Management of patients with COVID-19 and renal impairment

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Unresolved problems in RRT (EcTr) before COVID-19

- Is it possible to improve survival of dialysis dependent patients using technical invention by increasing of removal specific molecules?
  - In CKD…
  - In AKI…
  - In AKI on CKD…… we still believe, but?

- Diagnostic challenge due to AKI:
  - serum creatinine as diagnostic destiny or
  - entity such as non creatininie AKI exists (nonCrAKI) ?

Unresolved problems in RRT (EcTr) before COVID 19

- Old and new cytokine story – is it still unspoken jet to the end in RRT ?

OR

- Could adsorbtion be better than filtration in cytokines removal?

OR

- What intensive care nephrology may offer during the cytokine storm (in “good old” sepsis or new nasty COVID-19)?

Our local problems in RRT (EcTr) during COVID-19

- Lack of stuff due to moving non-covid HD patients to non-covid HD facilities

- IHD as a metod of choice, ie. difficulties with providing SLEDD or CRRT/hemoperfusion

- Competition for ICU space between RRT and MV (respiratory unit was established in ourHD center) …. MV win that “war” of machines

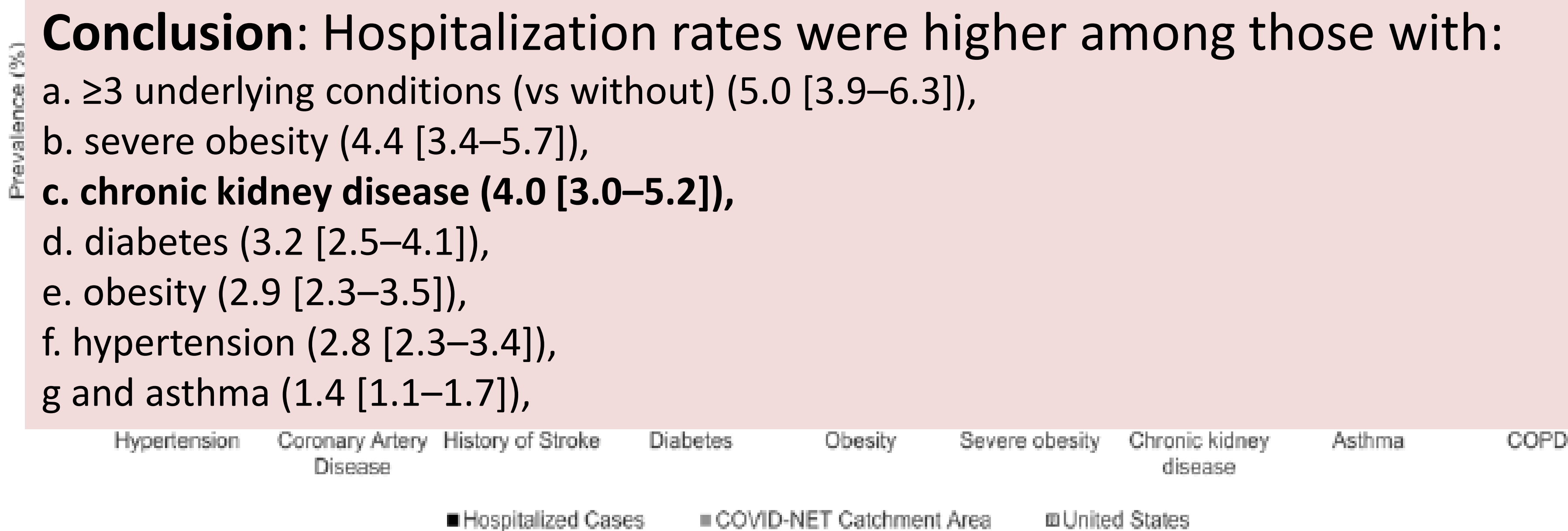
Selected LITERATURE DATA focused on hospitalization and mortality in dialysis dependent COVID-19 positive patients

Clinical Infectious Diseases
MAJOR ARTICLE
IDSA Infectious Diseases Society of America
hivma hiv medicine association
OXFORD

Risk Factors for Coronavirus Disease 2019 (COVID-19)–Associated Hospitalization: COVID-19–Associated Hospitalization Surveillance Network and Behavioral Risk Factor Surveillance System

Jean Y. Ko,[1,2] Melissa L. Danielson,[1] Machell Town,[3] Gordana Derado,[1] Kurt J. Greenlund,[3] Pam Daily Kirley,[4] Nisha B. Alden,[5] Kimberly Yousey-Hindes,[6] Evan J. Anderson,[7,8,9] Patricia A. Ryan,[10] Sue Kim,[11] Ruth Lynfield,[12] Salina M. Torres,[13] Grant R. Barney,[14] Nancy M. Bennett,[15] Melissa Sutton,[16] H. Keipp Talbot,[17] Mary Hill,[18] Aron J. Hall,[1] Alicia M. Fry,[1,2] Shikha Garg,[1,2] and Lindsay Kim[1,2]; for the COVID-NET Surveillance Team[a]

5715 community-dwelling adults (≥18 years of age) from 70 counties in 12 states participating in COVID-NET



Conclusion: Hospitalization rates were higher among those with:

a. ≥3 underlying conditions (vs without) (5.0 [3.9–6.3]),
b. severe obesity (4.4 [3.4–5.7]),
c. chronic kidney disease (4.0 [3.0–5.2]),
d. diabetes (3.2 [2.5–4.1]),
e. obesity (2.9 [2.3–3.5]),
f. hypertension (2.8 [2.3–3.4]),
g and asthma (1.4 [1.1–1.7]),

