Discharge to Community Claims-Based Measure for Home Health: Risk Adjustment Methodology

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1 INTRODUCTION

The Improving Medicare Post-Acute Care Transformation Act of 2014 (IMPACT Act), enacted on October 6, 2014, requires standardization of the *Discharge to Community* measure across four post-acute care (PAC) settings: home health agencies (HHAs), skilled nursing facilities (SNFs), long-term care hospitals (LTCHs), and inpatient rehabilitation facilities (IRFs). The *Discharge to Community* measure for HHAs estimates the risk-standardized rate of patients (Medicare Fee-for-Service [FFS] beneficiaries) who are discharged to the community following a home health (HH) episode, do not have an unplanned readmission to an acute care hospital or LTCH in the 31 days following discharge to community, and remain alive during the 31 days following discharge to community.

This report summarizes the statistical risk model, variable specifications, the variable selection process, and the performance of the risk adjustment model for the claims-based *Discharge to Community* measure calculated for the home health Medicare FFS population. Section 2 describes the statistical risk model. Then Section 3 details the set of potential risk factors and each variable's specifications. Next, Section 4 describes how a subset of these risk factors was selected for the final predictive model. Section 5 evaluates the risk adjustment model's performance and appropriateness for this measure. Finally, Appendix A provides the risk adjustment model results.

2 STATISTICAL RISK MODEL

In alignment with the IRF, LTCH, and SNF discharge to community measures, we used a hierarchical logistic regression method to predict the probability of a discharge to the community. Patient characteristics related to discharge and a marker for the specific discharging facility are included in the equation. We utilized a hierarchical model in order to account for both individual patient characteristics as well as the clustering of patient characteristics within HHAs. The statistical model estimates both the average predictive effect of the patient characteristics across all HHAs, and the degree to which each HHA has an effect on discharges to the community that differs from that of the average HHA. The HHA effects are assumed to be randomly distributed around the average (according to a normal distribution). When computing the HHA effect, hierarchical modeling accounts for the known predictors of discharge to the community, on average, such as patient characteristics, the observed HHA rate, and the number of HHA stays eligible for inclusion in the measure. The estimated HHA effect is determined mostly by the HHA's own data if the number of eligible stays is relatively large (as the estimate would be relatively precise), but is adjusted toward the average if the number of eligible stays is small (as that would yield a less precise estimate).

We used the following model:

Let Y_{ij}, denote the outcome (equal to 1 if patient *i* has a discharge to the community, 0 otherwise) for a patient *i* at facility *j*; Z_{ij} denotes a set of risk adjustment variables. We assume the outcome is related to the risk adjusters via a logit function with dispersion:

$$logit\left(Prob(Y_{ij})\right) = \alpha_j + \beta \times Z_{ij} + \varepsilon_{ij}$$

$$\alpha_j = \mu + \omega_j; \omega_j \sim N(0, \tau^2)$$

where Zij = (Z1, Z2, ... Zk) is a set of k patient-level risk adjustment variables; alpha sub j represents the HHA-specific intercept; mu is the adjusted average outcome across all facilities; tau squared is the between-HHA variance component; and epsilon approximately equal to the N of sigma squared at zero is the error term. The hierarchical logistic regression model is estimated using SAS software (PROC GLIMMIX: SAS/STAT User's Guide, SAS Institute Inc.).

The estimated equation is used twice in the measure. The sum of the probabilities of discharge to the community of all patients in the HHA measure, including both the effects of patient characteristics and the HHA, is the "predicted number" of discharges to the community after adjusting for the HHA's case mix. The same equation is used without the HHA effect to compute the "expected number" of discharges to the community for the same patients at the average HHA. The ratio of the predicted-to-expected number of discharges to the community is a measure of the degree to which discharged to the community are higher or lower than what would otherwise be expected. This standardized risk ratio is then multiplied by the mean discharge to the community rate for all HHA stays for the measure, yielding the risk-standardized discharge to the community rate for each HHA.

