



ERACODA

- The ERA-EDTA COVID-19 Database for Patients on Kidney Replacement Therapy -

April 15, 2020

Second ERACODA Study Report

Dear Colleagues and Friends,

One week after the first study report of the ERACODA registry, we now provide you an update.

Some key summary data

- 222 individuals have registered as user (last week 134), representing 170 centres and 34 European countries and 10 other countries attached to the ERA-EDTA.
- 184 patient records have already been entered (last week 100). An analysis of the first 134 records shows that approximately 57% relate to kidney transplant and 43% to dialysis patients. Average age of these 134 subjects is 62 years, 64% being male, with a BMI of 26,5.
- 23% of these patients were sent home after an initial diagnosis of COVID-19 (of which 27% were admitted to hospital on a second presentation), whereas 77% was admitted to hospital (of which 15% to an ICU). Twenty deaths have currently been reported. It is still not possible to draw firm conclusions on mortality rates, because follow-up time is still limited.

General information

ERACODA is an acronym for the ERA-EDTA database that collects individual level data of patients with COVID-19 that are living with a kidney transplantation or who are on dialysis. This database has been established to achieve detailed insight in subject and treatment characteristics that are related to outcome. We hope that such knowledge can help improve the prognosis of the patients we care for by intervening on modifiable risk factors.

Disclaimer

Numbers are growing, and therefore reliability becomes better. However, we want to emphasize that these data are preliminary. There is for several variables a considerable percentage of missing data. To be transparent we have indicated this in our tables. Some data also need validation. In

the coming days we will send out queries to resolve these issues. Given these considerations we caution that it is not possible to draw firm conclusions on the present data yet.

Help us to reach our goal

We urgently ask the members of the ERA-EDTA to help fill our COVID-19 database as rapidly as possible. More data, especially representative data, are needed. ***To ensure representativeness please send us not only the cases with bad outcomes, but unbiased information on all (!) your patients with COVID-19, independent of their clinical course.*** You will be acknowledged for your contribution on any manuscripts to derive from this initiative. Please spread the news about this database among your colleagues.

How to register as a user

Please send an e-mail to COVID.19.KRT@umcg.nl. This e-mail should contain:

- First name and surname
- Institution (in English) + country

We will reply as soon as possible with further details and instructions.

In case you have any questions or comments, please let us know via the above e-mail address.

Best regards,

Dr. Lyanne Kieneker, Chief Project Coordinator and Epidemiologist

Dr. Michelle Pena, Epidemiologist

Ms. Hanne de Vries, Project Coordinator

On behalf of the ERACODA Working Group

Casper Franssen, Lead Dialysis Sub-database

Luuk Hilbrands, Lead Kidney Transplant Sub-database

Ron Gansevoort, Member ERA-EDTA Council

Marc Hemmelder, Director Dutch National KRT Registry

Kitty Jager, Director ERA-EDTA Registry

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Country specific data sets (biweekly output, starting April 22, 2020)

Same tables as above, but country specific (only for countries with >40 patients entered)

Patient and COVID-19 characteristics at presentation

According to type of kidney replacement therapy

Table 1

	Kidney transplant patients	Dialysis patients	Missing data (n)
Number of patients, N	77	57	
Male sex, %	68	58	
Age, y	59 ± 14	66 ± 14	
BMI, kg/m ²	26.5 ± 4.8	26.4 ± 6.6	28/12
Race			
Asian, %	0	4	
Black or African descent, %	1	2	
White or Caucasian, %	62	91	
Other, %	3	4	
Unknown, %	34	0	
Tobacco use			
Current, %	3	0	
Prior, %	16	25	
Never, %	35	35	
Unknown, %	47	40	
<i>Primary kidney disease</i>			
Primary glomerulonephritis, %	NA	11	
Pyelonephritis, %	NA	5	
Interstitial nephritis, %	NA	0	
Familial/hereditary renal diseases, %	NA	4	
Congenital diseases, %	NA	0	
Vascular diseases, %	NA	19	
Secondary glomerular/systemic disease, %	NA	11	
Diabetic kidney disease, %	NA	26	
Other, %	NA	9	
Unknown, %	NA	16	
Hemodialysis, %	NA	89	-/9
Peritoneal dialysis, %	NA	11	-/9
Residual diuresis > +/- 200 ml/day	NA	51	-/4
<i>Comorbidities</i>			
Obesity, %	9	19	28/12
Hypertension, %	69	74	
Diabetes Mellitus, %	27	40	
Coronary artery disease, %	26	32	

