Improving Large-Scale Estimation and Inference for Profiling Health Care Providers: Supporting Information

Wenbo Wu, Yuan Yang, Jian Kang, and Kevin He

Appendix A Score and Information Matrix of Log-Likelihood $\ell(\boldsymbol{\gamma}, \boldsymbol{\beta})$

Let $\mathbf{g} \coloneqq [g_{11}, \ldots, g_{1n_1}, \ldots, g_{m1}, \ldots, g_{mn_m}]^\top$, in which $g_{ij} \coloneqq g_{ij}(\gamma_i, \boldsymbol{\beta}) \coloneqq \dot{b}(\gamma_i + \mathbf{Z}_{ij}^\top \boldsymbol{\beta})$, and let $\dot{g}_{ij}$ denote the first order derivative of g_{ij}. With $\boldsymbol{\theta} \coloneqq [\boldsymbol{\gamma}^\top, \boldsymbol{\beta}^\top]^\top$, the score and Fisher information of $\ell(\boldsymbol{\gamma}, \boldsymbol{\beta})$ are given by

$$\mathcal{U}(\boldsymbol{\theta}) \coloneqq \begin{bmatrix} \mathcal{U}(\boldsymbol{\gamma}) \\ \mathcal{U}(\boldsymbol{\beta}) \end{bmatrix}, \quad \mathcal{I}(\boldsymbol{\theta}) \coloneqq \begin{bmatrix} \mathcal{I}(\boldsymbol{\gamma}) & \mathcal{I}^\top(\boldsymbol{\beta}, \boldsymbol{\gamma}) \\ \mathcal{I}(\boldsymbol{\beta}, \boldsymbol{\gamma}) & \mathcal{I}(\boldsymbol{\beta}) \end{bmatrix} = \begin{bmatrix} \mathcal{I}_{11} & \mathcal{I}_{12} \\ \mathcal{I}_{21} & \mathcal{I}_{22} \end{bmatrix},$$

in which

$$\begin{aligned} \mathcal{U}(\boldsymbol{\gamma}) &= [\mathcal{U}_{1\cdot}, \ldots, \mathcal{U}_{m\cdot}]^\top, \quad \mathcal{I}(\boldsymbol{\gamma}) = \operatorname{diag}(\mathcal{I}_{1\cdot}, \ldots, \mathcal{I}_{m\cdot}), \\ \mathcal{U}(\boldsymbol{\beta}) &= \sum_{i=1}^{m} \sum_{j=1}^{n_i} \mathcal{U}_{ij} \mathbf{Z}_{ij}, \quad \mathcal{I}(\boldsymbol{\beta}) = \sum_{i=1}^{m} \sum_{j=1}^{n_i} \mathcal{I}_{ij} \mathbf{Z}_{ij} \mathbf{Z}_{ij}^\top, \\ \mathcal{I}(\boldsymbol{\beta}, \boldsymbol{\gamma}) &= \left[\sum_{j=1}^{n_1} \mathcal{I}_{1j} \mathbf{Z}_{1j}, \ldots, \sum_{j=1}^{n_m} \mathcal{I}_{mj} \mathbf{Z}_{mj} \right], \end{aligned}$$

with $\mathcal{U}_{ij} \coloneqq Y_{ij} - g_{ij}$ and $\mathcal{I}_{ij} \coloneqq \dot{g}_{ij}$. For convenience, let $\mathcal{D}(\boldsymbol{\gamma}) \coloneqq [\mathcal{I}_{1\cdot}^{-1}, \ldots, \mathcal{I}_{m\cdot}^{-1}]^\top$, a vector of diagonal elements of $\mathcal{I}^{-1}(\boldsymbol{\gamma})$, and $\mathcal{I} \coloneqq [\mathcal{I}_{11}, \ldots, \mathcal{I}_{1n_1}, \ldots, \mathcal{I}_{m1}, \ldots, \mathcal{I}_{mn_m}]^\top$, a vector of $\mathcal{I}_{ij}$'s.