3 VARIABLE SPECIFICATION

To account for beneficiary characteristics that may affect the risk of discharge to community, the risk adjustment model uses potential risk factors that fall into three categories:

(1) Demographics;
(2) Care received during a prior proximal hospitalization (if one occurred); and
(3) Other care received within one year of the HH stay.

The following sub-sections detail risk factors in each of these categories in turn.

3.1 Factor 1: Demographics

Demographic risk factors included in the risk adjustment model are age and sex, enrollment status, and activities of daily living (ADL) scores.

3.1.1 Age and Sex

The risk adjustment model includes age and sex as covariates. Age-sex interactions allow the model to account for the differing effects of age on the outcomes for each sex. Age is subdivided into 12 bins for each sex: ages 18-34, 35-44, 45-54, five-year age bins from 55 to 95, and one bin for ages over 95. 65-69, Male is the reference group.

3.1.2 Enrollment Status

The model employs aged (reference), end stage renal disease (ESRD), and disability as covariates for the original reason for Medicare entitlement.

3.1.3 Activities of Daily Living Scores

The Home Health Prospective Payment System (HH-PPS) calculates an Activity of Daily Living (ADL) Severity Score by combining responses from several Outcome and Assessment Information Set (OASIS) fields. The ADL Severity Score is calculated using four methods that differ by how much weight is assigned to the OASIS variables that comprise the score. These four scores are then combined with information related to episode timing (early/late status) and the number of therapy visits to determine which Severity Score is placed on the five-character Health Insurance Prospective Payment System (HIPPS) code as the ADL Severity Score. The risk adjustment model includes all four Severity Scores (i.e., ADL 1-4).

3.2 Factor 2: Care Received during the Prior Proximal Hospitalization

Because beneficiaries who enter home health care from prior proximal hospitalizations[1] may have different health statuses, this model takes into account beneficiaries' immediate prior care setting, principal diagnoses, and procedures.

3.2.1 Length of Prior Proximal Hospitalization

The length of the prior proximal hospitalization is included in the model as a binary variable: 0-30 days (reference) and greater than or equal to 31 days.

3.2.2 Clinical Classification Software (CCS) during Prior Proximal Hospitalization

The risk model relies on CCS diagnosis and procedure groups to adjust for beneficiary health status during a prior proximal hospitalization, if a prior proximal hospitalization occurred. CCS diagnosis groups are defined using principal diagnosis codes from the prior proximal hospitalization. CCS procedure groups are defined using procedure codes recorded during the prior proximal hospitalization.

3.3 Factor 3: Other Care Received within One Year of Stay

To further account for beneficiaries who may have different health statuses entering into home health, this model adjusts for the beneficiaries' number of prior acute discharges, number of emergency department visits, number of skilled nursing facility visits, number of long-term care hospital visits, and Hierarchical Condition Categories (HCC) comorbidities.

3.3.1 Number of Prior Acute Discharges

The model adjusts for the number of prior acute hospital discharges in the past year, excluding those that took place within 30 days prior to the start of home health or resumption of care. The number of prior acute discharges is classified in the model as 0 (i.e., no prior acute discharge; reference group), 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 or more discharges.

3.3.2 Number of Outpatient Emergency Department Visits

The model also takes into account whether or not an outpatient emergency department (ED) visit took place within one year of the HH stay (i.e., 0 ED visits [reference] or 1 or more ED visits).

3.3.3 Number of Skilled Nursing Facility Visits

The model adjusts for whether or not a skilled nursing facility took place within one year of the HH stay (i.e., 0 SNF visits [reference] or 1 or more SNF visits).

[1] Prior proximal hospitalizations for the *Discharge to Community* measure are defined as a short-term acute-care or psychiatric stay within 30 days prior to home health admission. Prior proximal hospitalizations are indicated by the discharge date from an inpatient claim for an acute care hospital (CMS Certification Numbers [CCN] ending in 0001-0879, 0880-0899, and 1300-1399) or psychiatric facility (CCNs ending in 4000-4499).

