

Infrequent Provision of Palliative Care to Patients with Dialysis-Requiring Acute Kidney Injury

Supplement Material

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Supplemental Table 1: ICD-9-CM codes used to define study criteria, comorbidities, and procedures

Supplemental Table 2: Factors associated with a palliative care encounter in patients ages 65 years and over, including health insurance status as a covariate

Supplemental Figure 1: Factors associated with provision of palliative care in patients without acute kidney injury (AKI). Confidence intervals that do not cross 1 denote statistical significance.

Supplemental Figure 2: Factors associated with provision of palliative care in patients with acute kidney injury NOT requiring dialysis. Confidence intervals that do not cross 1 denote statistical significance.

Table 1: ICD-9-CM codes used to define study criteria, comorbidities, and procedures

Disease or Procedure	ICD-9-CM Code
Inclusion criteria	
Acute kidney injury	Diagnosis code 584
Acute kidney injury requiring dialysis (AKI-D)	584 plus one of the following: Diagnosis code V45.1, V56.0, V56.1 Procedure code 39.95
Exclusion criteria	
End-stage renal disease	Diagnosis code 585.6 Procedure code 39.27, 39.42, 39.43, 39.93, 54.98 OR One of the following codes without diagnosis code 584: Diagnosis code V45.1, V56.0, V56.1, V56.2, V56.3, V56.8 Procedure code 39.95
Comorbidities	Diagnosis code
Acute leukemia	204.0, 204.2, 205.0, 205.2, 205.3, 206.0, 206.2, 207.0, 207.2, 208.0, 208.2
Acute pancreatitis	577.0
Acute respiratory distress syndrome	One of 518.5, 518.81, or 518.82 AND Procedure code 96.7
Cancer	140-209, 238.4-238.7
Cardiogenic shock	785.51
Chronic kidney disease	250.4, 403, 404, 585.1, 585.2, 585.3, 585.4, 585.5, 585.9, 586
Chronic obstructive pulmonary disease	491, 492, 496
Cirrhosis	456.0, 456.1, 456.2, 567.23, 572.2, 572.3, 572.4
Congestive heart failure	425, 428, 514, 518.4
Coronary artery disease	410, 411, 412, 413, 414, 429.7
Dementia	290, 294.1, 294.2, 331.0, 331.1, 331.2, 331.82, 797

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Disease or Procedure	ICD-9-CM Code
Diabetes	250
Intracranial hemorrhage	430, 431, 432
Ischemic stroke	434, 436
Pulmonary fibrosis	515, 516.3
Sepsis	003.1, 036.2, 038.0, 038.1, 038.2, 038.3, 038.40, 038.41, 038.42, 038.43, 038.44, 038.49, 038.8, 038.9, 785.52, 790.7, 995.91, 995.92
Hospital procedures	Procedure code
Cardiopulmonary resuscitation	99.6
Extracorporeal membrane oxygenation	39.65
Left ventricular assist device	37.62, 37.65, 37.66, 37.68
Mechanical ventilation	96.04, 96.05, 96.7

^aIf a higher level code is listed, all lower-level codes are also included. For example, if ICD-9 code 584 is listed, then all of 584.5, 584.6, 584.7, 584.8, 584.9 were also included.

Table 2: Factors associated with a palliative care encounter in patients ages 65 years and over within groups identified by acute kidney injury status, including health insurance status as a covariate