Appendix B Expressions of $V_i(\tau)$ for Different Types of Outcome Y_{ij}

When the cumulative distribution function of O_i given $\mathbf{Z}_i$ is $F_i(o; \gamma_{\mathrm{M}}, \hat{\boldsymbol{\beta}}, \tau)$ with τ being the target of the indirectly standardized measure T_i, the variance $V_i(\tau)$ of O_i given $\mathbf{Z}_i$ is given by

$$V_i(\tau) = \begin{cases} n_i \hat{\sigma}^2 & \text{if } Y_{ij} \text{ is normal;} \\ \tau \sum_{j=1}^{n_i} \dot{b}(\gamma_{\mathrm{M}} + \mathbf{Z}_{ij}^\top \hat{\boldsymbol{\beta}}) \{1 - \tau \dot{b}(\gamma_{\mathrm{M}} + \mathbf{Z}_{ij}^\top \hat{\boldsymbol{\beta}})\} & \text{if } Y_{ij} \text{ is binary;} \\ \tau \sum_{j=1}^{n_i} \dot{b}(\gamma_{\mathrm{M}} + \mathbf{Z}_{ij}^\top \hat{\boldsymbol{\beta}}) & \text{if } Y_{ij} \text{ is Poisson.} \end{cases}$$

Table 1: Type I error rates and powers of exact, score and Wald tests. All values were calculated based on 1,000 independent replicates with $m = 100$, $\sigma^2 = 0.16$, and significance level $\alpha = 0.05$. With correlation ρ varying from 0 to 0.9, rates in Panel A were obtained assuming $\gamma_1 = \gamma_M = \mu = \log(4/11)$. In Panel B, correlation was fixed at $\rho = 0.5$, whereas γ_1 is allowed to vary in terms of relative deviation $(\gamma_1 - \mu)/\sigma$.

Panel A: Type I Error Rates (Left-Tailed, Right-Tailed)

ρ	$n_1 = 11$			$n_1 = 50$		
	exact	score	Wald	exact	score	Wald
0	0.019, 0.027	0.019, 0.040	0.004, 0.033	0.021, 0.030	0.018, 0.037	0.011, 0.036
0.1	0.021, 0.031	0.017, 0.040	0.003, 0.037	0.034, 0.019	0.033, 0.024	0.024, 0.020
0.2	0.032, 0.019	0.032, 0.025	0.010, 0.021	0.018, 0.030	0.018, 0.037	0.013, 0.033
0.3	0.016, 0.034	0.016, 0.044	0.003, 0.039	0.023, 0.028	0.022, 0.037	0.015, 0.032
0.4	0.014, 0.039	0.012, 0.051	0.000, 0.047	0.021, 0.026	0.017, 0.031	0.010, 0.029
0.5	0.025, 0.026	0.022, 0.032	0.001, 0.029	0.019, 0.033	0.019, 0.039	0.014, 0.035
0.6	0.015, 0.032	0.014, 0.041	0.000, 0.035	0.026, 0.021	0.025, 0.029	0.017, 0.023
0.7	0.027, 0.021	0.027, 0.026	0.001, 0.023	0.026, 0.024	0.022, 0.036	0.011, 0.032
0.8	0.027, 0.023	0.025, 0.033	0.000, 0.029	0.023, 0.029	0.018, 0.035	0.007, 0.032
0.9	0.031, 0.020	0.032, 0.023	0.000, 0.021	0.019, 0.031	0.013, 0.041	0.003, 0.036

Panel B: Powers with $\rho = 0.5$

$\frac{\gamma_1 - \mu}{\sigma}$	$n_1 = 11$			$n_1 = 50$		
	exact	score	Wald	exact	score	Wald
-4	0.042	0.035	0.001	0.778	0.730	0.532
-3.6	0.032	0.026	0.002	0.776	0.742	0.635
-3.2	0.056	0.044	0.001	0.615	0.585	0.505
-2.8	0.080	0.064	0.001	0.645	0.612	0.557
-2.4	0.106	0.088	0.001	0.658	0.636	0.602
-2	0.095	0.079	0.003	0.565	0.546	0.515
2	0.218	0.248	0.218	0.680	0.693	0.677
2.4	0.281	0.321	0.271	0.847	0.854	0.844
2.8	0.361	0.391	0.342	0.935	0.938	0.933
3.2	0.447	0.473	0.410	0.977	0.978	0.974
3.6	0.528	0.560	0.464	0.996	0.996	0.996
4	0.553	0.574	0.431	0.993	0.993	0.992

