

## **Supplemental Materials**

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Supplemental Table 1. Summary of studies reporting association of PSG-measured sleep apnea severity with mortality in patients with CKD and/or ESKD

Author	Sample size/Re-nal status	Clinical characteristic	Baseline sleep assessment	Follow up duration	Results	Selection bias
Benz et al. <sup>19</sup> , 2000 (USA)	29 HD	Age 59 ± 13 yrs, 62% male, 48% black, dialysis vintage 38 months, 7% had KTx	Mean RDI (number of apneas/hrs of sleep)= 45 ± 37/hr  Avg PLMI = 70/hr	14 months	Increased PLMI (>20) was associated with increased mortality. No association of RDI, sleep duration, efficiency, hypoxemia, or stages of sleep with mortality	Yes, patients referred to sleep clinic
Jung et al. <sup>20</sup> , 2010 (Korea)	30 HD	Age 56 ± 11 yrs, 77% males, 50% DM, vintage 44 months, no KTx data available	Median AHI = 22/hr (range: 1-67/hr)  Median PLMI = 37/hr (range: 1-208/hr)	48 months	Nocturnal hypoxemia and PLMI were associated with increased mortality.  No association of AHI, ODI, sleep duration, efficiency or mean SaO <sub>2</sub> with mortality	Yes, single center
Sivalingam et al. <sup>21</sup> , 2013 (UK)	91 HD	Age 60 ± 14 yrs, 66% males, 17% DM, 30% CVD, dialysis vintage 44 months, no KTx data available	Mean AHI 34 ± 17/hr  44% had Major OSA (MOSA) defined as AHI≥15 together with significant desaturation (ODI≥15) or symptoms of daytime sleepiness Epworth>10	44 months	No association of AHI, ODI or MOSA with mortality	No
Tang et al. <sup>22</sup> , 2010 (China)	93 PD	Age 55 ± 15 yrs, 52% males, 45% DM, 22% CVD, dialysis vintage 10 months, 14% had KTx	Median AHI = 22/h (interquartile range 3–48/hr)  55% had Sleep Apnea (SA) syndrome defined as AHI ≥15	41 months	SA syndrome associated with increased mortality in multivariable analysis.	No

<p>Xu et al.<sup>14</sup>, 2016, (Korea)</p>	<p>103 CKD (out of total 1454 patients)</p>	<p>Age 67 ± 11 yrs, 58% males, 22% DM, eGFR 49 ± 11 ml/min/1.73m<sup>2</sup>, no KTx data available</p>	<p>Mean RDI 29 ± 22/hr</p>	<p>47 months</p>	<p>Central Sleep Apnea is associated with all-cause mortality</p> <p>No association of OSA or RDI with mortality</p>	<p>Yes, patients referred to sleep clinic</p>
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Supplemental Table 2. Missing data for key variables

Variable	ALL	Alive	Died	p-value
	<i>n</i> missing (%)	<i>n</i> missing (%)	<i>n</i> missing (%)	
Sleep variables				
Apnea hypopnea index	0 (0%)	0 (0%)	0 (0%)	--
Nocturnal hypoxemia	3 (2%)	2 (2%)	1 (1%)	0.99
Mean oxygen saturation	7 (4%)	5 (5%)	2 (2%)	0.45
Oxygen Desaturation index	5 (3%)	3 (3%)	2 (2%)	0.99
Total sleep	0 (0%)	0 (0%)	0 (0%)	--
Sleep efficiency	0 (0%)	0 (0%)	0 (0%)	--
Periodic leg movement index	2 (1%)	1 (1%)	1 (1%)	0.99
Covariates				
Age	0 (0%)	0 (0%)	0 (0%)	--
Sex	0 (0%)	0 (0%)	0 (0%)	--
Kidney disease	0 (0%)	0 (0%)	0 (0%)	--
Kidney transplant recipient	0 (0%)	0 (0%)	0 (0%)	--
Race	0 (0%)	0 (0%)	0 (0%)	--
Diabetes	15 (8%)	7 (7%)	8 (10%)	0.79
BMI	23 (13%)	9 (9%)	14 (17%)	0.22

Supplemental Table 3. Sensitivity analysis of association of sleep measures with mortality by censoring at the time of kidney transplant

Variable	Primary analysis		Analysis censored at time of kidney transplant	
	HR (95% CI)	p-value	HR (95% CI)	p-value
Hypoxemia-based measures				
Apnea hypopnea index, for every 5 events/hour higher	1.01(0.96,1.05)	0.75	1.01(0.96,1.05)	0.81
Nocturnal hypoxemia (proportion of sleep time with oxygen saturation <90%), for every 10 percent higher <sup>#</sup>	1.23(1.08,1.41)	0.002	1.11(0.94,1.31)	0.20
Mean oxygen saturation, for every 10 percent lower	10.21(2.76,37.77)	<0.001	6.27(1.27,31.08)	0.02
Oxygen Desaturation index, for every 10 events/hour higher <sup>#</sup>	1.01(0.90,1.14)	0.86	1.01(0.89,1.14)	0.92
Other PSG measures				
Total sleep, for every hour lower**	1.06 (0.93,1.22)	0.38	0.98(0.83,1.15)	0.78
Sleep efficiency, for every 10 percent lower	1.05(0.88,1.25)	0.6	0.99(0.81,1.22)	0.92
Periodic leg movement index, for every 10 events/hour higher	1.00(0.96,1.05)	0.99	0.98(0.93,1.03)	0.45

\* Adjusted model is adjusted for age, sex, race, diabetes, BMI, renal function status (CKD or ESKD).

\*\* Time-to-mortality was calculated from time of transplantation to account for varying times participants received kidney transplant.

Supplemental Figure 1. Participant enrollment in the study