	Acute Kidney Injury Status					
	No AKI		AKI - No Dialysis		AKI - with Dialysis	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Demographics						
Sex						
Female	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
Male	0.96 (0.94-0.98)	0.85 (0.83-0.86)	0.92 (0.89-0.94)	0.84 (0.81-0.86)	1.03 (0.90-1.18)	0.96 (0.83-1.10)
Race						
White	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
Black	0.92 (0.86-0.97)	0.77 (0.72-0.82)	0.77 (0.72-0.83)	0.74 (0.69-0.80)	0.78 (0.62-0.99)	0.73 (0.58-0.93)
Hispanic	0.86 (0.79-0.94)	0.82 (0.75-0.91)	0.77 (0.70-0.84)	0.74 (0.67-0.82)	0.66 (0.47-0.92)	0.66 (0.46-0.93)
Other race	1.01 (0.94-1.08)	0.82 (0.76-0.90)	1.07 (0.97-1.17)	0.91 (0.82-1.00)	0.75 (0.54-1.04)	0.64 (0.45-0.91)
Health insurance						
Medicare	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
Private insurance	1.67 (1.51-1.84)	1.93 (1.73-2.14)	1.25 (1.15-1.35)	1.25 (1.15-1.36)	1.28 (0.97-1.69)	1.22 (0.93-1.61)
Self-pay/other insurance	4.72 (3.93-5.67)	5.82 (4.80-7.06)	2.57 (2.16-3.06)	2.92 (2.43-3.52)	1.34 (0.86-2.09)	1.42 (0.89-2.26)
Median household income for patient's zip code						
Under \$39,000	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
\$39,000 to \$47,999	1.12 (1.07-1.17)	1.11 (1.06-1.16)	1.14 (1.07-1.21)	1.08 (1.02-1.15)	1.05 (0.85-1.28)	0.99 (0.81-1.23)
\$48,000 to \$62,999	1.23 (1.18-1.30)	1.15 (1.09-1.21)	1.22 (1.14-1.31)	1.11 (1.04-1.18)	1.09 (0.88-1.35)	1.00 (0.79-1.25)
\$63,000 and over	1.34 (1.26-1.43)	1.20 (1.12-1.28)	1.34 (1.24-1.45)	1.13 (1.05-1.22)	1.13 (0.91-1.41)	0.96 (0.76-1.21)
Hospital-Level Variables						
Hospital region						
South	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
Northeast	0.99 (0.90-1.08)	0.80 (0.72-0.88)	1.02 (0.92-1.14)	0.82 (0.73-0.92)	1.14 (0.89-1.45)	0.89 (0.68-1.17)
Midwest	1.00 (0.91-1.10)	0.90 (0.82-0.99)	0.98 (0.88-1.10)	0.86 (0.78-0.96)	1.14 (0.88-1.47)	0.96 (0.74-1.26)
West	1.28 (1.18-1.40)	1.16 (1.06-1.27)	1.32 (1.20-1.46)	1.16 (1.05-1.28)	1.25 (0.98-1.60)	1.32 (1.02-1.71)
Hospital bed number						
Large	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
Small	0.68 (0.63-0.74)	0.75 (0.68-0.82)	0.72 (0.65-0.81)	0.76 (0.68-0.85)	0.59 (0.43-0.82)	0.59 (0.42-0.83)
Medium	0.92 (0.85-0.99)	0.94 (0.87-1.02)	0.91 (0.83-0.99)	0.94 (0.86-1.03)	0.77 (0.63-0.95)	0.82 (0.66-1.02)