Appendix C Supplementary Table for Simulation Study

Appendix D Application Details

Data are derived from an extensive national ESRD patient database, which is primarily based on Consolidated Renal Operations in a Web-enabled Network (CROWNWeb) facility-reported clinical and administrative data (including CMS-2728 Medical Evidence Form, CMS-2746 Death Notification Form, and CMS-2744 Annual Facility Survey Form and patient tracking data), the Renal Management Information System, the Medicare Enrollment Database, and Medicare claims data. In addition, the database includes transplant data from the Scientific Registry of Transplant Recipients, and data from the Nursing Home Minimum Data Set, the Quality Improvement Evaluation System Business Intelligence Center (which includes Provider and Survey and Certification data from Automated Survey Processing Environment), and the Dialysis Facility Compare.

The database is comprehensive for Medicare patients not enrolled in Medicare Advantage (MA). MA patients are included in all sources but their Medicare payment records are limited to inpatient claims. Non-Medicare patients are included in all sources except for the Medicare payment records. Tracking by dialysis provider and treatment modality is available for all patients including those with only partial or no Medicare coverage.

Information on hospitalizations is obtained from Part A Medicare Inpatient Claims Standard Analysis Files, and past-year comorbidity data are obtained from multiple Part A types (inpatient, home health, hospice, skilled nursing facility claims) only.

Discharges of a patient were excluded if the patient had MA coverage at the time of the discharge, had ESRD for 90 days or less at time of discharge, or was less than 18 years of age at the time of discharge. We also excluded discharges and ED visits for which the patient

- was actively enrolled in hospice at any time during the calendar month of the discharge or ED visit,
- did not result in a live discharge,
- was against medical advice,
- had a primary diagnosis for cancer, mental health or rehabilitation,
- was from a prospective payment system-exempt cancer hospital, or
- had discharges followed within 3 days by an ED visit, any hospitalization (at acute care, long-term care, rehabilitation, or psychiatric hospital or unit), transplant, loss to follow-up, withdrawal from dialysis, or recovery of renal function.

Based on input from the National Quality Form Technical Expert Panel (TEP) in May 2016, we excluded pediatric patients, hospice patients, and patients in their first 90 days of ESRD treatment. A majority of TEP members proposed excluding pediatric patients due to substantial differences

in both the pediatric population comorbidities as well as reasons for seeking care in the ED when compared to the adult population. Hospice patients were excluded to allow for ED care that may be palliative in nature and directed by other providers outside of the dialysis facility.

Appendix E Supplementary Table for Application

Table 2: Summary of model fitting for risk factors (binary) with 2018–2019 ED visits data (reference group in parentheses). BMI, body mass index; ESRD, end-stage renal disease; LOHS, length of hospital stay; NHS, nursing home stay (past 365 days); PC, prevalent comorbidity. OR, odds ratio; SE, standard error; Z-stat, Z-statistics (ratio of coefficient estimate to SE); LB and UB stand for lower and upper bounds of the 95% confidence intervals. PC categories were created by grouping ICD-10 diagnosis codes based on AHRQ CCSR (https://www.hcup-us.ahrq.gov/toolssoftware/ccsr/ccs_refined.jsp). A dictionary of categories listed below is appended to the end of this document.

