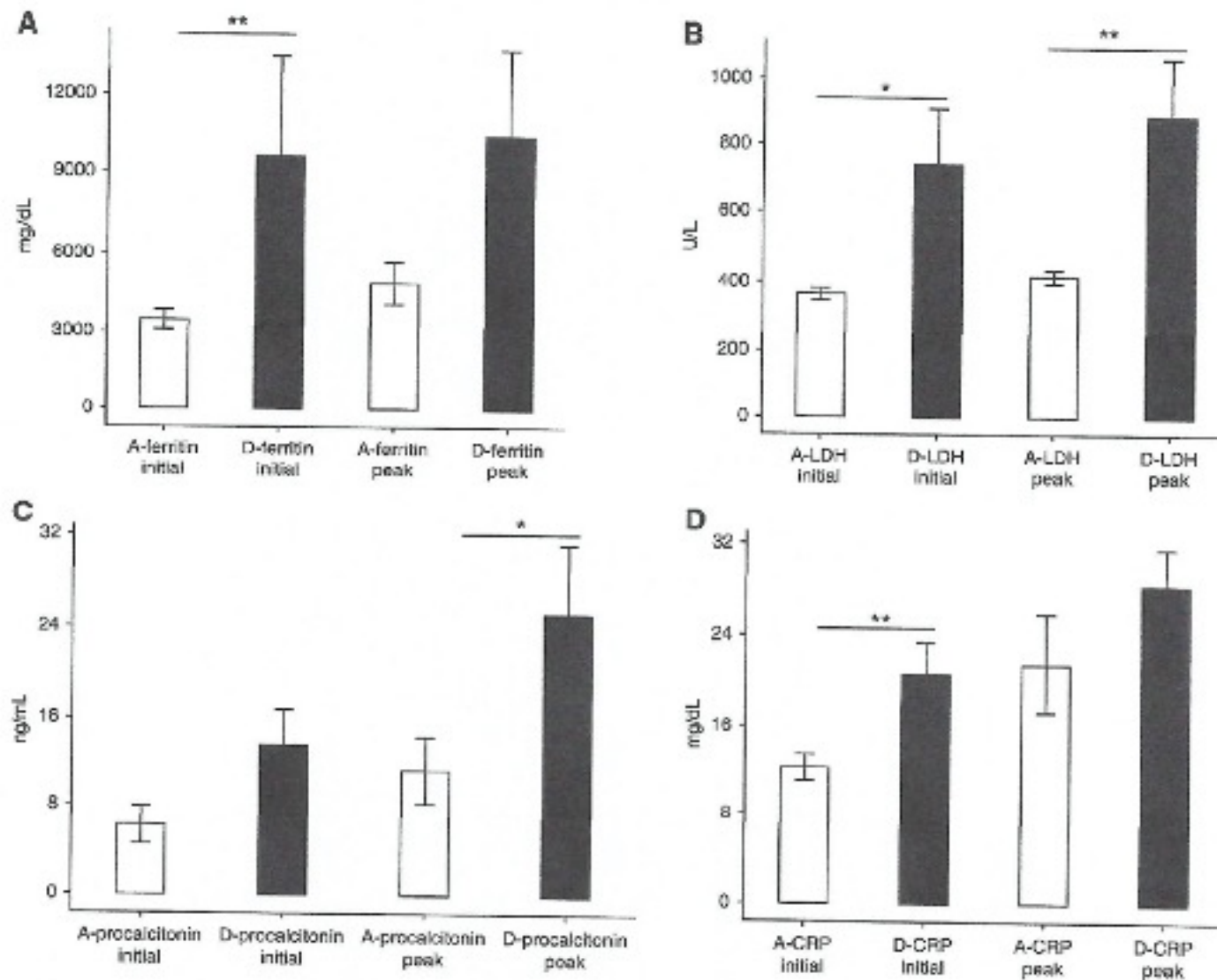
United States

- Bronx, NY: 28% mortality *(Fisher)*
- New York, NY: 31% mortality *(Valeri)*
- New York City Area: 32% mortality *(Ng)*
- California (Kaiser Permanente): 18.2% *(Sims)*