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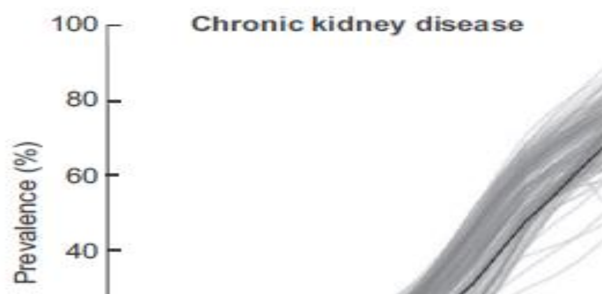
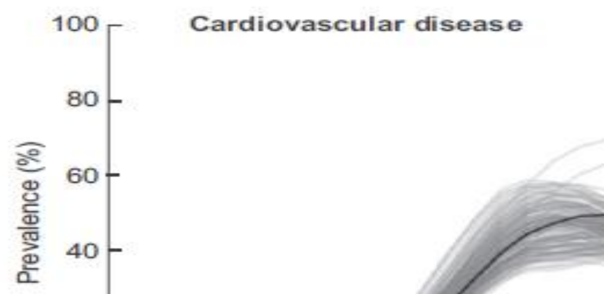
ndt
Nephrology Dialysis Transplantation

Chronic kidney disease is a key risk factor for severe COVID-19: a call to action by the ERA-EDTA

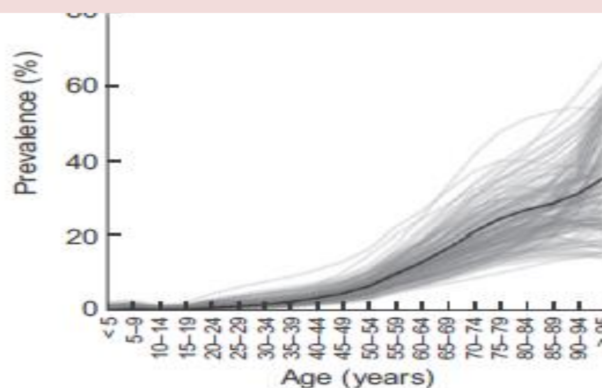
ERA-EDTA Council and the ERACODA Working Group*

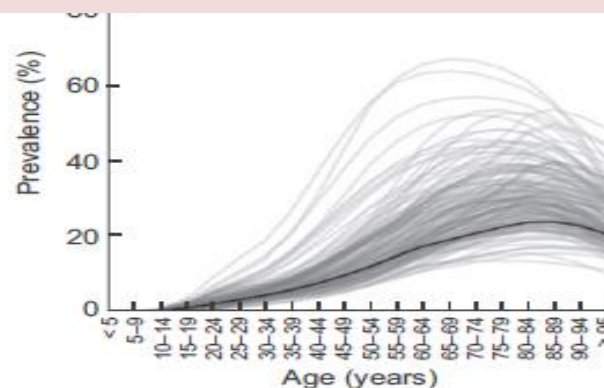
•**OpenS** ... 19
death i ...
•The pi ...
•**Hyper** ... death
2.52 fo ... the
four co ... om
COVID-





The risk of death associated with CKD st 4 and 5 is higher than the risk associated with DM (aHR range 1.31–1.95, depending upon glycaemic control) or CHD (aHR 1.17).





Kidney Int. 2020 Jul; 98(1): 20–26.
Published online 2020 May 8. doi: 10.1016/j.kint.2020.04.030
PMCID: PMC7206428
PMID: 32437768

A report from the Brescia Renal COVID Task Force on the clinical characteristics and short-term outcome of hemodialysis patients with SARS-CoV-2 infection

Federico Alberici,[1,2,*,6] Elisa Delbarba,[2,6] Chiara Manenti,[2] Laura Econimo,[2] Francesca Valerio,[2] Alessandra Pola,[2]

The disease severity of the SARS-CoV-2 infection is highly variable, and a significant proportion of infected patients appear to experience only mild disease or no symptoms at all in our cohort. Notably, the overall case fatality rate of our population was higher compared to that in the general Italian and Chinese population (28% vs. 7.2% vs. 2.3%).9, 10 The finding of worse outcome of hemodialysis patients with SARS-CoV-2 infection may be explained by a high prevalence of comorbidities, as well as other risk factors related to end-stage renal disease *per se*.2

Our study also provides some preliminary information on factors associated with the risk of ARDS and death. The presence of cardiovascular disease and severe inflammation were predictive of worse outcomes. Notably, these factors are not specific for the hemodialysis population, as cardiac comorbidities, fever, and older age have already been described as prognostic factors in the general population with SARS-CoV-2 infection.11, 12

Two models of multivariate analyses of the association between clinic[...] death in hemodialysis patients with SARS-CoV-2 infection

Variable	Outcome: ARDS	
	OR (95% CI)	*P* value
Model 1		
History of ischemic cardiac disease	**7.5 (1.6–36.3)**	**0.04**
Fever at disease onset	**17 (4.5–64)**	**0.0009**
Age at symptoms (>70 yr vs. ≤70 yr)	**1.1 (1–1.15)**	**0.03**
Shortness of breath	**20 (3.6–79.3)**	**0.004**
Myalgia or fatigue	8.5 (0.83–40.3)	0.11