risk factor	count	proportion	OR	SE	Z-stat	p-value	LB	UB
Year 2018	381400	50.4%	0.970	0.007	-4.672	<0.001	0.958	0.982
female	358157	47.3%	1.015	0.008	1.932	0.053	1.000	1.031
diabetes as cause of ESRD	371643	49.1%	0.998	0.008	-0.273	0.785	0.983	1.013
age in years (60–74)								
18–24	4034	0.5%	1.542	0.042	10.330	<0.001	1.420	1.674
25–44	87330	11.5%	1.346	0.012	25.506	<0.001	1.315	1.377
45–59	204969	27.1%	1.176	0.008	19.025	<0.001	1.156	1.195
≥75	154396	20.4%	0.954	0.010	-4.733	<0.001	0.936	0.973
BMI (18.5–25)								
≤18.5	22708	3.0%	1.010	0.020	0.520	0.603	0.971	1.051
25–30	198852	26.3%	1.002	0.009	0.214	0.831	0.984	1.020
≥30	346225	45.7%	0.982	0.009	-2.128	0.033	0.966	0.999
time on ESRD (1–2 years)								
91 days to 6 months	33355	4.4%	1.121	0.018	6.337	<0.001	1.082	1.162
6 months to 1 year	59437	7.9%	1.019	0.015	1.293	0.196	0.990	1.048
2–3 years	98224	13.0%	1.001	0.012	0.049	0.961	0.976	1.025
3–5 years	160276	21.2%	1.009	0.011	0.833	0.405	0.987	1.031
≥5 years	296878	39.2%	1.007	0.010	0.626	0.531	0.986	1.027
LOHS (1st quartile)								
2nd quartile	230587	30.5%	0.945	0.009	-6.621	<0.001	0.930	0.961
3rd quartile	131203	17.3%	0.923	0.010	-7.945	<0.001	0.905	0.942
4th quartile	196958	26.0%	0.910	0.009	-10.124	<0.001	0.894	0.927
NHS (0 day)								
1–89 days	131289	17.3%	0.943	0.010	-6.233	<0.001	0.925	0.960

continued on next page

Table 2 – continued

	risk factor	count	proportion	OR	SE	Z-stat	p-value	LB	UB
	90–365 days	78628	10.4%	0.859	0.012	-12.170	<0.001	0.839	0.881
PC categories									
	category 4	17925	2.4%	1.045	0.021	2.091	0.037	1.003	1.089
	category 5	76776	10.1%	1.051	0.011	4.484	<0.001	1.028	1.075
	category 6	86294	11.4%	1.004	0.010	0.361	0.718	0.984	1.024
	category 7	104384	13.8%	1.015	0.010	1.558	0.119	0.996	1.035
	category 10	45731	6.0%	0.908	0.015	-6.461	<0.001	0.882	0.935
	category 17	167834	22.2%	0.989	0.008	-1.334	0.182	0.973	1.005
	category 19	610909	80.7%	1.045	0.010	4.452	<0.001	1.025	1.066
	category 28	12969	1.7%	0.946	0.025	-2.269	0.023	0.901	0.992
	category 32	285685	37.7%	1.075	0.007	10.294	<0.001	1.061	1.090
	category 33	575461	76.0%	1.082	0.010	8.239	<0.001	1.062	1.103
	category 36	710763	93.9%	1.240	0.017	12.442	<0.001	1.198	1.283
	category 37	752807	99.4%	1.078	0.053	1.409	0.159	0.971	1.197
	category 38	546474	72.2%	1.024	0.008	2.881	0.004	1.008	1.041
	category 39	486660	64.3%	1.198	0.008	22.587	<0.001	1.179	1.217
	category 40	251547	33.2%	1.018	0.007	2.521	0.012	1.004	1.034
	category 41	381014	50.3%	1.049	0.007	6.596	<0.001	1.035	1.065
	category 42	560455	74.0%	1.047	0.008	5.457	<0.001	1.030	1.065
	category 47	610639	80.7%	1.054	0.010	5.525	<0.001	1.035	1.075
	category 48	202775	26.8%	1.037	0.008	4.787	<0.001	1.021	1.052
	category 51	233957	30.9%	1.050	0.007	6.723	<0.001	1.036	1.066
	category 52	377168	49.8%	1.026	0.007	3.648	<0.001	1.012	1.042
	category 56	671696	88.7%	1.106	0.013	7.852	<0.001	1.079	1.134
	category 57	178772	23.6%	1.015	0.008	1.859	0.063	0.999	1.030
	category 59	61001	8.1%	1.051	0.011	4.375	<0.001	1.027	1.075
	category 60	450820	59.5%	1.015	0.008	2.021	0.043	1	1.030
	category 61	262123	34.6%	1.052	0.008	6.526	<0.001	1.037	1.069
	category 66	41277	5.5%	1.040	0.014	2.756	0.006	1.011	1.068
	category 67	56631	7.5%	0.918	0.013	-6.736	<0.001	0.895	0.941
	category 69	71212	9.4%	1.091	0.011	8.120	<0.001	1.068	1.114
	category 70	199930	26.4%	0.979	0.008	-2.614	0.009	0.964	0.995
	category 71	110762	14.6%	1.035	0.009	3.652	<0.001	1.016	1.052
	category 72	534956	70.7%	1.030	0.009	3.499	<0.001	1.013	1.048
	category 76	206648	27.3%	1.026	0.008	3.337	0.001	1.011	1.042