Clinical parameters common to all ESRD patients hospitalized with Covid-19 during Spring 2020 Surge

- Presenting Symptoms: dyspnea, fever, GI, and Altered Mental Status
- robust immune response: elevated baseline and peak inflammatory markers.
- Peak levels of LDH, CRP, ferritin, D-Dimer are associated with increased mortality (*Fisher et al; Valeri et al; Keller et al; Alberici et al; Tortonese et al; etc.*)
- ICU care for respiratory failure with mechanical ventilation—dire prognosis and mortality rates greater than 80%
- Treatment was largely supportive early in the pandemic with hemodialysis, antibiotics, anticoagulation as per hospital protocols.

Inflammatory Parameters Alive vs Dead (fisher et al, 2020)



Long-term Outcomes in Survivors

What happens to patients with ESRD who survive Covid-19?

Little information is available

Long term outcomes of ESRD patients who survived Covid-19

- Montefiore admissions from March 8th to June 30th
- Clinical course reviewed for at least 6 months
- Clinical characteristics, treatment, laboratory parameters, morbidity and mortality, readmissions are detailed.
- Antibody formation to SARS-CoV-2 nucleocapsid Antigen was noted.

How we managed the Surge in 2020

- Hundreds of patients during the Spring Surge
- Dialysis units were overwhelmed
- Initially patients were treated at bedside b/o contagiousness
- Subsequently treated in dialysis unit on biweekly basis, +/- emergency treatments
- Potassium binders were used liberally
- Diuretics were used in patients who still made urine
- Peritoneal dialysis was used in some AKI patients

Baseline Clinical Characteristics

- 181 patients admitted
- 35% Nursing Home Residents
- 61% males
- Mostly Black and Hispanic race
- High comorbidity burden

N=181	
Dwelling (n, %)	
community	118 (65)
Nursing Home	63 (35)
Age (yrs, median IQR)	65(56,74)
Gender (n, %)	
males	111 (61)
females	70 (39)
Ethnicity (n,%)	
Black	89 (49)
Hispanic	68 (38)
White	14 (8)
Asian	10 (6)
Dialysis Vintage (yr, median IQR)	3.2 (1.3-5.6)
Males	3.3 (1.5-5.9)
Females	3.1 (0.95-5.1)
Access (n,%)	
AVF	132 (73)
AVG	18 (10)
TDC	31 (17)
Comorbidities (n,%)	
Smoking	84 (47)
COPD/Asthma	68 (38)
Diabetes Mellitus	123 (68)
Hypertension	176 (97)
Cardiovascular disease	87 (48)
Stroke	48 (27)
Malignancy	30 (17)
HCV	26 (14)
HBV	4 (2)
HIV	9 (5)
Renal Transplant history	12 (7)