Heart failure, %	6	14	
Chronic lung disease, %	10	7	
Active malignancy, %	3	4	
Auto-immune disease, %	3	5	
<i>Use of RAASi use at presentation</i>			
ACE-inhibitors, %	27	4	7/7
ARB, %	17	8	7/7
<i>Use of immunosuppressive medication at presentation</i>			
Prednisone, %	83	4	11/0
Tacrolimus, %	72	2	9/0
Cyclosporine, %	20	0	21/0
Mycophenolate, %	70	0	13/0
mTOR inhibitor, %	12	2	20/0
Azathioprine, %	7	0	21/0
Belatacept, %	0	0	22/0
Anti TNF A, %	0	0	21/0
Rituximab, %	0	0	21/0
Cyclophosphamide, %	0	0	21/0
Other, %	0	3	22/0
<i>COVID-19 symptoms</i>			
Sore throat, %	11	11	23/3
Cough, %	81	53	10/2
Shortness of breath, %	44	40	16/2
Fever, %	64	66	21/4
Headache, %	16	6	22/4
Nausea or vomiting, %	25	15	17/4
Diarrhea, %	32	11	17/4
Myalgia or arthralgia, %	20	21	22/4
Temperature, Celcius	37.8 ± 1.1	37.8 ± 1.1	11/8
Respiration rate, /minute	19,8 ± 6,7	20,1 ± 7,0	20/16
Oxygen saturation with room air, %	94,7 ± 4,3	94,6 ± 4,2	17/15
Systolic blood pressure, mm Hg	132 ± 23	144 ± 24	17/8
Diastolic blood pressure, mm Hg	80 ± 17	76 ± 17	17/8
Pulse rate, BPM	85 ± 15	86 ± 17	18/11
COVID-19 test result positive, %	99	89	2/8
Abnormalities chest X-ray suggestive for COVID-19, %	28	23	8/9
Abnormalities CT-scan suggestive for COVID-19, %	44	35	9/8

<i>Laboratory results</i>			
Lymphocyte count, x1000/microL	0.9 (0.6-1.5)	0.7 (0.6-1.1)	36/19
eGFR, mL/min	43 (25-58)	NA	31/-
CRP, mg/L	64 (24-100)	44 (15-116)	31/11

Continuous variables are reported as mean \pm SD or median (IQR). eGFR is calculated with the creatinine-based CKD-EPI formula. Obesity is defined as BMI > 30 kg/m². Abbreviations: ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; BMI, body mass index; COVID-19, corona virus disease 2019; CRP, C-reactive protein; eGFR, estimated glomerular filtration rate; mTOR, mammalian target of rapamycin; NA, not applicable; TNF, tumor necrosis factor.

Preliminary

Patient and COVID-19 characteristics at presentation
For patients with a kidney transplant, according to hospital status