continued on next page

Table 2 – continued

risk factor	count	proportion	OR	SE	Z-stat	p-value	LB	UB
category 77	262086	34.6%	1.029	0.007	3.979	<0.001	1.015	1.044
category 78	135629	17.9%	1.015	0.010	1.569	0.117	0.996	1.036
category 82	535930	70.8%	1.047	0.008	5.610	<0.001	1.030	1.064
category 83	108170	14.3%	0.972	0.011	-2.581	0.01	0.951	0.993
category 89	68796	9.1%	1.123	0.011	10.724	<0.001	1.100	1.148
category 93	542382	71.6%	1.038	0.008	4.784	<0.001	1.022	1.054
category 95	188627	24.9%	1.058	0.008	7.186	<0.001	1.042	1.075
category 97	36553	4.8%	1.038	0.015	2.540	0.011	1.008	1.068
category 98	359918	47.5%	1.045	0.007	5.898	<0.001	1.029	1.061
category 99	170982	22.6%	1.059	0.008	7.126	<0.001	1.042	1.075
category 102	80612	10.6%	0.958	0.012	-3.460	0.001	0.935	0.982
category 103	99201	13.1%	0.879	0.010	-12.736	<0.001	0.862	0.896
category 104	371634	49.1%	1.102	0.008	12.833	<0.001	1.085	1.119
category 105	407031	53.8%	1.151	0.008	17.909	<0.001	1.133	1.169
category 106	470045	62.1%	1.090	0.008	10.888	<0.001	1.074	1.107
category 107	369276	48.8%	1.065	0.007	8.752	<0.001	1.050	1.080
category 115	290547	38.4%	1.077	0.008	9.537	<0.001	1.061	1.093
category 116	21388	2.8%	1.074	0.019	3.773	<0.001	1.035	1.114
category 118	10343	1.4%	1.132	0.026	4.728	<0.001	1.075	1.191
category 121	319483	42.2%	1.002	0.008	0.283	0.777	0.987	1.017
category 122	7902	1.0%	1.113	0.029	3.715	<0.001	1.052	1.177
category 123	37731	5.0%	1.063	0.015	4.062	<0.001	1.031	1.094
category 124	258483	34.1%	1.113	0.008	14.206	<0.001	1.096	1.129
category 125	18715	2.5%	1.139	0.019	6.790	<0.001	1.096	1.182
category 126	372477	49.2%	1.019	0.007	2.702	0.007	1.005	1.033
category 127	65044	8.6%	1.031	0.011	2.699	0.007	1.008	1.054
category 291	122614	16.2%	1.024	0.009	2.715	0.007	1.007	1.043
category 292	207045	27.3%	1.141	0.008	17.294	<0.001	1.124	1.158
category 761	92267	12.2%	1.016	0.010	1.576	0.115	0.996	1.036
category 841	349517	46.2%	1.066	0.007	8.731	<0.001	1.050	1.081
category 842	370992	49.0%	1.049	0.007	6.587	<0.001	1.035	1.064
category 843	64058	8.5%	0.938	0.012	-5.279	<0.001	0.916	0.961
category 846	615017	81.2%	1.049	0.010	4.629	<0.001	1.028	1.070