3.3.4 Number of Long-Term Care Hospital Visits

The model adjusts for whether or not a long-term care hospital visit took place within one year of the HH stay (i.e., 0 LTCH visits [reference] or 1 or more LTCH visits).

3.3.5 Hierarchical Condition Categories (HCC) Comorbidities

To account for beneficiary health status within one year of the HH stay, the risk adjustment model also relies on the HCC framework[2]. The risk adjustment model includes 54 hierarchically ranked HCCs based on the 2009 CMS-HCC risk adjustment model. HCC comorbidities are defined using secondary diagnoses from the prior proximal hospitalization (if a prior proximal hospitalization occurred) and all other diagnoses recorded in the inpatient, outpatient, and carrier settings during the year prior to the home health stay.

[2] CMS-HCC Mappings of ICD-9 Codes: Mappings are included in the software at the following website: http://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Risk-Adjustors.html

4 VARIABLE SELECTION

Several steps were implemented to develop a model that accounts for important risk factors while also ensuring that the model is not over fit to the data. The Least Absolute Shrinkage and Selection Operator (LASSO) was one of the analyses used to guide the variable selection process. The LASSO technique is designed to develop models that minimize prediction error in a manner that does not overfit the data. The nature of the LASSO function encourages parameter estimates of unimportant predictors to shrink to zero (which effectively eliminates these variables from the model). Additionally, the LASSO technique utilizes cross-validation to establish the set of model predictors that consistently result in a relatively low prediction error. The remainder of this section describes why the LASSO method for variable selection is particularly useful in this context and outlines the measure selection process.

4.1 Use of LASSO for Model Selection

LASSO is particularly appropriate for the home health discharge to community measure because of the need to select a parsimonious set of predictors from a large number of available variables as well as the need for a risk model that performs consistently across data updates. A large number of independent variables were under consideration for this measure, including diagnosis and procedure code groupings, age-sex interactions and prior healthcare utilization, among others. While it is important to consider all of the available variables, it is also important to avoid overfitting the data. Because of sample-specific relationships, a model that minimizes prediction error in one sample may be too closely tailored and generate large prediction errors in another sample. Given that the discharge to community risk adjustment model will be applied to new data as the measure is updated annually, it is important that model performance remain consistent across data updates. Because LASSO utilizes cross-validation to evaluate prediction error, it lends itself well to generating models that perform consistently across datasets; thus, it is expected that the risk-adjustment model will perform consistently as data are updated annually.

4.2 Covariate Selection Methodology

Considering the volume of independent covariates available for this model, multiple steps were taken to eliminate variables that do not improve the model’s predictive ability or that do not predict discharges to the community risk in a consistent manner. All variable selection activities were performed using a training dataset comprised of an eighty percent random sample of the population of eligible home health stays. Covariate selection occurred in three stages:

(1) Before initiating the LASSO, we eliminated all independent variables that have fewer than 500 occurrences in our population across all three years of data. The population consisted of roughly 6.3 million home health stays, so this eliminated covariates appearing in approximately 0.01% of stays and which were unlikely to meaningfully

improve model performance. Furthermore, we eliminated all variables with zero dischargers to the community in any individual year. As described below in #3, this exclusion was necessary to run annual logistic regression models assessing each covariate's stability over time. When zero discharges to the community were observed in a given year for a particular variable, it was observed that there were also zero or very low numbers of discharges to the community for the same variable in adjacent years.

(2) LASSO was implemented using the "glmnet" package in R to select which of the remaining variables were important to include in the risk model.

(3) Lastly, after the LASSO provided a list of suitable model covariates, we checked to ensure that each covariate's predictive ability is consistent across calendar years (because the final model will be applied to annually updated data). To test this, we constructed logistic regression models controlling for the list of variables provided by LASSO, stratified by calendar year. If the point estimates for a particular variable were not consistently above or below the null across calendar years, then that variable was eliminated from the final model.