Variable	Outcome: death	
	OR (95% CI)	*P* value
Model 2		
History of ischemic cardiac disease	5 (0.94–32.3)	0.07
Fever at disease onset	**18.7 (2.4–146)**	**0.02**
Cough at disease onset	**4 (1.02–17.6)**	**0.05**
CRP at baseline (>50 mg/l vs. ≤50 mg/l)	**5.6 (1.6–23.5)**	**0.01**

Nephrol Dial Transplant (2020) 35: 1973–1983
doi: 10.1093/ndt/gfaa261

COVID-19-related mortality in kidney transplant and dialysis patients: results of the ERACODA collaboration

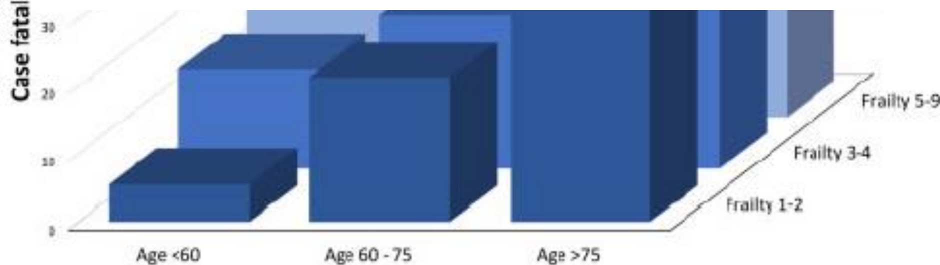
Luuk B. Hilbrands [1], Raphaël Duivenvoorden[1], Priya Vart[2,3,4], Casper F.M. Franssen[4], Marc H. Hemmelder[5], Kitty J. Jager[6], Lyanne M. Kieneker[4], Marlies Noordzij[4], Michelle J. Pena[7], Hanne de Vries[4], David Arroyo[8], Adrian Covic[9], Marta Crespo[10], Eric Goffin[11], Mahmud Islam [12], Ziad A. Massy[13,14], Nuria Montero [15], João P. Oliveira[16], Ana Roca Muñoz[17], J. Emilio Sanchez[18], Sivakumar Sridharan [19], Rebecca Winzeler[20] and Ron T. Gansevoort[4], ERACODA Collaborators*

1073 pts

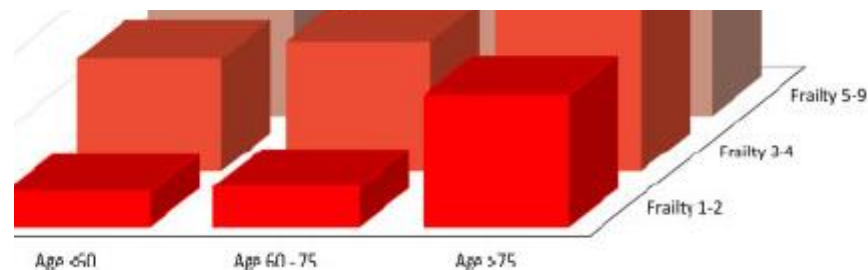
Tx pts:305 (28%) 60±13 years old

D pts:768 (72%) 67±14 years old

Mortality was primarily associated with advanced age in kidney Tx pts, and with age and frailty in dialysis pts.



Kidney transplant pts with COVID-19.



Dialysis patients with COVID-19

Relationship between age, clinical frailty score and 28-day case-fatality rate

Recovery of dialysis patients with COVID-19: Health outcomes 3 months after diagnosis in ERACODA

Marc H. Hemmelder[1], Marlies Noordzij[2], Priya Vart[2], Luuk B. Hilbrands[3], Kitty J. Jager[4], Alferso C. Abrahams[5], David Arroyo[6], Yuri Battaglia[7], Robert Ekart[8], Francesca Mallamaci[9], Sharon-Rose Malloney[10], Joao Oliveira[11], Andrzej Rydzewski[12], Sivakumar Sridharan[13], Liffert Vogt[14], Raphaël Duivenvoorden[3], Ron T. Gansevoort[2], Casper F.M. Franssen[2], ERACODA Collaborators