Category	ICD-10	Diagnosis Description	AHRQ Category	AHRQ Category decription
4	B20	Human immunodeficiency virus [HIV] disease	5	HIV infection
5	B150	Hepatitis A with hepatic coma	6	Hepatitis
6	A6000	Herpesviral infection of urogenital system, unspecified	7	Viral infection
7	A270	Leptospirosis icterohemorrhagica	8	Other infections; including parasitic
7	A5001	Early congenital syphilitic oculopathy	9	Sexually transmitted infections (not HIV or hepatitis)
10	C430	Malignant melanoma of lip	22	Melanomas of skin
10	C4400	Unspecified malignant neoplasm of skin of lip	23	Other non-epithelial cancer of skin
17	D250	Submucous leiomyoma of uterus	46	Benign neoplasm of uterus
17	D100	Benign neoplasm of lip	47	Other and unspecified benign neoplasm
19	E089	Diabetes due to underlying condition w/o complications	49	Diabetes mellitus without complication
19	E0800	Diab d/t undrl cond w hyprosm w/o nonket hyprgly-hypros coma	50	Diabetes mellitus with complications
28	A0101	Typhoid meningitis	76	Meningitis (except that caused by tuberculosis or sexually transmitted disease)
28	A3212	Listerial meningoencephalitis	77	Encephalitis (except that caused by tuberculosis or sexually transmitted disease)
28	A800	Acute paralytic poliomyelitis, vaccine-associated	78	Other CNS infection and poliomyelitis
32	B053	Measles complicated by otitis media	92	Otitis media and related conditions
32	H8101	Meniere's disease, right ear	93	Conditions associated with dizziness or vertigo
32	H6000	Abscess of external ear, unspecified ear	94	Other ear and sense organ disorders
33	B2701	Gammaherpesviral mononucleosis with polyneuropathy	95	Other nervous system disorders
36	I10	Essential (primary) hypertension	98	Essential hypertension
37	I110	Hypertensive heart disease with heart failure	99	Hypertension with complications and secondary hypertension

Category	ICD-10	Diagnosis Description	AHRQ Category	AHRQ Category decription
38	I2101	STEMI involving left main coronary artery	100	Acute myocardial infarction
38	I200	Unstable angina	101	Coronary atherosclerosis and other heart disease
39	R072	Precordial pain	102	Nonspecific chest pain
40	I2601	Septic pulmonary embolism with acute cor pulmonale	103	Pulmonary heart disease
41	I231	Atrial septal defect as current complication following AMI	104	Other and ill-defined heart disease
42	I440	Atrioventricular block, first degree	105	Conduction disorders
42	I470	Re-entry ventricular arrhythmia	106	Cardiac dysrhythmias
47	I7300	Raynaud's syndrome without gangrene	117	Other circulatory disease
48	I8000	Phlbts and thombophlb of superfic vessels of unsp low extrm	118	Phlebitis; thrombophlebitis and thromboembolism
51	J0380	Acute tonsillitis due to other specified organisms	124	Acute and chronic tonsillitis
51	J200	Acute bronchitis due to Mycoplasma pneumoniae	125	Acute bronchitis
51	A360	Pharyngeal diphtheria	126	Other upper respiratory infections
52	J40	Bronchitis, not specified as acute or chronic	127	Chronic obstructive pulmonary disease and bronchiectasis
52	J4520	Mild intermittent asthma, uncomplicated	128	Asthma
56	J182	Hypostatic pneumonia, unspecified organism	133	Other lower respiratory disease
57	J300	Vasomotor rhinitis	134	Other upper respiratory disease
59	K000	Anodontia	136	Disorders of teeth and jaw
59	K098	Other cysts of oral region, not elsewhere classified	137	Diseases of mouth; excluding dental
60	B5731	Megaesophagus in Chagas' disease	138	Esophageal disorders
61	K251	Acute gastric ulcer with perforation	139	Gastroduodenal ulcer (except hemorrhage)
61	K2900	Acute gastritis without bleeding	140	Gastritis and duodenitis
61	K30	Functional dyspepsia	141	Other disorders of stomach and duodenum