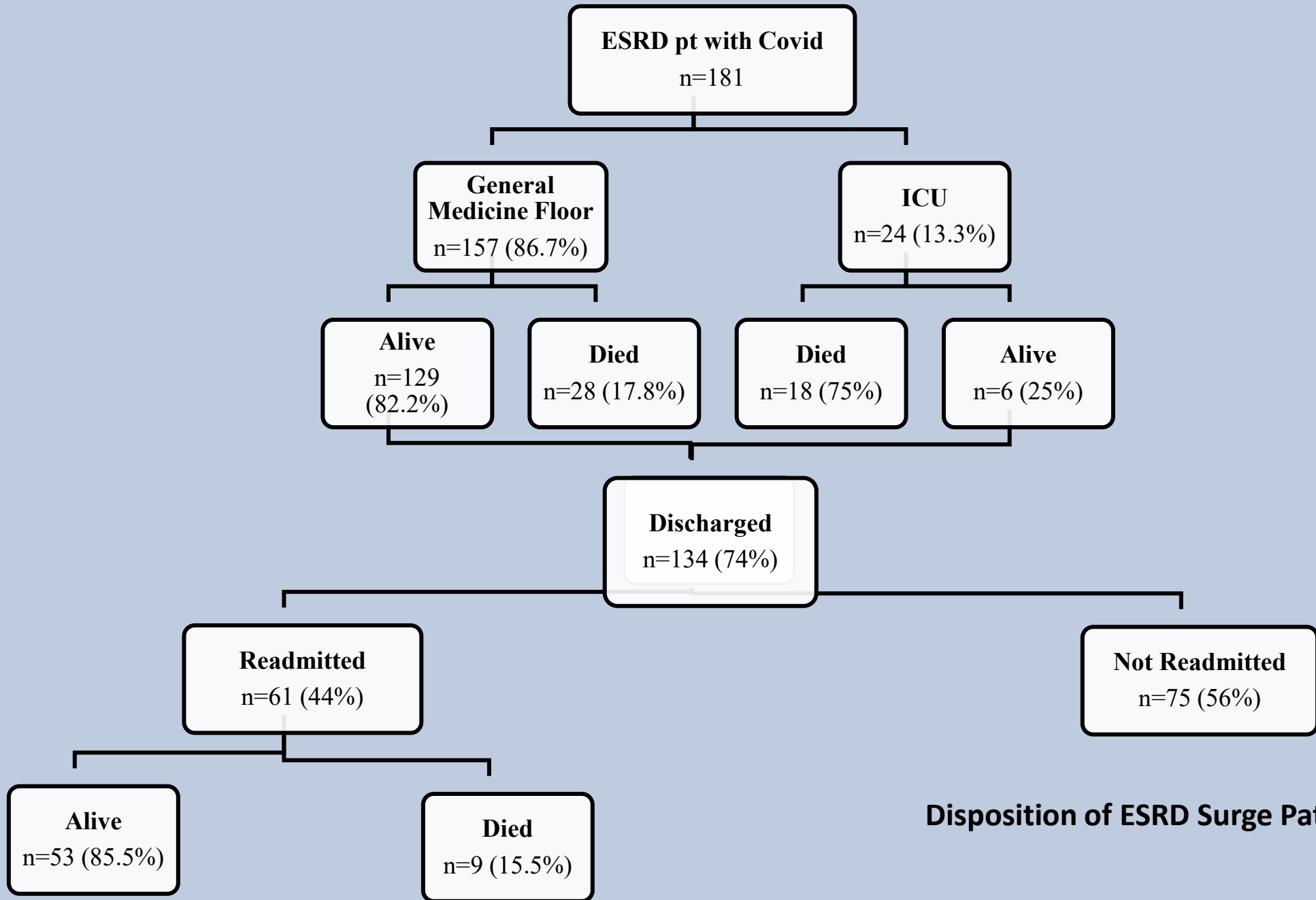
Admission Characteristics

- Presenting symptoms

Dyspnea/cough	49
Fever	2
GI (diarrhea, bleeding, dysgeusia)	7
Altered Mental Status	7
Other (weakness, missed dialysis, Cardiac arrest, seizures)	12

- RR was significantly higher in deceased vs survivors

N Median IQR	Total (181)	Dead (46)	Alive (135)	Male (111)	Female (70)
SBP	142 (118-161)	145(113-167)	139.5 (120,160)	142 (119-159)	142 (117-167)
DBP	71 (61-86)	72 (60-84)	71 (61-86)	72(63-84)	71 (60-87)
MAP	94.3 (82-110)	93 (83-113)	95(82-108)	95 (82-107)	93.2 (82-112)
Temp (F)	99.1 (98-101)	99.5 (98-101)	99 (98-101)	99.2 (98-101)	98.9 (98-101)
RR*	20 (18-22)	20(18-24)	19 (18-22)	20(18-22)	19 (18-22)
HR	88 (75-102)	93(79-106)	88 (75-98)	87 (76-100)	92 (75-103)
O2sat %	95.5 (91-98)	92(89-98)	96 (92-98)	95 (91-98)	96 (91-98)
Weight kg	73.3 (60-86)	73.6(59-81)	72.9 (61-88)	75.8 (64-89)	65.8 55-78
BMI	26.4 (22-30)	26.7(23-30)	26.3(22-30)	26.3 (22-30)	27.5 (23-30)