	Acute Kidney Injury Status					
	No AKI		AKI - No Dialysis		AKI - with Dialysis	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Hospital teaching status						
Urban teaching	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
Rural	0.64 (0.59-0.71)	0.69 (0.62-0.76)	0.66 (0.59-0.74)	0.71 (0.63-0.81)	0.68 (0.46-0.99)	0.66 (0.44-0.99)
Urban, nonteaching	0.83 (0.77-0.89)	0.83 (0.77-0.90)	0.85 (0.79-0.92)	0.86 (0.80-0.94)	0.63 (0.52-0.76)	0.64 (0.52-0.79)
Ownership						
Private nonprofit	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
Government nonfederal	0.89 (0.79-1.00)	0.85 (0.75-0.97)	0.90 (0.74-1.09)	0.86 (0.71-1.03)	0.87 (0.60-1.25)	0.77 (0.53-1.11)
Private investor-owned	0.54 (0.49-0.61)	0.56 (0.49-0.63)	0.49 (0.44-0.55)	0.49 (0.43-0.55)	0.43 (0.32-0.57)	0.48 (0.35-0.67)
Comorbidities^p						
Acute pancreatitis	0.56 (0.49-0.64)	0.71 (0.62-0.81)	0.78 (0.68-0.89)	0.76 (0.66-0.88)	1.01 (0.66-1.57)	0.80 (0.51-1.27)
Acute respiratory distress syndrome	7.15 (6.80-7.52)	1.21 (1.11-1.30)	3.09 (2.95-3.24)	1.11 (1.02-1.21)	2.43 (2.12-2.79)	1.27 (0.99-1.63)
Cancer	3.96 (3.85-4.07)	4.97 (4.83-5.11)	2.72 (2.63-2.82)	3.08 (2.97-3.19)	1.66 (1.41-1.96)	1.75 (1.47-2.08)
Cardiogenic shock	5.72 (5.22-6.26)	3.26 (2.89-3.69)	3.23 (2.99-3.50)	2.43 (2.22-2.67)	1.88 (1.52-2.33)	1.60 (1.25-2.05)
Chronic kidney disease	1.11 (1.08-1.15)	1.09 (1.06-1.13)	0.71 (0.69-0.73)	0.88 (0.85-0.91)	0.58 (0.51-0.67)	0.82 (0.70-0.96)
Chronic obstructive pulmonary disease	1.24 (1.21-1.27)	1.11 (1.08-1.14)	0.99 (0.96-1.03)	0.99 (0.96-1.03)	1.20 (1.02-1.40)	1.24 (1.05-1.46)
Cirrhosis	2.30 (2.11-2.49)	1.98 (1.81-2.17)	2.47 (2.28-2.68)	2.40 (2.20-2.63)	1.56 (1.15-2.12)	1.35 (0.96-1.89)
Congestive heart failure	1.46 (1.43-1.50)	1.47 (1.43-1.51)	1.13 (1.10-1.17)	1.30 (1.26-1.34)	1.04 (0.90-1.19)	1.21 (1.04-1.42)
Coronary artery disease	0.82 (0.80-0.84)	0.87 (0.85-0.89)	0.85 (0.83-0.88)	0.95 (0.92-0.98)	0.86 (0.75-0.98)	0.90 (0.78-1.04)
Dementia	2.40 (2.33-2.47)	2.67 (2.60-2.75)	1.73 (1.67-1.79)	2.04 (1.96-2.12)	1.14 (0.88-1.48)	1.49 (1.14-1.96)
Diabetes	0.73 (0.71-0.75)	0.74 (0.72-0.76)	0.62 (0.60-0.64)	0.72 (0.69-0.74)	0.61 (0.53-0.70)	0.72 (0.62-0.84)
Intracranial hemorrhage	8.90 (8.46-9.36)	6.55 (6.20-6.93)	3.26 (2.95-3.61)	2.66 (2.37-2.99)	1.74 (0.97-3.11)	1.48 (0.77-2.86)
Ischemic stroke	3.10 (2.99-3.22)	2.79 (2.68-2.91)	2.12 (1.98-2.27)	2.04 (1.90-2.19)	1.70 (1.22-2.37)	1.45 (1.00-2.11)
Pulmonary fibrosis	2.01 (1.90-2.12)	1.87 (1.76-1.98)	1.50 (1.38-1.64)	1.50 (1.36-1.64)	1.44 (0.92-2.25)	1.32 (0.84-2.09)
Sepsis	3.73 (3.60-3.87)	2.31 (2.22-2.40)	2.76 (2.66-2.85)	2.13 (2.05-2.21)	2.32 (2.04-2.63)	1.69 (1.45-1.98)
Procedures^p						
Cardiopulmonary resuscitation	1.54 (1.41-1.67)	0.78 (0.72-0.86)	1.72 (1.59-1.87)	0.93 (0.84-1.02)	1.29 (1.01-1.65)	0.87 (0.67-1.13)
Extracorporeal membrane oxygenation	4.97 (1.88-13.15)	4.36 (1.53-12.44)	2.91 (1.60-5.30)	1.43 (0.73-2.82)	0.75 (0.10-5.81)	0.71 (0.86-5.88)
Left ventricular assist	1.37 (0.78-2.40)	1.45 (0.74-2.84)	1.57 (1.05-2.34)	1.21 (0.76-1.90)	0.97 (0.31-2.97)	0.63 (0.20-1.95)

	Acute Kidney Injury Status					
	No AKI		AKI - No Dialysis		AKI - with Dialysis	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
device						
Mechanical ventilation	6.81 (6.51-7.12)	4.51 (4.21-4.83)	3.03 (2.90-3.17)	2.13 (1.96-2.32)	2.54 (2.22-2.91)	1.64 (1.25-2.14)
Operating room procedure	0.24 (0.23-0.25)	0.24 (0.23-0.26)	0.64 (0.61-0.67)	0.51 (0.49-0.54)	0.99 (0.84-1.16)	0.76 (0.64-0.89)

^aAll estimates are adjusted for the demographic factors, hospital-level variables, comorbidities, and procedures listed in this table.