5 MODEL PERFORMANCE

This section evaluates the risk adjustment model and illustrates its appropriateness for the discharge to community measure. First, Section 5.1 describes the analysis performed to confirm that the variables selected by LASSO were appropriate for the final hierarchical model. Section 5.2 examines how risk adjustment affects the distribution of discharge to the community rates overall. Finally, Section 5.3 evaluates the model fit in both the training and validation datasets. The final population comprised of 6,325,578 home health stays attributed to 12,316 HHAs. The detailed model results are included in Appendix A.

5.1 Comparison of Parameter Estimates between the LASSO and Random Effects Models

The LASSO model used for variable selection does not account for the clustering of eligible stays within HHAs. The final hierarchical risk adjustment model, on the other hand, does account for this clustering. Therefore, it was important to confirm that the variables selected using LASSO were also appropriate for the final risk model. To this end, we compared the parameter estimates of the covariates remaining in the risk model after implementing LASSO between two hierarchical logistic regression models: one that accounts for the clustering of stays and another that does not. We found the model coefficients were very close across these two models; therefore, we concluded that the variables selected using LASSO were also appropriate for the final hierarchical risk model.

5.2 Distributions of Observed Rates and Risk Standardized Readmission Rates (RSRRs)

The unadjusted readmission rates range from 0.0 to 100 percent, with a median of 77.8 percent and a 10th to 90th percentile range of 45.6 to 88.9 percent. The RSRR had a similar distribution, but slightly compressed compared to the unadjusted rates, with a range from 1.1 to 100 percent, a higher median of 82.4 percent and a tighter 10th to 90th percentile range of 50.9 to 92.5 percent. The mean RSRR (76.7%) was slightly higher than the unadjusted rate (72.2%) and the scores had a smaller standard deviation (17.5 % vs. 18.2%). The compression of the RSRR distribution compared to the distribution of observed rates is expected because the hierarchical model adjusts each HHA toward the average performance rate. The extent to which an HHA is adjusted toward the average depends on the number of eligible stays included in the measure for the HHA. Table 5.1 presents the distributions of the observed rates and RSRRs of discharges to the community for agencies with at least 20 home health stays using the full data set. Agencies with fewer than 20 eligible stays were excluded from this summary because they tend to have more extreme rates due to imprecision. There was no evidence of a ceiling effect for this measure and there is a large amount of variation in performance rates across HHAs.

Table 5.1: Distribution of Observed Rates and RSRRs of Discharges to the Community among Agencies with at least 20 Eligible Stays

Rate	Mean	Std. Err	Min	10th percentile	25th percentile	Median	75th percentile	90th percentile	Max
Observed Rate	0.722	0.182	0.000	0.456	0.655	0.778	0.843	0.889	1.000
RSRR	0.767	0.175	0.011	0.509	0.707	0.824	0.885	0.925	1.000

5.3 Predictive Power

We evaluated the predictive power of the model for both the development sample and the validation sample. Evaluating model fit for the development sample shows how well the model predicts outcomes in the data on which it was developed, while evaluating model fit for the validation sample shows how well the model predicts outcomes outside the data on which it was developed. The area under the receiver operating curve (AUC) statistic, also known as the c-statistic, measures the ability of the model to differentiate between outcomes without resorting to an arbitrary cutoff point. A model that perfectly discriminates between outcomes would have a c-statistic of 1.0, while a model that has no predictive power would have a c-statistic of 0.5. The c-statistic for the development sample was 0.74, which suggests the risk model is well fit to the data in which it was developed. To assess the fit of model in the validation sample, the parameter estimates from the development sample were used to calculate the probability of an event for each home health stay in the validation sample. The c-statistic resulting from the validation dataset was 0.68, which is slightly smaller but comparable to the c-statistic of 0.77 observed in the testing dataset. We also calculated the range of differences between the 10th and 90th percentile of RSRRs in both the training and validation datasets to further ensure the model will perform similarly as new data is added. In the development sample, the range of RSRRs was 51.8 percent to 92.3 percent and the range in the validation sample was 63.2 percent to 90.5. The distribution of RSRRs fall within similar ranges, with the range in the validation being narrower than that of the validation dataset due to the relatively smaller number of eligible stays for each HHA in the validation sample. Overall, these results indicate that the model strongly fit the data and that the model continues to perform well when applied to new data.

