

APPENDIX

1. Exclusion criteria

Exclusion criteria	ICD-9-CM code	CPT code
End stage kidney disease	585.6	90970
Kidney transplantation	55.61, 55.69, 996.81, V42.0	50360, 50365, 50370, 50380

2. Diagnosis

Diagnosis	ICD-9-CM code
Congestive heart failure	398.91, 402.11, 402.91, 404.11, 404.13, 404.91, 404.93, 428.0-428.9
Cardiac arrhythmias	426.10, 426.11, 426.13, 426.2-426.53, 426.6-426.89, 427.0, 427.2, 427.31, 427.60, 427.9, 785.0, V45.0, V53.3
Valvular disease	093.20-093.24, 394.0-397.1, 424.0-424.91, 746.3-746.6, V42.2, V43.3
Pulmonary circulation disorders	416.0-416.9, 417.9
Peripheral vascular disorders	440.0-440.9, 441.2, 441.4, 441.7, 441.9, 443.1-443.9, 447.1, 557.1, 557.9, V43.4
Hypertension	401.1, 401.9, 402.10, 402.90, 404.10, 404.90, 405.11, 405.19, 405.91, 405.99
Paralysis	342.0-342.12, 342.9-344.9
Other neurological disorders	331.9, 332.0, 333.4, 333.5, 334.0-335.9, 340, 341.1-341.9, 345.00-345.11, 345.40-345.51, 345.80-345.91, 348.1, 348.3, 780.3, 784.3
Diabetes, uncomplicated	250.00-250.33
Diabetes, complicated	250.40-250.73, 250.90-250.93
Hypothyroidism	243-244.2, 244.8, 244.9
Liver disease	070.32, 070.33, 070.54, 456.0, 456.1, 456.20, 456.21, 571.0, 571.2, 571.3, 571.40-571.49, 571.5, 571.6, 571.8, 571.9, 572.3, 572.8, V42.7
Peptic ulcer disease excluding bleeding	531.70, 531.90, 532.70, 532.90, 533.70, 533.90, 534.70, 534.90, V12.71
AIDS	042-044.9
Lymphoma	200.00-202.38, 202.50-203.01, 203.8-203.81, 238.6, 273.3, V10.71, V10.72, V10.79
Metastatic cancer	196.0-199.1
Solid tumor without metastasis	140.0-172.9, 174.0-175.9, 179-195.8, V10.00-V10.9
Rheumatoid arthritis/collagen vascular diseases	701.0, 710.0-710.9, 714.0-714.9, 720.0-720.9, 725
Coagulopathy	286.0-286.9, 287.1, 287.3-287.5
Obesity	278.0
Weight loss	260-263.9
Fluid and electrolyte disorders	276.0-276.9
Blood loss anemia	280.0
Deficiency anemias	280.1-281.9, 285.9
Drug abuse	292.0, 292.82-292.89, 292.9, 304.00-304.93, 305.20-305.93
Psychoses	295.00-298.9, 299.10-299.11
Depression	300.4, 301.12, 309.0, 309.1, 311

Acute myocardial infarction	410.0-410.9
Sepsis	038.0-038.9, 020.2, 112.5, 112.81, 790.7
Pneumonia	480.0-480.9, 481, 482.0-482.9, 483.0-483.8, 484.1-484.8, 485, 486
Chronic kidney disease	582.0-582.9, 583.0-583.9, 585.1-585.9, 586, 588.0-588.9
Hypertensive disease in pregnancy	642.0-642.9