^pThe reference group for each of the comorbidities and procedures indicated in the table is comprised of those individuals who did not possess that specific comorbidity or experience the indicated procedure.

Figure 1: Factors associated with provision of palliative care in patients without acute kidney injury (AKI). Confidence intervals that do not across 1 denote statistical significance.

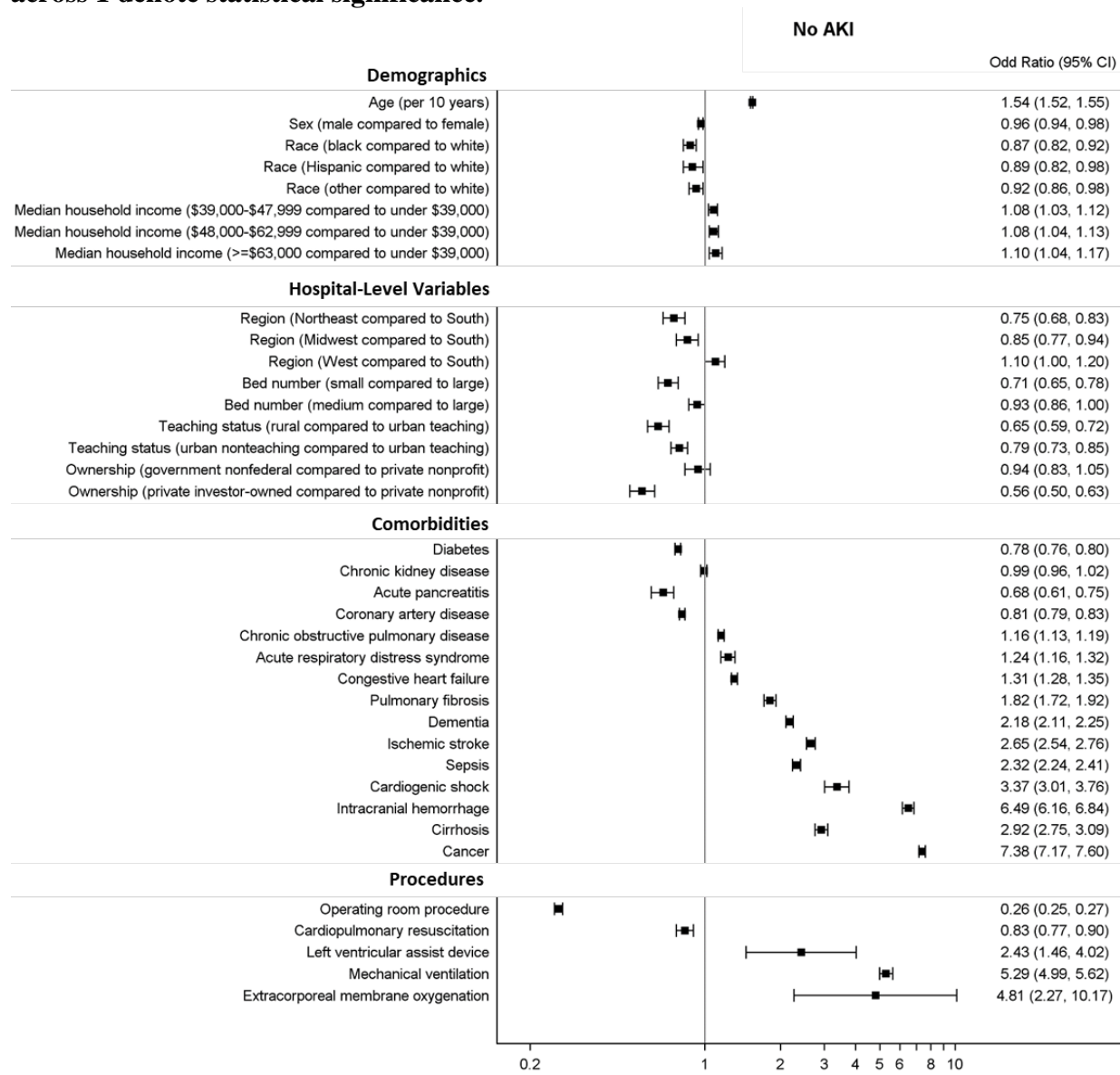


Figure 2: Factors associated with provision of palliative care in patients with acute kidney injury NOT requiring dialysis. Confidence intervals that do not across 1 denote statistical significance.