Table 2

	Control group*	Patients with a kidney transplant			
		Not admitted	Admitted to		Deceased **
			Hospital, no ICU	ICU	
Number of patients, N		17	39	12	10
Number of patients, %		25	57	18	
Male sex, %	62	76	72	33	50
Age, y	56 ± 15	58 ± 8	62 ± 15	56 ± 15	72 ± 11
BMI, kg/m ²	26 ± 6	25.6 ± 2.5	26.5 ± 4.5	25.2 ± 3.6	26.7 ± 5.4
Race					
Asian, %		0	0	0	0
Black or African descent, %		0	0	8	10
White or Caucasian, %		65	67	42	60
Other, %		0	0	0	0
Unknown, %		35	33	50	30
Tobacco use					
Current, %		0	3	8	10
Prior, %		18	18	17	10
Never, %		35	41	25	50
Unknown, %		47	38	50	30
<i>Comorbidities</i>					
Obesity, %		0	13	0	10
Hypertension, %		76	72	67	50
Diabetes Mellitus, %		24	38	17	40
Coronary artery disease, %		29	33	17	40
Heart failure, %		0	10	8	20
Chronic lung disease, %		6	15	8	20
Active malignancy, %		0	5	0	20
Auto-immune disease, %		0	5	0	0
<i>Use of RAASi use at presentation</i>					
ACE-inhibitors, %		25	26	30	33
ARB, %		0	21	20	22
<i>Use of immunosuppressives at presentation</i>					
Prednisone, %		88	83	89	88
Tacrolimus, %		88	62	70	78

Cyclosporine, %		8	26	22	25
Mycophenolate, %		85	64	70	53
mTOR inhibitor (sirolimus, everolimus), %		17	13	12	11
Azathioprine, %		0	13	0	0
Belatacept, %		0	0	0	0
Anti TNF A, %		0	0	0	0
Rituximab, %		0	0	0	0
Cyclophosphamide, %		0	0	0	0
Other, %		0	0	0	0
<i>COVID-19 symptoms</i>					
Sore throat, %	NA	8	13	14	0
Cough, %	NA	87	73	100	100
Shortness of breath, %	NA	15	42	60	63
Fever, %	NA	67	63	57	71
Headache, %	NA	17	19	14	29
Nausea or vomiting, %	NA	14	27	50	50
Diarrhea, %	NA	14	33	63	38
Myalgia or arthralgia, %	NA	17	16	43	14
Temperature, Celcius	NA	37.8 ± 1.1	37.9 ± 1.1	37.3 ± 1.2	37.5 ± 1.1
Respiration rate, /minute	NA	16.3 ± 4.6	19.6 ± 6.1	20.2 ± 7.6	21.0 ± 7.2
Oxygen saturation with room air, %	NA	96.8 ± 1.2	94.3 ± 4.9	94.9 ± 2.6	92.6 ± 4.0
Systolic blood pressure, mm Hg	NA	131 ± 10	136 ± 25	118 ± 16	137 ± 25
Diastolic blood pressure, mm Hg	NA	82 ± 10	80 ± 18	74 ± 17	75 ± 12
Pulse rate, BPM	NA	81 ± 19	87 ± 14	81 ± 12	80 ± 6
COVID-19 test result positive, %	NA	100	100	100	100
Suggestive abnormalities X-ray, %	NA	13	31	40	33
Suggestive abnormalities CT-scan, %	NA	13	51	60	56
<i>Laboratory results</i>					
Lymphocyte count, x1000/microL	NA	2.1 (1.0-3.5)	0.9 (0.5-1.1)	0.6 (0.6-0.7)	0.7 (0.6-1.1)
eGFR, mL/min	NA	55 (31-62)	44 (26-53)	37 (13-40)	26 (13-46)
CRP, mg/L	NA	12 (7-21)	66 (34-100)	121 (52-211)	139 (100-171)

Continuous variables are reported as mean ± SD or median (IQR).

* Control group: formed by the average of all patients with a kidney transplant in the ERA-EDTA registry

** Deceased: these patients are also included in one of the three aforementioned columns (hospital admission y/n, ICU admission y/n)

eGFR is calculated with the creatinine-based CKD-EPI formula. Obesity is defined as BMI > 30 kg/m². Abbreviations: ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; BMI, body mass index; COVID-19, corona virus disease 2019; CRP, C-reactive protein; eGFR, estimated glomerular filtration rate; mTOR, mammalian target of rapamycin; NA, not applicable; TNF, tumor necrosis factor.