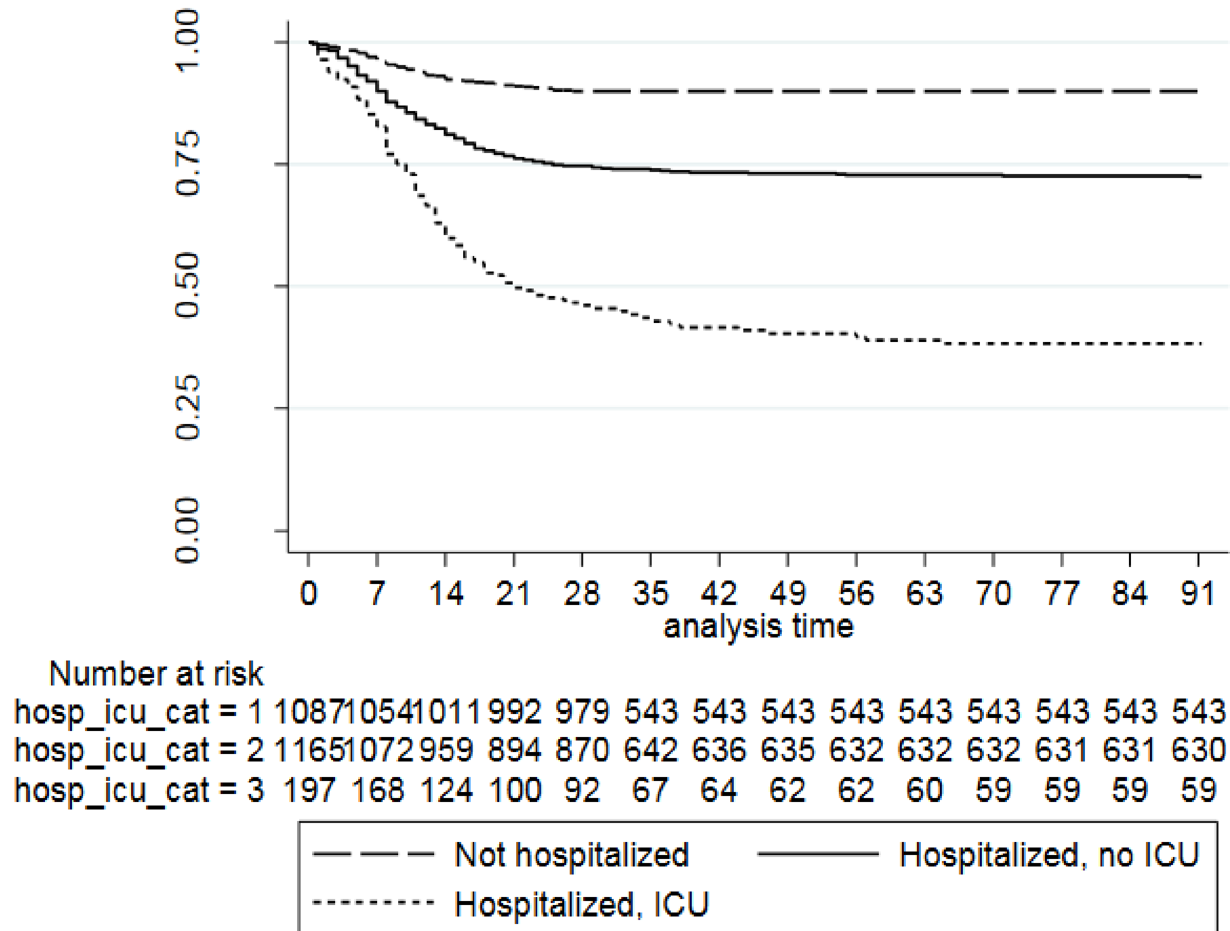


Figure: Kaplan-Meier curves presenting cumulative three month survival probability (in days) among hemodialysis patients with COVID-19

Results from the ERA-EDTA Registry indicate a high mortality due to COVID-19 in dialysis patients and kidney transplant recipients across Europe

Check for updates

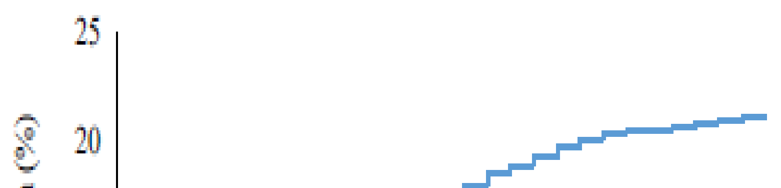
see commentaries on pages 1402 and 1404

7 countries , 4298 pts

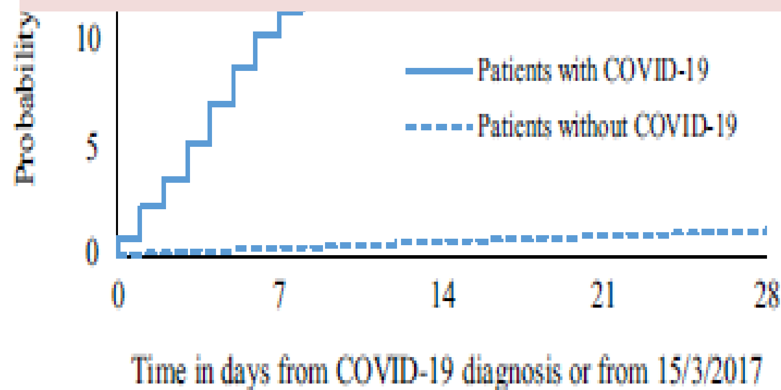
3825 Dpts

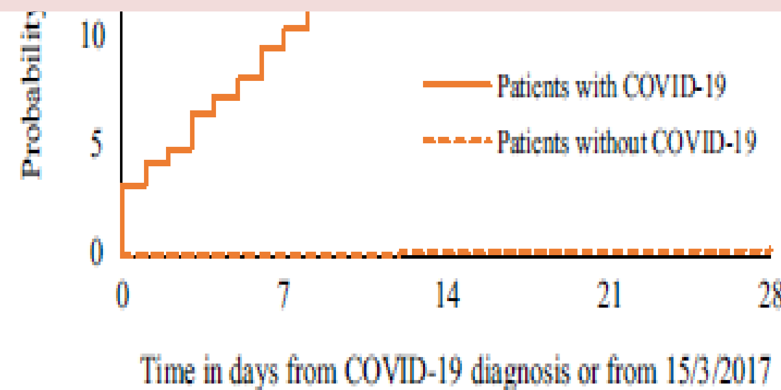
1013 Txpts

Kitty J. Jager[1,17], Anneke Kramer[1,17], Nicholas C. Chesnaye[1], Cécile Couchoud[2], J. Emilio Sánchez-Álvarez[3], Liliana Garneata[4,5], Fréderic Collart[6], Marc H. Hemmelder[7], Patrice Ambühl[8], Julia Kerschbaum[9], Camille Legeai[10], María Dolores del Pino y Pino[11], Gabriel Mircescu[4,5], Lionel Mazzoleni[12], Tiny Hoekstra[7], Rebecca Winzeler[8], Gert Mayer[9], Vianda S. Stel[1], Christoph Wanner[13], Carmine Zoccali[14] and Ziad A. Massy[15,16]



COVID-19– attributable mortality was 20.0% in 3285 HD pts and 19.9% in 1013 Tx pts
In Tx pts ‡75 years of age, 44.3% did not survive COVID-19. .