6 CONCLUSION

The report describes the risk adjustment methodology and performance of the *Discharge to Community* measure i the home health population. A hierarchical, multivariate risk-adjustment model was used to derive the HHA-level risk standardized readmission rates (RSRRs). The risk model employs the following sets of covariates:

(1) Demographics
  (a) Age and sex
  (b) Enrollment status
  (c) Activities of daily living scores
(2) Care received during the prior proximal hospitalization (if relevant)
  (a) Length of prior proximal hospitalization
  (b) Clinical classification software (CCS) diagnosis and procedure categories during prior proximal hospitalization
(3) Other care received within one year of the HH stay
  (a) Number of prior acute discharges
  (b) Number of outpatient emergency department visits
  (c) Number of skilled nursing facility visits
  (d) Number of long-term care hospital visits
  (e) Hierarchical condition categories (HCC) comorbidities

The specific set of 285 covariates used in the model consisted of demographic and healthcare utilization variables as well as clinical characteristics selected through a series of steps including the implementation of LASSO as well as analyses to ensure covariates consistently predict discharge to the community risk over time. Implementing a hierarchical model adjusts for individual demographic and clinical characteristics, accounts for the clustering of stays within HHAs, and compresses the distribution of discharge to community rates (although a large degree of variability remains). Overall, the model strongly fits the data with a c-statistic of 0.74 and performs well when applied to new data.

APPENDIX A: MOEL COEFFICIENTS, P-VALUES, AND MARGINAL EFFECTS

Table A.1: Discharge to Community Post Home Health Measure Logistic Regression Model Results in 2012 - 2013

Variable Name in Model	Covariate	Count	Percent Total	Estimate	Std. Error	P value	Odds Ratio	OR 95% Lower CL	OR 95% Upper CL
Age-Sex Groups (Reference group: Male 65-69)									
age_18_34_f	18-34, Female	16,057	0.3	-0.024	0.021	0.2355	0.98	0.94	1.02
age_18_34_m	18-34, Male	15,671	0.2	0.091	0.021	<.0001	1.10	1.05	1.14
age_35_44_f	35-44, Female	41,289	0.7	0.034	0.014	0.0140	1.03	1.01	1.06
age_35_44_m	35-44, Male	36,514	0.6	0.067	0.014	<.0001	1.07	1.04	1.10
age_45_54_f	45-54, Female	122,663	1.9	0.056	0.009	<.0001	1.06	1.04	1.08
age_45_54_m	45-54, Male	108,304	1.7	0.022	0.010	0.0200	1.02	1.00	1.04
age_55_59_f	55-59, Female	113,158	1.8	0.032	0.009	0.0007	1.03	1.01	1.05
age_55_59_m	55-59, Male	91,873	1.5	0.003	0.010	0.7683	1.00	0.98	1.02
age_60_64_f	60-64, Female	146,476	2.3	0.032	0.009	0.0002	1.03	1.02	1.05
age_60_64_m	60-64, Male	109,694	1.7	0.008	0.009	0.3956	1.01	0.99	1.03
age_65_69_f	65-69, Female	395,410	6.3	0.027	0.007	<.0001	1.03	1.01	1.04
age_65_69_m	65-69, Male (Reference)	272,322	4.3	-	-	-	-	-	-
age_70_74_f	70-74, Female	530,436	8.4	0.012	0.007	0.0753	1.01	1.00	1.02
age_70_74_m	70-74, Male	343,284	5.4	-0.043	0.007	<.0001	0.96	0.94	0.97
age_75_79_f	75-79, Female	621,830	9.8	-0.023	0.006	0.0004	0.98	0.97	0.99
age_75_79_m	75-79, Male	369,320	5.8	-0.093	0.007	<.0001	0.91	0.90	0.92
age_80_84_f	80-84, Female	739,781	11.7	-0.069	0.006	<.0001	0.93	0.92	0.95
age_80_84_m	80-84, Male	399,155	6.3	-0.153	0.007	<.0001	0.86	0.85	0.87
age_85_89_f	85-89, Female	734,322	11.6	-0.125	0.006	<.0001	0.88	0.87	0.89
age_85_89_m	85-89, Male	342,655	5.4	-0.236	0.007	<.0001	0.79	0.78	0.80
age_90_94_f	90-94, Female	427,177	6.8	-0.186	0.007	<.0001	0.83	0.82	0.84
age_90_94_m	90-94, Male	172,711	2.7	-0.339	0.008	<.0001	0.71	0.70	0.72
age_95_pl_f	95+, Female	134,441	2.1	-0.274	0.009	<.0001	0.76	0.75	0.77
age_95_pl_m	95+, Male	41,035	0.6	-0.441	0.013	<.0001	0.64	0.63	0.66