Patient and COVID-19 characteristics at presentation
For patients on dialysis, according to hospital status

Table 3

	Control group*	Patients on dialysis			
		Not admitted	Admitted to		Deceased **
			Hospital, no ICU	ICU	
Number of patients, N		11	33	2	10
Number of patients, %					
Male sex, %	62	36	64	0	60
Age, y	67 ± 15	57 ± 17	67 ± 13	57 ± 3	70 ± 13
BMI, kg/m ²	28 ± 6	27.4 ± 10.0	26.1 ± 5.2	26.2 ± 4.0	28.0 ± 5.7
Race					
Asian, %		9	0	0	0
Black or African descent, %		9	0	0	0
White or Caucasian, %		73	100	100	100
Other, %		9	0	0	0
Unknown, %		0	0	0	0
Tobacco use					
Current, %		0	0	0	0
Prior, %		27	30	0	50
Never, %		55	33	50	40
Unknown, %		18	36	50	0
<i>Primary kidney disease</i>					
Primary glomerulonephritis, %		9	12	0	20
Pyelonephritis, %		0	3	50	0
Interstitial nephritis, %		0	0	0	0
Familial/hereditary renal diseases, %		0	3	50	0
Congenital diseases, %		0	0	0	0
Vascular diseases, %		18	24	0	50
Secondary systemic disease, %		9	6	0	0
Diabetic kidney disease, %		27	21	0	30
Other, %		18	9	0	0
Unknown, %		18	21	0	0
Hemodialysis, %		91	94	0	90
Peritoneal dialysis, %		9	6	100	10
Residual diuresis > +/- 200 ml/day		36	52	50	70

<i>Comorbidities</i>					
Obesity, %		27	21	0	30
Hypertension, %		31	82	100	90
Diabetes Mellitus, %		45	45	50	30
Coronary artery disease, %		18	42	0	30
Heart failure, %		9	21	0	30
Chronic lung disease, %		0	12	0	10
Active malignancy, %		0	6	0	0
Auto-immune disease, %		9	6	0	0
<i>Use of RAASi use at presentation</i>					
ACE-inhibitors, %		9	3	0	10
ARB, %		18	0	50	0
<i>Use of immunosuppressives at presentation</i>					
Prednisone, %		18	0	-	-
Tacrolimus, %		9	0	-	-
Cyclosporine, %		0	0	-	-
Mycophenolate, %		0	0	-	-
mTOR inhibitor (sirolimus, everolimus), %		9	0	-	-
Azathioprine, %		0	0	-	-
Belatacept, %		0	0	-	-
Anti TNF A, %		0	0	-	-
Rituximab, %		0	0	-	-
Cyclophosphamide, %		0	0	-	-
Other, %		0	3		
<i>COVID-19 symptoms</i>					
Sore throat, %	NA	18	3	100	10
Cough, %	NA	64	55	100	40
Shortness of breath, %	NA	9	58	0	40
Fever, %	NA	55	76	100	80
Headache, %	NA	0	3	50	10
Nausea or vomiting, %	NA	9	13	50	20
Diarrhea, %	NA	18	9	0	20
Myalgia or arthralgia, %	NA	36	16	50	10
Temperature, Celcius	NA	37.5 ± 0.8	37.8 ± 1.1	38.7 ± 0.1	37.7 ± 1.2
Respiration rate, /minute	NA	15.1 ± 2.8	21.7 ± 7.4	20.0 ± 2.8	18.6 ± 5.1
Oxygen saturation with room air, %	NA	97.6 ± 2.2	94.3 ± 3.7	85.5 ± 3.5	94.1 ± 4.1
Systolic blood pressure, mm Hg	NA	147 ± 15	139 ± 22	187 ± 47	137 ± 22
Diastolic blood pressure, mm Hg	NA	77 ± 13	75 ± 16	108 ± 11	69 ± 11
Pulse rate, BPM	NA	82 ± 12	88 ± 18	91 ± 26	78 ± 9

COVID-19 test result positive, %	NA	100	82	100	100
Suggestive abnormalities X-ray, %	NA	0	29	100	44
Suggestive abnormalities CT-scan, %	NA	0	50	50	22
<i>Laboratory results</i>					
Lymphocyte count, x1000/microL	NA	1.1 (0.8-3.1)	0.6 (0.5-0.8)	1	0.7 (0.6-0.8)
eGFR, mL/min	NA	NA	NA	NA	NA
CRP, mg/L	NA	12 (5-16)	72 (28-123)	197 (129-264)	46 (34-107)

Continuous variables are reported as mean \pm SD or median (IQR).