Mortality risk was 1.28 (1.02–1.60) times higher in transplant recipients compared with matched dialysis patients

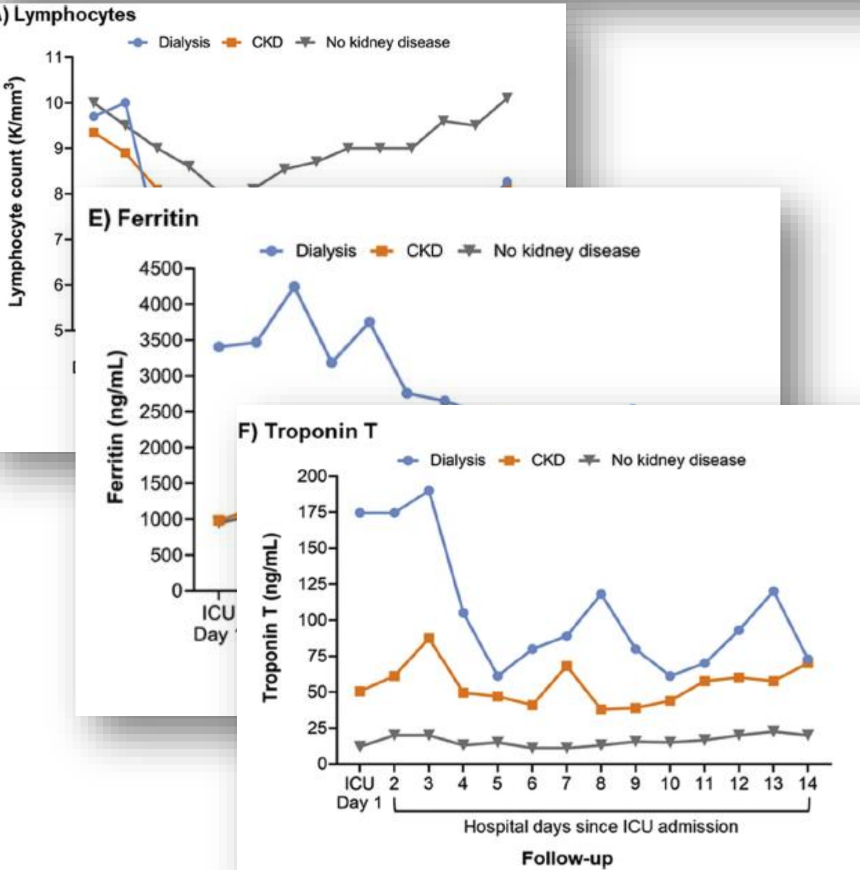
AJKD

Original Investigation

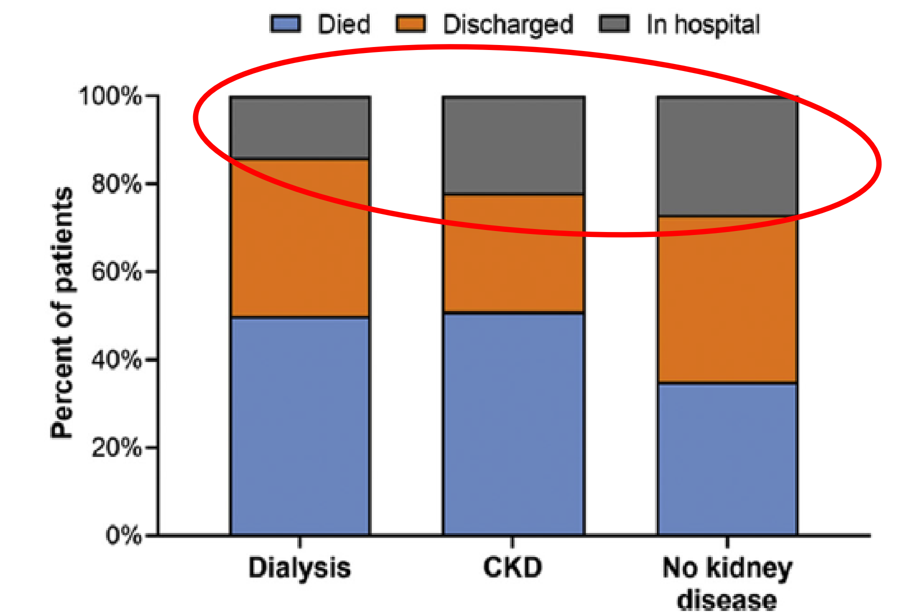
4,264 critically ill pts with COVID-19

Characteristics and Outcomes of Individuals With Pre-existing Kidney Disease and COVID-19 Admitted to Intensive Care Units in the United States

Jennifer E. Flythe, Magdalene M. Assimon,* Matthew J. Tugman, Emily H. Chang, Shruti Gupta, Jatan Shah, Marie Anne Sosa, Amanda DeMauro Renaghan, Michal L. Melamed, F. Perry Wilson, Javier A. Neyra, Arash Rashidi, Suzanne M. Boyle, Shuchi Anand, Marta Christov, Leslie F. Thomas, Daniel Edmonston, and David E. Leaf, on behalf of the STOP-COVID Investigators*