Disposition of ESRD Surge Patients

Admission Inflammatory Markers

Patients who died:

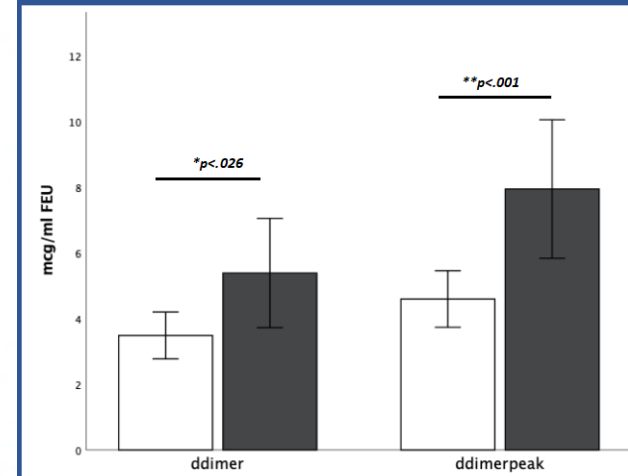
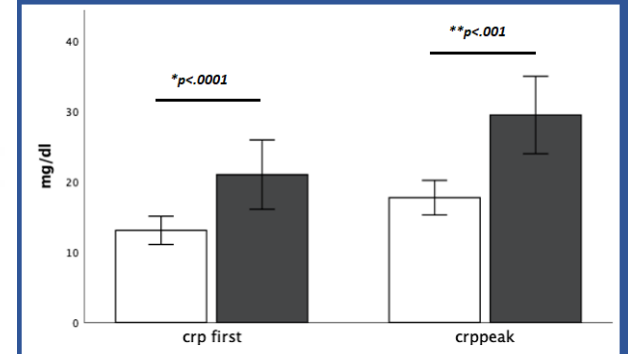
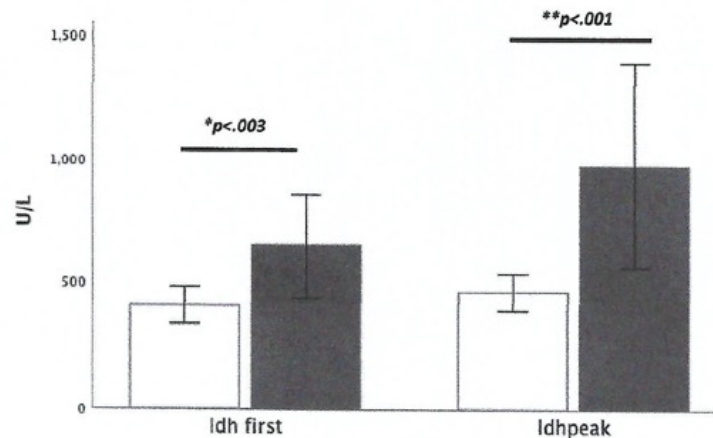
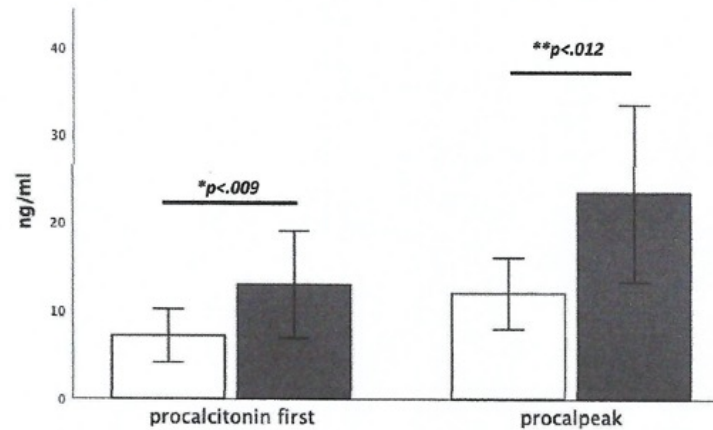
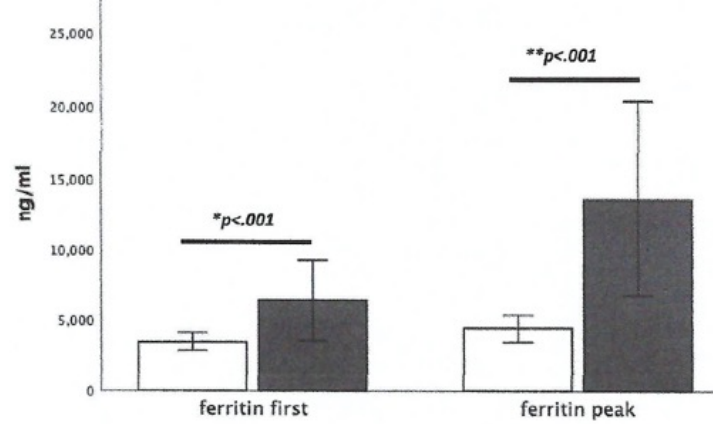
-elevated markers