Category	ICD-10	Diagnosis Description	AHRQ Category	AHRQ Category decription
61	K352	Acute appendicitis with generalized peritonitis	142	Appendicitis and other appendiceal conditions
66	K594	Anal spasm	147	Anal and rectal conditions
67	A7481	Chlamydial peritonitis	148	Peritonitis and intestinal abscess
69	K850	Idiopathic acute pancreatitis	152	Pancreatic disorders (not diabetes)
70	I8501	Esophageal varices with bleeding	153	Gastrointestinal hemorrhage
71	K523	Indeterminate colitis	154	Noninfectious gastroenteritis
72	B5732	Megacolon in Chagas' disease	155	Other gastrointestinal disorders
76	A3685	Diphtheritic cystitis	159	Urinary tract infections
77	N130	Hydronephrosis with ureteropelvic junction obstruction	161	Other diseases of kidney and ureters
78	N400	Benign prostatic hyperplasia without lower urinry tract symp	164	Hyperplasia of prostate
78	N410	Acute prostatitis	165	Inflammatory conditions of male genital organs
78	N420	Calculus of prostate	166	Other male genital disorders
82	A201	Cellulocutaneous plague	197	Skin and subcutaneous tissue infections
82	B653	Cercarial dermatitis	198	Other inflammatory condition of skin
82	L89000	Pressure ulcer of unspecified elbow, unstageable	199	Chronic ulcer of skin
82	L301	Dyshidrosis [pompholyx]	200	Other skin disorders
83	A0104	Typhoid arthritis	201	Infective arthritis and osteomyelitis (except that caused by tuberculosis or sexually transmitted disease)
89	S031XXA	Dislocation of septal cartilage of nose, initial encounter	232	Sprains and strains
93	D89810	Acute graft-versus-host disease	237	Complication of device; implant or graft
95	S0000XA	Unspecified superficial injury of scalp, initial encounter	239	Superficial injury; contusion
97	T424X1A	Poisoning by benzodiazepines, accidental, init	241	Poisoning by psychotropic agents
97	K1231	Oral mucositis (ulcerative) due to antineoplastic therapy	242	Poisoning by other medications and drugs
97	T510X1A	Toxic effect of ethanol, accidental (unintentional), init	243	Poisoning by nonmedicinal substances

Category	ICD-10	Diagnosis Description	AHRQ Category	AHRQ Category decription
98	R6510	SIRS of non-infectious origin w/o acute organ dysfunction	244	Other injuries and conditions due to external causes
99	R55	Syncope and collapse	245	Syncope
102	I70261	Athscl native arteries of extremities w gangrene, right leg	248	Gangrene
103	R570	Cardiogenic shock	249	Shock
104	R110	Nausea	250	Nausea and vomiting
105	R100	Acute abdomen	251	Abdominal pain
106	G933	Postviral fatigue syndrome	252	Malaise and fatigue
107	B4481	Allergic bronchopulmonary aspergillosis	253	Allergic reactions
115	F064	Anxiety disorder due to known physiological condition	651	Anxiety disorders
116	F900	Attn-defct hyperactivity disorder, predom inattentive type	652	Attention-deficit conduct and disruptive behavior disorders
118	F70	Mild intellectual disabilities	654	Developmental disorders
121	F0630	Mood disorder due to known physiological condition, unsp	657	Mood disorders
122	F600	Paranoid personality disorder	658	Personality disorders
123	F060	Psychotic disorder w hallucin due to known physiol condition	659	Schizophrenia and other psychotic disorders
124	F1010	Alcohol abuse, uncomplicated	660	Alcohol-related disorders
124	F1110	Opioid abuse, uncomplicated	661	Substance-related disorders
125	R45851	Suicidal ideations	662	Suicide and intentional self-inflicted injury
126	R780	Finding of alcohol in blood	663	Screening and history of mental health and substance abuse codes
127	F061	Catatonic disorder due to known physiological condition	670	Miscellaneous mental health disorders
291	G40001	Local-rel idio epi w seiz of loc onst, not ntrct, w stat epi	83	Epilepsy; convulsions
292	G43001	Migraine w/o aura, not intractable, with status migrainosus	84	Headache; including migraine
761	N200	Calculus of kidney	160	Calculus of urinary tract
841	M0200	Arthropathy following intestinal bypass, unspecified site	204	Other non-traumatic joint disorders

Category	ICD-10	Diagnosis Description	AHRQ Category	AHRQ Category decription
842	M4320	Fusion of spine, site unspecified	205	Spondylosis; intervertebral disc disorders; other back problems
843	M810	Age-related osteoporosis w/o current pathological fracture	206	Osteoporosis
846	G4762	Sleep related leg cramps	211	Other connective tissue disease
846	M4100	Infantile idiopathic scoliosis, site unspecified	212	Other bone disease and musculoskeletal deformities