3. Procedures

Procedures	ICD-9-CM code	CPT code
Hemodialysis	39.95	90935, 90937
Peritoneal dialysis	54.98	
Other dialysis		90945, 90947, 90999
Critical care		99291, 99292
Mechanical ventilation		94002, 94656, 94003, 94657, 94660
HSCT	41.0	38240, 38241
Cardiac surgery	35.10, 35.11, 35.12, 35.13, 35.14, 35.20, 35.21, 35.22, 35.23, 35.24, 35.25, 35.26, 35.27, 35.28, 35.42, 35.51, 35.53, 35.54, 35.55, 35.60, 35.61, 35.62, 35.81, 35.82, 35.92, 35.93, 35.94, 35.95, 35.99, 36.03, 36.10, 36.11, 36.12, 36.13, 36.14, 36.15, 36.16, 36.17, 36.19, 36.2, 36.31, 36.33, 36.9, 36.91, 37.10, 37.11, 37.12, 37.31, 37.33, 37.34, 37.36, 37.4, 37.49, 37.51, 37.9, 39.63	32660, 33020, 33025, 33030, 33031, 33050, 33120, 33130, 33140, 33141, 33201, 33236, 33237, 33243, 33245, 33246, 33250, 33253, 33259, 33261, 33300, 33305, 33310, 33315, 33400, 33403, 33405, 33406, 33410, 33411, 33412, 33413, 33414, 33415, 33422, 33425, 33426, 33427, 33430, 33460, 33463, 33464, 33465, 33474, 33475, 33500, 33502, 33504, 33506, 33510, 33511, 33512, 33513, 33514, 33517, 33518, 33519, 33521, 33522, 33523, 33530, 33530, 33533, 33534, 33535, 33536, 33542, 33545, 33572, 33600, 33602, 33612, 33641, 33647, 33660, 33681, 33702, 33710, 33720, 33730, 33732, 33774, 33820, 33824, 33917, 33922, 33945, 33999
Thoracic surgery	01.32, 07.80, 07.83, 07.84, 31.21, 32.1, 32.21, 32.22, 32.23, 32.29, 32.30, 32.39, 32.4, 32.41, 32.50, 32.59, 32.6, 32.9, 33.1, 33.20, 33.25, 33.31, 33.34, 33.39, 33.41, 33.42, 33.48, 33.49, 33.50, 33.51, 33.53, 33.93, 33.98, 33.98, 33.99, 34.02, 34.03, 34.05, 34.06, 34.09, 34.1, 34.20, 34.22, 34.26, 34.3, 34.4, 34.51, 34.52, 34.59, 34.73, 34.79, 34.81, 34.82, 34.84, 34.85, 34.89, 34.91, 34.92, 34.93, 34.99, 40.64, 42.42, 42.51, 42.52, 42.53, 42.54, 42.55,	19260, 19271, 19272, 20101, 21600, 21615, 21630, 32035, 32036, 32095, 32100, 32110, 32120, 32124, 32140, 32141, 32150, 32151, 32160, 32200, 32201, 32220, 32225, 32310, 32320, 32402, 32440, 32442, 32445, 32480, 32482, 32484, 32486, 32488, 32491, 32500, 32520, 32522, 32525, 32601, 32602, 32604, 32605, 32606, 32650, 32651, 32652, 32653, 32654, 32655, 32656, 32657, 32658, 32659, 32660, 32661, 32662, 32663, 32664, 32665, 32810, 32815, 32851, 32852, 32853, 32854, 32905, 32906, 32940, 35820, 35905, 38746, 39000, 39010, 39200, 39220, 39400, 39560, 39561, 43101,