-lymphopenic

Median IQR	ALL	Alive	Dead	P value (dead vs alive)
WBC	6.3 (4.3-8.5)	6.0 (4.2-8.1)	7.3 (5.5-10.5)	0.001
Lymph (%)	13.5 (8-21)	14 (10-22)	9.5 (6.6-14.3)	0.0001
Procalcitonin	3.0 (1.1-8.4)	2.0 (0.9-6.2)	7 (1.6-21.2)	0.009
LDH	353 (270-517)	331 (257-464)	488(351-716)	0.003
CRP	11.8 (4.9-21.5)	9 (3.8-19)	15.7(10-21)	0.0001
IL6	64.5 (30-160)	56 (24-101)	160 (52-284)	0.087
D-dimer	2.5 (1.4-4.6)	2.3 (1.4-3.9)	3.6 (1.9-6.5)	0.026
Ferritin	2984 (1665-4619)	2880 (1403-4082)	3965 (2800-7577)	0.001

Inflammatory markers

- Increased peak inflammatory markers were associated with increased mortality
- Survivors had a higher WBC and lymphocyte count than those who died
- Consistent with other studies

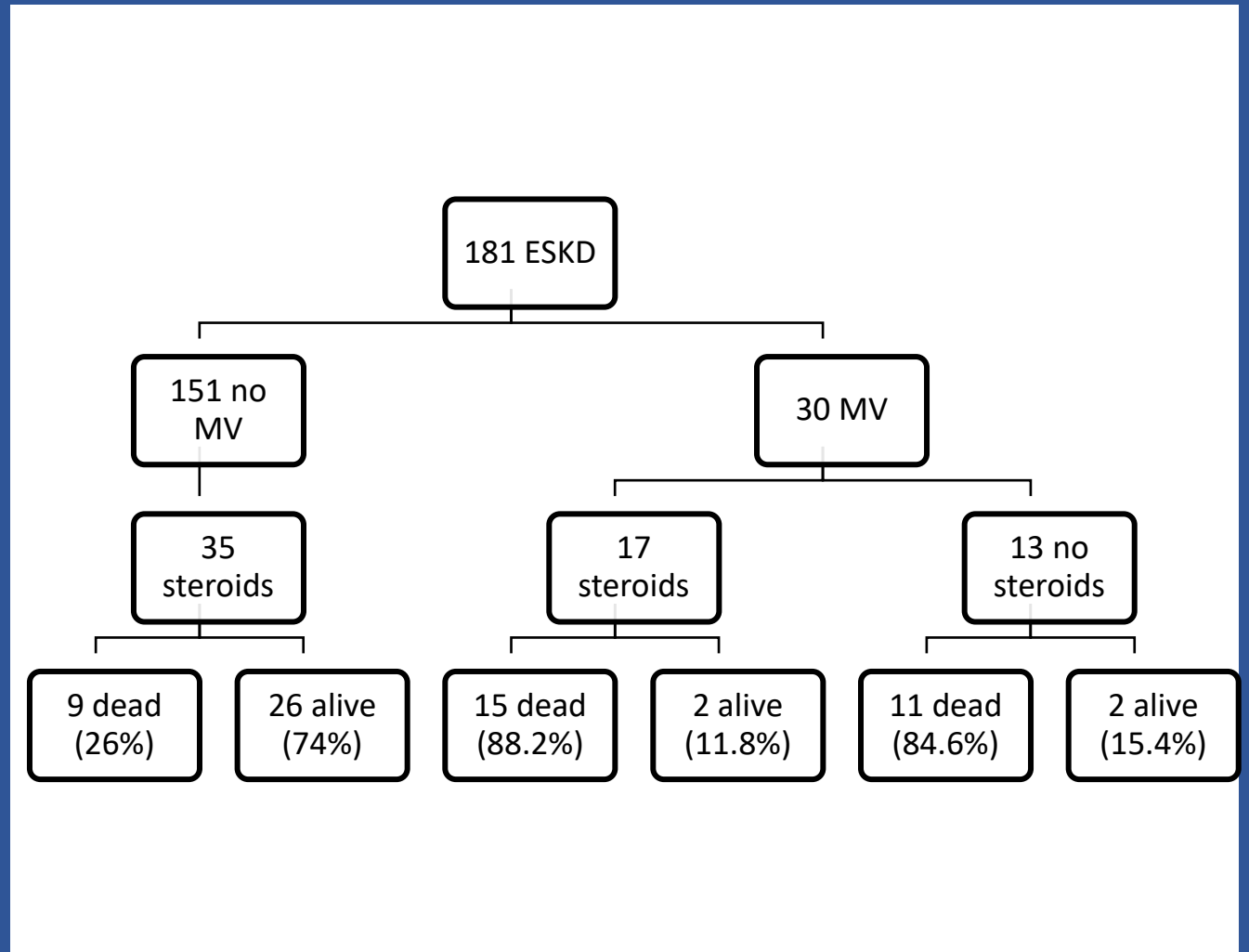


Treatment of Covid infection 2020

- **Mostly supportive: respiratory and cardiovascular status**
- **Prophylactic Anticoagulation according to guidelines at the time**
- **Antibiotics were used empirically or directed in 73% of patients**
13% of 150 blood cultures drawn were positive
- **Hydroxychloroquine was given to 70% of the cohort per guidelines**
- **2 patients received convalescent serum, one tocilizumab**
- **Remdesivir was not offered to ESRD patients at the time**