* Control group: formed by the average of all patients on dialysis in the ERA-EDTA registry

** Deceased: these patients are also included in one of the three aforementioned columns (hospital admission y/n, ICU admission y/n)

eGFR is calculated with the creatinine-based CKD-EPI formula. Obesity is defined as BMI > 30 kg/m². Abbreviations: ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; BMI, body mass index; COVID-19, corona virus disease 2019; CRP, C-reactive protein; eGFR, estimated glomerular filtration rate; mTOR, mammalian target of rapamycin; NA, not applicable; TNF, tumor necrosis factor.

Follow-up data of KRT patients with COVID-19

According to type of kidney replacement therapy

Table 4.

	Kidney transplant Patients (n=77)	Dialysis Patients (n=57)	Missing data (n)
Hospitalisation, %	77	77	3/9
Reason for no hospital admission			66/45
No indication, %	100	91	
Logistical reasons related to COVID-19, %	0	0	
Patient/family preferred no admission, %	0	9	
ICU admission, %	24	6	6/1
Reason for no ICU admission			32/4
No indication, %	80	75	
Logistical reasons related to COVID-19, %	0	0	
Patient/family preferred no admission, %	4	3	
Prognosis was too bad, %	16	22	
Intubation, %	20	6	8/1
Reason for no intubation			31/4
No indication, %	77	75	
Logistical reasons related to COVID-19, %	4	3	
Patient/family preferred no admission, %	4	0	
Prognosis was too bad, %	15	22	
Start of CVVH/hemodialysis, %	8	-	19/36
Reasons not to start CVVH/hemodialysis			29/36
No indication, %	96	NA	
Logistical reasons related to COVID-19, %	0	-	
Patient/family preferred no admission, %	0	-	
Prognosis was too bad, %	4	-	
Continuing kidney replacement therapy during admission, %	NA	97	-/1
Increase in intensity kidney replacement therapy, %	NA	3	-/2
Reason for discontinuation of kidney replacement therapy			-/35
No indication, %	NA	0	
Logistical reasons related to COVID-19, %	NA	0	
Patient/family preferred no admission, %	NA	0	
Prognosis was too bad, %	NA	100	

Continuous variables are reported as mean \pm SD or median (IQR). Abbreviations: CVVH, continuous veno-venous hemofiltration; COVID-19, corona virus disease 2019; ICU, intensive care unit; NA, not applicable.

Follow-up data for patients with a kidney transplant with COVID-19 According to hospital status

Table 5.

	Not admitted to hospital (n=17)	Admitted to hospital, no ICU (n=39)	Admitted to ICU (n=12)	Deceased* (n=10)
Antiviral therapy, %	0	49	90	57
(Hydroxy)chloroquine, %	0	100	100	100
Lopinavir/ritonavir, %	0	0	33	0
Remdesevir, %	0	0	0	0
Interferon, %	0	0	0	0
Other, %	0	7	0	0
Anti-inflammatory therapy, %	0	6	0	0
Tocilizumab, %	0	50	-	-
Anakinra, %	0	0	-	-
High dose steroids, %	0	0	-	-
Other, %	0	50	-	-
ACE-inhibitor use				
Continued, %	100	56	0	0
Discontinued, %	0	44	100	100
Replaced by ARB, %	0	0	0	0
ARB use				
Continued, %	-	57	50	50
Discontinued, %	-	43	50	50
Change in dose immunosuppressive drugs < 48h after presentation				
Tacrolimus				
No change, %	92	52	57	33
Reduction, %	8	29	0	0
Withdrawal, %	0	19	43	37
Cyclosporine				
No change, %	100	75	50	0
Reduction, %	0	0	0	0
Withdrawal, %	0	25	50	100
Mycophenolate				
No change, %	20	27	14	20
Reduction, %	0	9	0	0
Withdrawal, %	80	64	86	80