	42.58, 42.59, 53.81	43112, 43113, 43130, 43135, 43415, 60520, 60521, 60522, 64746, 64752, 64809
Abdominal surgery	07.12, 07.21, 07.22, 07.29, 07.3, 07.44, 17.35, 40.52, 40.53, 41.2, 41.41, 41.42, 41.43, 41.5, 42.09, 42.11, 42.19, 42.21, 42.22, 42.23, 42.25, 42.31, 42.32, 42.40, 42.41, 42.42, 42.54, 42.59, 42.62, 42.64, 42.65, 42.68, 42.69, 42.7, 42.83, 42.84, 42.89, 42.91, 42.92, 42.99, 43.0, 43.19, 43.3, 43.42, 43.5, 43.6, 43.7, 43.81, 43.89, 43.99, 44.01, 44.02, 44.15, 44.31, 44.38, 44.39, 44.5, 44.61, 44.62, 44.63, 44.64, 44.65, 44.66, 44.68, 44.95, 44.96, 44.97, 44.98, 45.00, 45.01, 45.02, 45.03, 45.15, 45.26, 45.33, 45.41, 45.41, 45.51, 45.52, 45.61, 45.62, 45.63, 45.74, 45.76, 45.79, 45.81, 45.82, 45.83, 45.91, 45.93, 45.95, 45.95, 46.01, 46.03, 46.10, 46.11, 46.13, 46.14, 46.23, 46.31, 46.32, 46.39, 46.41, 46.43, 46.51, 46.60, 46.62, 46.63, 46.64, 46.72, 46.74, 46.76, 46.76, 46.79, 46.80, 46.81, 46.82, 46.9, 46.93, 46.94, 47.01, 47.09, 47.01, 47.11, 47.19, 47.2, 47.91, 48.0, 48.1, 48.25, 48.35, 48.49, 48.49, 48.59, 48.59, 48.62, 48.73, 48.75, 48.79, 48.9, 49.51, 49.74, 50.0, 50.12, 50.13, 50.21, 50.22, 50.3, 50.4, 50.61, 50.69, 50.91, 50.92, 50.93, 50.94, 50.99, 51.04, 51.13, 51.21, 51.22, 51.23, 51.36, 51.37, 51.39, 51.41, 51.42, 51.49, 51.51, 51.59, 51.61, 51.62, 51.63, 51.69, 51.71, 51.72, 51.79, 51.82, 51.83, 51.90-51.99, 52.09, 52.12, 52.3, 52.4, 52.52, 52.59, 52.6, 52.7, 52.90-52.99, 54.11, 54.19, 54.21, 54.4, 54.51,	20102, 38100, 38101, 38102, 38120, 38129, 38570, 38571, 38572, 38747, 39560, 39561, 43100, 43101, 43107, 43108, 43112, 43113, 43117, 43121, 43122, 43123, 43124, 43130, 43135, 43280, 43289, 43300, 43305, 43310, 43312, 43324, 43325, 43326, 43330, 43331, 43360, 43361, 43420, 43500, 43501, 43520, 43610, 43611, 43620, 43621, 43631, 43632, 43633, 43635, 43638, 43639, 43640, 43644, 43651, 43652, 43653, 43659, 43770, 43820, 43825, 43830, 43832, 43840, 43848, 43850, 43860, 43870, 43880, 44005, 44010, 44020, 44021, 44025, 44110, 44111, 44120, 44121, 44125, 44130, 44140, 44141, 44143, 44144, 44145, 44146, 44147, 44150, 44151, 44152, 44153, 44155, 44156, 44160, 44180, 44186, 44200, 44201, 44202, 44203, 44204, 44205, 44206, 44207, 44208, 44210, 44211, 44213, 44238, 44239, 44312, 44314, 44320, 44322, 44345, 44620, 44625, 44626, 44640, 44650, 44700, 44800, 44820, 44900, 44950, 44955, 44960, 44970, 45110, 45111, 45112, 45113, 45116, 45119, 45123, 45130, 45136, 45160, 45500, 45505, 45540, 45550, 45562, 45563, 46040, 46060, 47010, 47011, 47120, 47122, 47125, 47130, 47135, 47350, 47360, 47361, 47370, 47379, 47400, 47420, 47480, 47562, 47563, 47564, 47600, 47605, 47610, 47612, 47620, 47711, 47715, 47720, 47740, 47741, 47760, 47780, 47785, 48005, 48120, 48140, 48145, 48146, 48150, 48153, 48154, 48155, 48180, 48510, 48520, 48540, 48545, 49000, 49010, 49020, 49021, 49040, 49041, 49060, 49061, 49255, 49320, 49321, 49329, 49904, 49905, 50130, 51080, 58823, 60540, 60545, 60650, 61711, 74290