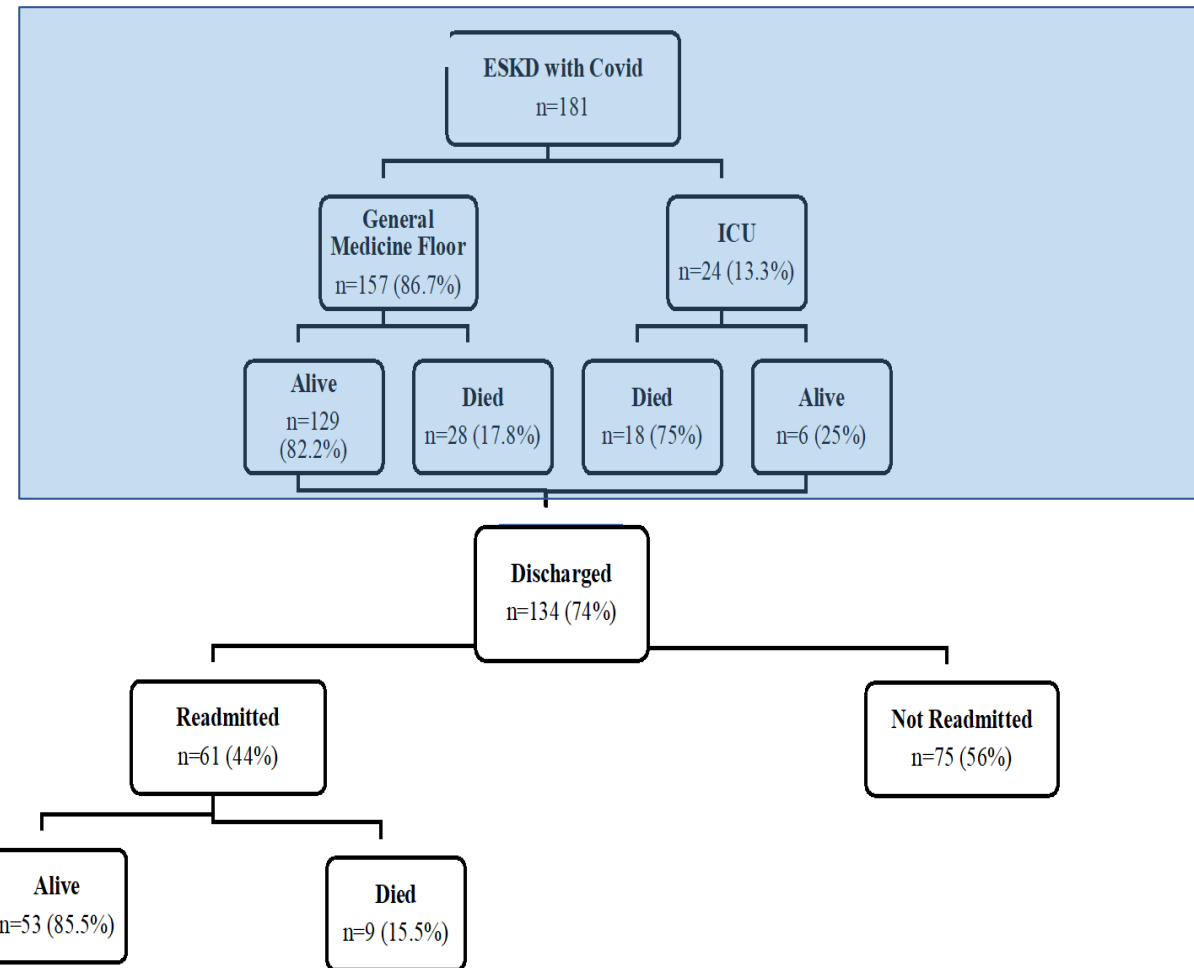
Steroid Use

- Used in severe hypoxia
- 52 patients: steroids did not seem to be effective in patients on mechanical ventilation (MV)
- 88% of patients on MV who received steroids died
- 74% of patients not on MV but received steroids survived
- steroids may have helped patients with less severe respiratory disease
- Observations differ from Recovery group trial which showed benefit for all patients with initial CRP>20



Follow-up

- 134 patients were discharge (74%)
- 61 readmitted (44%)
 - 15.5% expired
- Total 6 month mortality was 30.4%



Sars-CoV-2 nucleocapsid IgG antibody

- 29 patients had assays performed during a clinic encounter.
- 28 patients tested positive for the antibody, the earliest 6 weeks after infection, and the others were positive as long as 6 months from infection.

Conclusions

- Coronavirus-19 (Covid-19) disease took a tremendous toll on patients with ESKD, with very high short-term and long term mortality, as compared with the general population.
- Nursing Home Residents were very vulnerable, with elevated mortality
- Treatment was largely supportive at the time
- Steroids were effective in patients not requiring advanced life support.
- Mitigation factors have been decreasing the virus exposure via masking, social distancing, aggressive handwashing

Conclusions, etc

- New treatments are now being used in this vulnerable population including Remdesivir, monoclonal antibodies available in outpatient dialysis clinics.
- The fact that patients are able to make antibodies against the SARS-CoV-2 nucleocapsid bodes well for covid vaccine efficacy.
- ESRD patients are being vaccinated at their dialysis clinics as well as federal and state-run centers and community pharmacies
- Further studies should include effectiveness of 2021 interventions.