Variable Name in Model	Covariate	Count	Percent Total	Estimate	Std. Error	P value	Odds Ratio	OR 95% Lower CL	OR 95% Upper CL
Original Reason for Medicare Enrollment (Reference group: Age)									
orig_aged	Age (Reference)	4,743,629	75.0	-	-	-	-	-	-
orig_disabled	Disability	1,525,287	24.1	-0.126	0.003	<.0001	0.88	0.88	0.89
orig_esrd	ESRD	56,662	0.9	-0.183	0.011	<.0001	0.83	0.81	0.85
Activities of Daily Living Score (Continuous, standardized variables)									
adl_1	ADL Score 1	6,325,578	100	0.014	0.012	0.2416	1.01	0.99	1.04
adl_2	ADL Score 2	6,325,578	100	-0.275	0.006	<.0001	0.76	0.75	0.77
adl_3	ADL Score 3	6,325,578	100	0.075	0.010	<.0001	1.08	1.06	1.10
adl_4	ADL Score 4	6,325,578	100	-0.033	0.004	<.0001	0.97	0.96	0.98
Length of Prior Proximal Hospitalization (Reference group: 0-30 Days)									
-	0-30 Days (Reference)	6,308,321	99.7	-	-	-	-	-	-
prior_proximal_31_plus	≥ 31 Days	17,257	0.3	-0.274	0.018	<.0001	0.76	0.73	0.79
Number of Prior Acute Discharges within One Year of Stay (Excluding Prior Proximal) (Reference group: 0)									
n_priors_00	0 (Reference)	4,217,052	66.7	-	-	-	-	-	-
n_priors_01	1	1,088,654	17.2	-0.166	0.003	<.0001	0.85	0.84	0.85
n_priors_02	2	494,253	7.8	-0.320	0.004	<.0001	0.73	0.72	0.73
n_priors_03	3	241,309	3.8	-0.458	0.005	<.0001	0.63	0.63	0.64
n_priors_04	4	124,023	2.0	-0.595	0.007	<.0001	0.55	0.54	0.56
n_priors_05	5	66,223	1.0	-0.736	0.009	<.0001	0.48	0.47	0.49
n_priors_06	6	36,858	0.6	-0.877	0.012	<.0001	0.42	0.41	0.43
n_priors_07	7	21,378	0.3	-0.982	0.015	<.0001	0.37	0.36	0.39
n_priors_08	8	12,859	0.2	-1.135	0.019	<.0001	0.32	0.31	0.33
n_priors_09	9	7,869	0.1	-1.276	0.025	<.0001	0.28	0.27	0.29
n_priors_10	10+	15,100	0.2	-1.677	0.019	<.0001	0.19	0.18	0.19
Number of Outpatient Emergency Department Visits within One Year of Stay (Reference group: 0)									
-	0 (Reference)	3,180,258	50.3	-	-	-	-	-	-
prior_er	≥ 1	3,145,320	49.7	-0.117	0.002	<.0001	0.89	0.89	0.89