143 pts on maintenance dialysis;
521 pts with pre-existing CKD CKD;
3,600 pts without pre-existing CKD



Nephron

Nephron
DOI: 10.1159/000519530

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Accepted: September 4, 2021
Published online: October 11, 2021

The Impact of Chronic Kidney Disease on Outcomes of Patients with COVID-19 Admitted to the Intensive Care Unit

Maureen Brogan[a] Michael J. Ross[a, b]

Patients with KFRT were admitted to the ICU sooner after hospital admission (median 4 days) than patients with ND-CKD or those without CKD (7 days). Importantly, KFRT patients were less likely to have had documented COVID-19-related symptoms prior to ICU admission than those without CKD except for altered mental status, which was more common in those with KFRT (25% vs. 12%). Patients with KFRT also were less likely than those without CKD to require mechanical ventilation at the time of ICU admission (56% vs. 63%). However, patients with KFRT were more likely to require pressors at ICU admission (50%) than those with ND-CKD (42%) or without CKD (41%), though the presence of shock, defined as requirement for 2 or more pressors, was similar between groups. Baseline biomarkers also varied between groups with patients with KFRT having lower white blood counts, platelet counts, and fibrinogen levels but higher C-reactive protein (CRP), IL-6, ferritin, and troponin levels than those without CKD.

In addition to being less likely to require mechanical ventilation at the time of ICU admission, patients with KFRT were less likely than those without CKD to require mechanical ventilation at any time during hospital admission (74% vs. 80%). Patients with ND-CKD or KFRT were also less likely to require prone positioning than those without CKD. Laboratory parameters differed between groups during the first 14 days of hospitalization; patients with KFRT and ND-CKD had persistently lower lymphocyte and platelet counts and higher CRP levels. Patients with KFRT had higher lactate levels during the first week of ICU care compared to other groups.

Patients with ND-CKD and KFRT had significantly higher mortality than those without CKD in unadjusted and adjusted analyses at 14 and 28 days after ICU admission. At 28 days after ICU admission, death occurred in 51% and 50% of patients with ND-CKD and KFRT but in only 35% of those without CKD. In the fully adjusted model (including age, sex, race, Hispanic ethnicity, diabetes, hypertension, coronary artery disease, heart failure, and atrial fibrillation or flutter), the hazard ratios for 28-day mortality were 1.41 and 1.25 for patients with KFRT and ND-CKD compared to those without CKD. Among those with KFRT, those dialyzing via a catheter had 1.94-fold higher risk of death than those dialyzing with an arteriovenous vascular access. Among those with ND-CKD, there was a nonsignificant trend toward higher mortality for those with baseline creatinine ≥2 mg/dL. The most common cause of death in all groups was respiratory failure. Patients with KFRT had a nonstatistically significant trend toward increased secondary outcomes, including

COVID-19 Among US Dialysis Patients: Risk Factors and Outcomes From a National Dialysis Provider

Caroline M. Hsu, Daniel E. Weiner, Gideon Aweh, Dana C. Miskulin, Harold J. Manley, Carol Stewart, Vlad Ladik, John Hosford, Edward C. Lacson, Douglas S. Johnson, and Eduardo Lacson Jr

438 COVID+ Maintenance HD Patients Feb 17, 2020 – Jun 1, 2020

296 ED/Hospitalized (67.6%)

142 Not Hospitalized* (32.4%)

201 Discharges (67.9%)

95 Deaths Within 90 Days of COVID+ (32.1%)

14 Deaths Within 90 Days of COVID+ (9.9%)

128 Outpatients (90.1%)

Overall Death Rate: 24.9% (109 Deaths/438 Infected Patients)

for COVID-19 included residence in a long-term care facility, Black race, male sex, diabetes, receipt of in-center compared to home dialysis, and treatment at an urban dialysis center. In dialysis patients who developed COVID-19, older age, hypertension, congestive heart failure, peripheral vascular disease, and wheelchair use were associated with higher risk of death.

Outcomes of dialysis dependant patients in CHC Zemun during COVID-19 hospitalization: March 2020 – March 2021

Dialysis status		AKI	HD	aCKD	p-value
Patients number (N)		28	129	19	
Age (X±SD)		70 ± 15	66±12	67±12	0.407
Gender (N, %)	Men	14 (50 %)	84 (65.1 %)	16 (84.2 %)	0.046
	Women	14 (50 %)	45 (34.9 %)	3 (15.8 %)	
Hospitalisation duration (average days, N)		12 ± 7	14 ± 8	11± 7	0.260
Comorbidities (N, %)	HTA	20 (71.4 %)	100 (77.5 %)	12 (63.1 %)	0.380
	DM	12 (42.8 %)	32 (24.8 %)	7 (36.8 %)	0.128
	CVD	11 (39.2 %)	46 (35.7 %)	8 (47.0 %)	0.665
	CVI	5 (17.8 %)	6 (4.6 %)	1 (5.3%)	0.085
	Malignancy	4 (14.3 %)	22 (17.1 %)	1 (5.3 %)	0.369
	COPD	1 (3.6 %)	7 (5.4 %)	1 (5.3 %)	0.912

Outcomes of dialysis dependant patients in CHC Zemun during COVID-19 hospitalization: March 2020 – March 2021