	54.51, 54.74, 54.75, 54.92, 55.11, 55.12, 57.34, 57.6, 65.64, 86.4, 96.39	
Vascular surgery	07.43, 35.93, 37.11, 38.01, 38.04, 38.05, 38.06, 38.07, 38.08, 38.09, 38.10, 38.11, 38.12, 38.13, 38.14, 38.15, 38.16, 38.18, 38.31, 38.32, 38.33, 38.34, 38.35, 38.36, 38.38, 38.39, 38.40, 38.41, 38.42, 38.43, 38.44, 38.45, 38.46, 38.47, 38.48, 38.49, 38.60, 38.61, 38.62, 38.63, 38.64, 38.65, 38.66, 38.67, 38.68, 38.69, 38.7, 38.80, 38.81, 38.82, 38.83, 38.84, 38.85, 38.86, 38.87, 38.88, 38.89, 39.1, 39.21-39.29, 39.50-39.59, 39.90-39.99, 44.91	30915, 30920, 33310, 33315, 33320, 33322, 33330, 33335, 33502, 33504, 33530, 33774, 33800, 33860, 33861, 33863, 33877, 33910, 33915, 33916, 33917, 34001, 34051, 34101, 34111, 34151, 34201, 34203, 34401, 34421, 34451, 34471, 34490, 34812, 34813, 34820, 34830, 34831, 34832, 34833, 35001, 35002, 35011, 35021, 35022, 35045, 35081, 35082, 35091, 35092, 35102, 35103, 35111, 35112, 35121, 35122, 35131, 35132, 35141, 35142, 35151, 35161, 35201, 35206, 35207, 35211, 35216, 35221, 35226, 35231, 35236, 35241, 35246, 35251, 35256, 35261, 35266, 35271, 35276, 35281, 35286, 35301, 35311, 35321, 35331, 35341, 35351, 35355, 35361, 35371, 35372, 35381, 35390, 35501, 35506, 35516, 35518, 35521, 35531, 35533, 35536, 35546, 35551, 35556, 35558, 35560, 35563, 35565, 35566, 35571, 35583, 35585, 35601, 35606, 35612, 35616, 35621, 35623, 35626, 35631, 35636, 35641, 35646, 35647, 35650, 35654, 35656, 35661, 35663, 35665, 35666, 35671, 35681, 35682, 35683, 35691, 35694, 35695, 35700, 35701, 35721, 35741, 35761, 35875, 35876, 35879, 35881, 37145, 37160, 37181, 37565, 37605, 37615, 37616, 37617, 37618, 37650, 37660, 61609, 61611, 61612, 61680, 61682, 61684, 61686, 61690, 61692, 61697, 61698, 61700, 61702, 61703, 61705, 61710, 61711
Usage of contrast media	0.22, 0.23, 0.24, 0.45, 0.46, 0.47, 0.48, 0.52, 0.55, 0.59, 0.61, 0.62, 0.63, 0.65, 0.66, 35.96, 36.04, 36.06, 36.07, 37.22, 37.23, 37.33, 37.68, 88.41, 88.42, 88.43, 88.44, 88.45, 88.47, 88.48, 88.53, 88.54, 88.55, 88.56, 88.57	34802, 34803, 34804, 34808, 34820, 34825, 34826, 34900, 35452, 35454, 35456, 35459, 35460, 35470, 35471, 35473, 35474, 35475, 35476, 35493, 35495, 36002, 36005, 36011, 36012, 36215, 36216, 36217, 36218, 36245, 36246, 36247, 36248, 36478, 36481, 37184, 37187, 37195, 37201, 37202, 37203, 37204, 37205, 37206, 37207, 37208, 37209, 37210, 37215, 75774, 92973, 92974, 92980, 92981, 92982,

		92984, 92986, 92997, 92998, 93508, 93510, 93526, 93527, 93529, 93531, 93532, 93539, 93540, 93541, 93542, 93543, 93544, 93545, 93555, 93556, 93568, 93580, 93581, 93609, G0290, G0291
Obstetric procedures	72.0-72.9, 73.00-73.99, 74.0-74.99	59510, 59514, 59515, 59620, 59525, 59618, 59622, 59610, 59612, 59614, 59400, 59410

4. Examples for diagnosis and staging according to RIFLE, AKIN and KDIGO

Case	Serum Creatinine (mg/dL)					Baseline SCr	RRT	AKI staging			
	Mean pre-admission outpatient value	Day 1	Day 2	Day 3	Day 7			KDIGO	RIFLE	AKIN	CK
A	1.0	1.0	1.1	1.2	2.0	1.0	No	Stage 2	Injury	No AKI	No AKI
B	Not available	2.2	2.0	2.5	3.0	2.0	Yes	Stage 3	Risk	Stage 3	Stage 2
C	Not available	3.6	3.8	4.0	3.8	3.6	No	Stage 3	Stage 1	Stage 1	No AKI