Azathioprine				
No change, %	-	25	-	-
Reduction, %	-	25	-	-
Withdrawal, %	-	50	-	-
mTor inhibitor				
No change, %	50	33	0	-
Reduction, %	0	0	0	-
Withdrawal, %	50	67	100	-
Belatacept				
No change, %	-	-	-	-
Reduction, %	-	-	-	-
Withdrawal, %	-	-	-	-
Prednisone				
No change, %	69	53	38	14
Reduction, %	0	0	0	0
Increase, %	31	47	63	86
Anti TNF A				
No change, %	-	-	-	-
Reduction, %	-	-	-	-
Withdrawal, %	-	-	-	-
Rituximab				
No change, %	-	-	-	-
Reduction, %	-	-	-	-
Withdrawal, %	-	-	-	-
Cyclophosphamide				
No change, %	-	-	-	-
Reduction, %	-	-	-	-
Withdrawal, %	-	-	-	-

Continuous variables are reported as mean \pm SD or median (IQR). Abbreviations: ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; COVID-19, corona virus disease 2019; ICU, intensive care unit; mTOR, mammalian target of rapamycin; NA, not applicable; TNF, tumor necrosis factor.

* Deceased: these patients are also included in one of the three aforementioned columns (hospital admission y/n, ICU admission y/n)

Follow-up data for patients on dialysis with COVID-19

According to hospital status

Table 6.

	Not admitted to hospital (n=11)	Admitted to hospital, no ICU (n=33)	Admitted to ICU (n=2)	Deceased* (n=10)
Continuing KRT during admission, %	NA	97	100	90
Increase in intensity KRT, %	NA	0	50	0
Reason for discontinuation KRT				
No indication, %	NA	0	-	0
Logistical reasons related to COVID-19, %	NA	0	-	0
Patient/family preferred no admission, %	NA	0	-	0
Prognosis was too bad, %	NA	100	-	100
Organ dysfunction				
Liver (transaminases > 2 times ULN), %	NA	19	50	20
Heart (heart failure/new ECG abn), %	NA	9	0	30
Antiviral therapy, %	NA	45	100	30
(Hydroxy)chloroquine, %	NA	86	100	100
Lopinavir/ritonavir, %	NA	8	50	33
Remdesevir, %	NA	0	0	0
Interferon, %	NA	0	0	0
Other, %	NA	23	50	0
Anti-inflammatory therapy, %	NA	9	50	10
Tocilizumab, %	NA	0	0	0
Anakinra, %	NA	50	0	0
High dose steroids, %	NA	0	-	0
Other, %	NA	67	0	100
ACE-inhibitor use				
Continued, %	100	0	-	0
Discontinued, %	0	100	-	100
Replaced by ARB, %	0	0	-	0
ARB use				
Continued, %	100	-	0	-
Discontinued, %	0	-	100	-

Continuous variables are reported as mean \pm SD or median (IQR). Abbreviations: ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; COVID-19, corona virus disease 2019; ICU, intensive care unit; NA, not applicable.

* Deceased: these patients are also included in one of the three aforementioned columns (hospital admission y/n, ICU admission y/n)

Preliminary outcome of hospital admitted KRT patients with COVID-19*
According to type of kidney replacement therapy

Table 7.

	Kidney transplant patients (n=51)	Dialysis patients (n=35)	Missing data (n)
Status			
Alive, %	80	71	
Deceased, %	20	29	
Lost to follow-up, %	0	0	
Specification alive			
Still admitted, %	46	56	
Transferred to another hospital, %	0	4	
Transferred to a nursing home, %	5	0	
Discharged to home, %	49	40	
Cause of death related to COVID-19, %	100	100	3/0

Abbreviations: COVID-19, corona virus disease 2019.

* These data relate to patients admitted to hospital only, and are preliminary. Some patients are still admitted, and their vital status can therefore yet change during the admission.