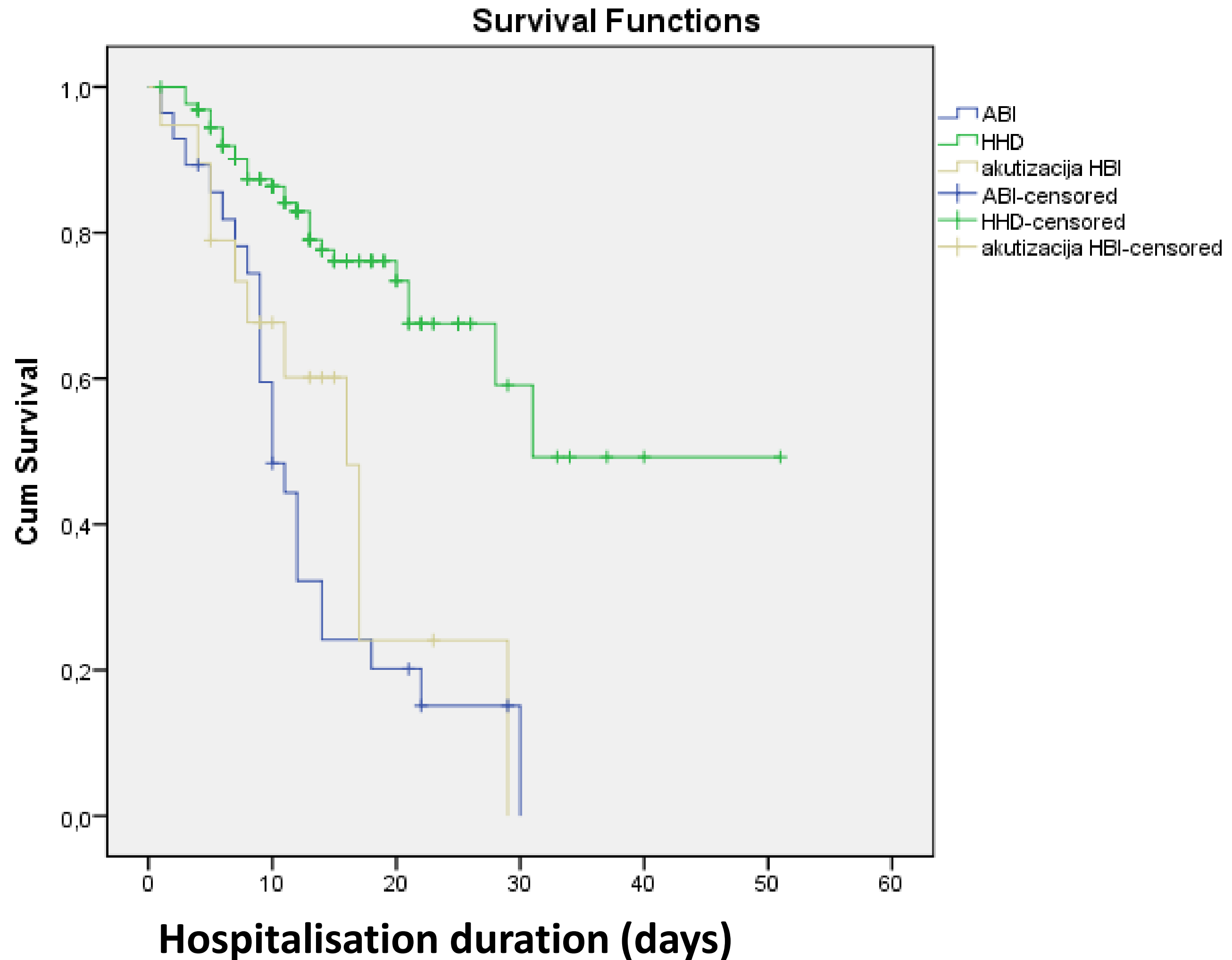
Dialysis status		AKI	HD	aCKD	p-value
AVF thrombosis		/	13 (10.1 %)	1 (5.3 %)	
Sepsis		6 (21.4 %)	7 (5.4 %)	2 (10.5 %)	0.044
Clinical status (N, %)	Asymptomatic	0 (0 %)	8 (6.2 %)	2 (10.5 %)	0.000
	Mild	2 (7.1 %)	50 (38.8 %)	1 (5.3 %)	
	Moderate	2 (7.1 %)	19 (14.7 %)	4 (21.1 %)	
	Severe	5 (17.9 %)	29 (22.5 %)	3 (15.8 %)	
	Critical	19 (67.9 %)	23 (17.8 %)	9 (47.4 %)	
Pneumonia (N, %)	No	2 (7.1 %)	16 (12.4 %)	1 (5.3 %)	0.464
	Unilateral	1 (3.6 %)	13 (10.1 %)	1 (5.3 %)	
	Bilateral	25 (89.3 %)	100 (77.5 %)	17 (89.5 %)	
Respiratory insufficiency (N, %)		22 (78.6 %)	23 (17.8 %)	9 (47.4 %)	0.000
Outcome (N, %)	Hospital discharge	2 (7.1 %)	77(59.7 %)	6 (31.6 %)	0.000
	Transfered	3 (10.7 %)	23 (17.8 %)	2 (10.5 %)	
	Death	23 (82.1 %)	29 (22.5%)	11 (57.9 %)	

Outcomes of dialysis dependant patients in CHC Zemun during COVID-19 hospitalization: March 2020 – March 2021