5. Comparisons of incidence, in-hospital mortality, unadjusted and adjusted odds ratio for mortality, associated increase in length of stay and cost of acute kidney injury according to four definitions

	Incidence (No. of Pats)	Mortality	OR for mortality*				Median increased LOS [¶]	Median increased cost [¶]
			Unadjusted	C statistic	Adjusted	C statistic		
No AKI								
RIFLE	22070	0.7%	NA	NA	NA	NA	NA	NA
AKIN	21937	0.7%	NA	NA	NA	NA	NA	NA
KDIGO	21561	0.6%	NA	NA	NA	NA	NA	NA
CK	24191	1.0%	NA	NA	NA	NA	NA	NA
AKI								
RIFLE	3789	11.1%	17.3 (14.3-20.8)	0.80	2.9 (2.2-3.6)	0.96	2.9 (2.7-3.1)	7.6 (6.9-8.3)
AKIN	3922	10.8%	17.0 (14.1-20.5)	0.80	2.6 (2.0-3.3)	0.96	2.5 (2.3-2.7)	6.6 (5.9-7.3)
KDIGO	4298	10.3%	18.1 (14.9-22.0)	0.81	2.8 (2.2-3.6)	0.96	2.8 (2.6-2.9)	7.1 (6.4-7.8)
CK	1668	19.6%	23.3 (19.6-27.7)	0.76	5.2 (4.1-6.6)	0.96	2.8 (2.4-3.1)	10.9 (9.3-12.5)
AKI stages								
RIFLE R	2592	5.9%	8.6 (6.9-10.8)		2.0 (1.6-2.7)		2.6 (2.3-2.8)	5.5 (4.8-6.3)
RIFLE I	742	14.4%	23.4 (18.1-30.2)	0.82	3.5 (2.5-4.8)	0.96	4.0 (3.4-4.6)	14.6(12.6-16.7)
RIFLE F	455	35.4%	75.9 (59.3-97.3)		8.7 (6.1-12.4)		7.1 (6.1-8.1)	33.3 (27.5-39.1)
AKIN 1	2708	5.4%	8.0 (6.4-10.1)		1.8 (1.4-2.4)		2.1 (1.8-2.3)	4.7 (3.9-5.5)
AKIN 2	723	13.3%	21.5 (16.5-28.1)	0.82	3.1 (2.2-4.3)	0.96	3.9 (3.2-4.6)	14.2 (12.1-16.2)
AKIN 3	491	36.9%	82.1 (64.4-104.5)		9.4 (6.6-13.4)		6.5 (5.5-7.4)	29.5 (23.7-35.2)
KDIGO 1	3061	5.3%	8.9 (7.0-11.2)		2.0 (1.5-2.7)		2.5 (2.3-2.7)	5.4 (4.7-6.1)
KDIGO 2	723	13.4%	24.4 (18.6-32.1)	0.83	3.4 (2.4-4.9)	0.96	4.2 (3.5-4.9)	15.2 (13.3-17.2)
KDIGO 3	514	35.4%	86.4 (67.4-110.6)		10.1 (7.1-14.4)		6.4 (5.3-7.5)	27.3 (22.6-32.0)
CK 1	929	11.5%	12.4 (9.8-15.7)		3.3 (2.5-4.5)		2.3 (1.9-2.7)	7.2 (5.9-8.5)
CK 2	514	26.1%	33.6 (26.6-42.5)	0.76	7.8 (5.7-10.7)	0.96	3.3 (2.6-4.1)	15.5 (12.0-19.0)
CK3	225	38.2%	59.0 (43.9-79.4)		9.7 (6.4-14.7)		5.3 (3.5-7.1)	25.5 (20.2-30.8)

* Results show odds ratios with 95% confidence intervals from logistic regression models with reference to no AKI. Adjusted model is adjusted for age, gender, race, procedures, diagnoses, DRG weights, and laboratory values including estimated glomerular filtration rate.

¶ Results show the increase in length of stay and costs in acute kidney injury (AKI) vs. no acute kidney injury, using multivariable adjusted quantile regression models adjusting for age, gender, race, procedures, diagnoses, laboratory values including estimated glomerular filtration rate and DRG weights. Values represent the increase in days or 1,000 USD in those with AKI versus no AKI.