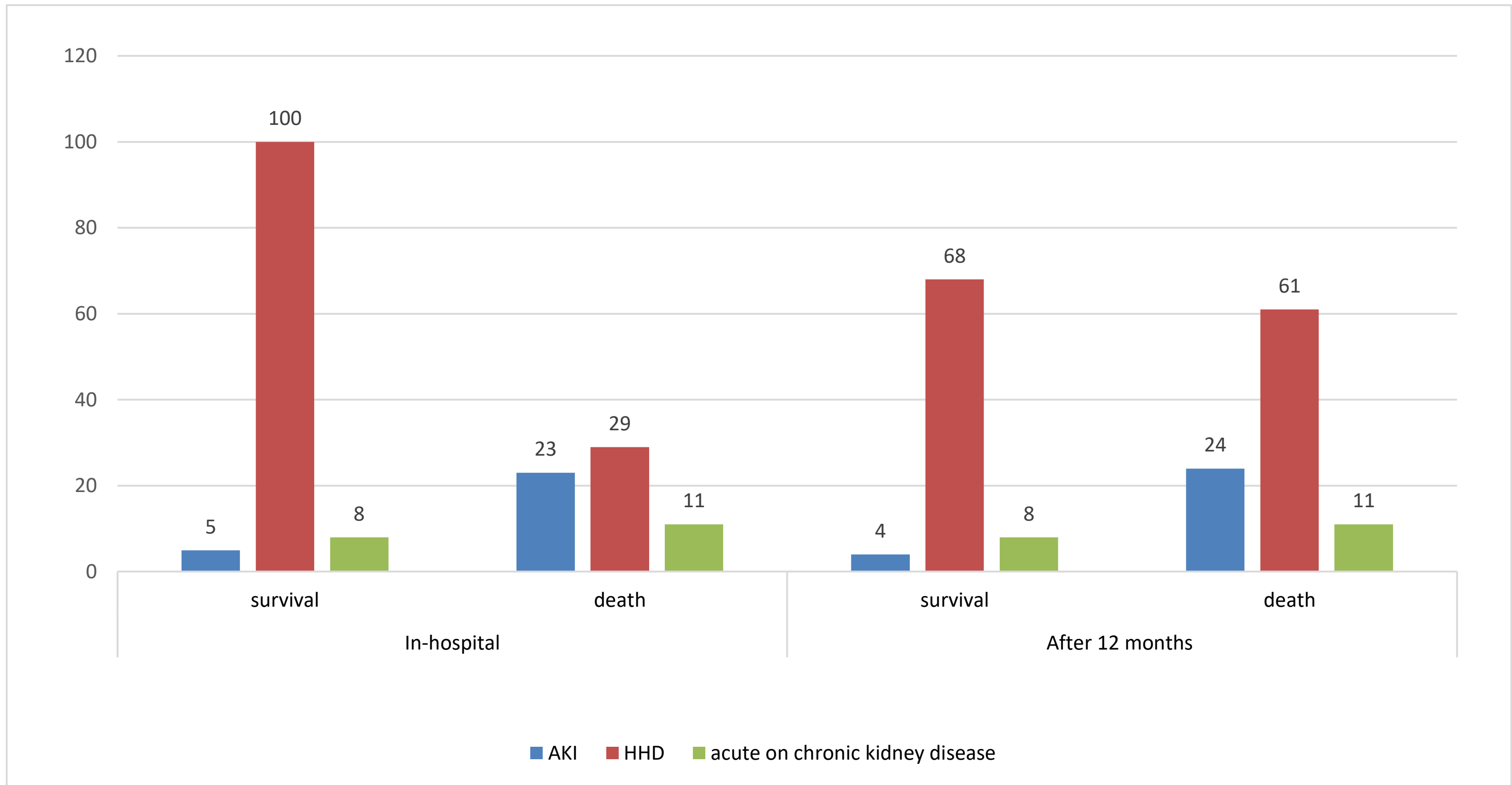
Factor	OR	Confidence interval 95%		p
		Lower limit	Upper limit	
Gender	1.204	0.642	2.258	0.563
Age	1.047	1.019	1.077	**0.001**
AKI	12.678	4.422	35.548	**<0.001**
HD	0.149	0.074	0.301	**<0.001**
aCKD	2.854	1.084	7.512	**0.034**
HTA	0.699	0.355	1.335	0.255
DM	2.060	1.068	3.976	**0.031**
KVD	2.490	1.319	4.700	**0.005**
CVI	2.333	0.749	7.271	0.144
Malignancy	0.486	0.185	1.276	0.143
COPD	0.222	0.027	1.815	0.160
Pneumonia	1.625	0.951	2.779	0.076
Respiratory insuficiency	85.292	28.858	252.090	**<0.001**
Hgb	1.020	0.994	1.020	0.304
Le	1.156	1.079	1.238	**<0.001**
Tr	1.002	0.999	1.005	0.160
CRP	1.007	1.003	1.011	**<0.001**
Feritin	1.000	1.000	1.000	0.451
LDH	1.002	1.001	1.003	**0.001**
D dimer	1.000	1.000	1.000	0.147
Fibrinogen	1.162	0.945	1.430	0.154

Univariate regression analysis of evaluated factors influence on mortality during hospitalization in Covid-19 positive patients;

In-hospital survival in patients with acute kidney injury, receiving chronic haemodialysis and patients with acute on chronic kidney disease



Survival outcomes during hospitalisation and after 12 months



Survival outcomes during hospitalisation and after 12 months in patients who received dialysis due to acute kidney injury, previous dialysis patients and patients who received dialysis due to acute on chronic kidney disease

CONCLUSION

- We should harmonize the limitations of blood purification therapy with our expectation to heal the death

- What to do than?

- …the same as before…to purificate the blood the best as we know