Variable Name in Model	Covariate	Count	Percent Total	Estimate	Std. Error	P value	Odds Ratio	OR 95% Lower CL	OR 95% Upper CL
Number of Skilled Nursing Home Visits within One Year of Stay (Reference group: 0)									
-	0 (Reference)	4,512,399	71.3	-	-	-	-	-	-
prior_snf	≥ 1	1,813,179	28.7	-0.080	0.003	<.0001	0.92	0.92	0.93
Number of Long-Term Care Hospital Visits within One Year of Stay (Reference group: 0)									
-	0 (Reference)	6,210,423	98.2	-	-	-	-	-	-
prior_ltch	≥ 1	115,155	1.8	-0.053	0.007	<.0001	0.95	0.94	0.96
CCS Diagnosis Groups (Reference group: No Prior Proximal Hospitalization)									
dgn_000	No Prior Proximal Hospitalization (Reference)	3,231,314	51.1	-	-	-	-	-	-
dgn_002	2 - Septicemia (except in labor)	141,492	2.2	0.056	0.008	<.0001	1.06	1.04	1.07
dgn_004	4 - Mycoses	2,648	0.0	-0.138	0.044	0.0018	0.87	0.80	0.95
dgn_005	5 - HIV infection	1,177	0.0	-0.280	0.068	<.0001	0.76	0.66	0.86
dgn_006	6 - Hepatitis	2,027	0.0	-0.474	0.050	<.0001	0.62	0.56	0.69
dgn_007	7 - Viral infection	3,777	0.1	0.340	0.044	<.0001	1.40	1.29	1.53
dgn_008	8 - Other infections; including parasitic	1,005	0.0	0.252	0.086	0.0033	1.29	1.09	1.52
dgn_047	47 - Other and unspecified benign neoplasm	9,649	0.2	0.250	0.032	<.0001	1.28	1.21	1.37
dgn_052	52 - Nutritional deficiencies	1,240	0.0	-0.223	0.064	0.0006	0.80	0.71	0.91
dgn_054	54 - Gout and other crystal arthropathies	2,909	0.0	0.166	0.048	0.0006	1.18	1.07	1.30
dgn_055	55 - Fluid and electrolyte disorders	44,143	0.7	-0.055	0.012	<.0001	0.95	0.93	0.97
dgn_059	59 - Deficiency and other anemia	18,216	0.3	-0.147	0.018	<.0001	0.86	0.83	0.89
dgn_061	61 - Sickle cell anemia	837	0.0	-0.804	0.077	<.0001	0.45	0.39	0.52
dgn_062	62 - Coagulation and hemorrhagic disorders	1,969	0.0	-0.207	0.052	<.0001	0.81	0.73	0.90
dgn_083	83 - Epilepsy; convulsions	16,339	0.3	0.063	0.020	0.0016	1.07	1.02	1.11
dgn_093	93 - Conditions associated with dizziness or vertigo	8,116	0.1	0.459	0.034	<.0001	1.58	1.48	1.69
dgn_095	95 - Other nervous system disorders	27,633	0.4	0.023	0.015	0.1240	1.02	0.99	1.05
dgn_096	96 - Heart valve disorders	41,716	0.7	0.004	0.027	0.8739	1.00	0.95	1.06
dgn_097	97 - Peri-; endo-; and myocarditis; cardiomyopathy (except that caused by tuberculosis or sexually transmitted disease)	5,666	0.1	0.129	0.034	0.0002	1.14	1.06	1.22
dgn_098	98 - Essential hypertension	4,735	0.1	0.164	0.040	<.0001	1.18	1.09	1.27
dgn_099	99 - Hypertension with complications and secondary hypertension	30,825	0.5	-0.106	0.014	<.0001	0.90	0.88	0.92

Variable Name in Model	Covariate	Count	Percent Total	Estimate	Std. Error	P value	Odds Ratio	OR 95% Lower CL	OR 95% Upper CL
dgn_100	100 - Acute myocardial infarction	67,524	1.1	-0.122	0.011	<.0001	0.89	0.87	0.90
dgn_101	101 - Coronary atherosclerosis and other heart disease	58,017	0.9	0.041	0.016	0.0095	1.04	1.01	1.07
dgn_103	103 - Pulmonary heart disease	26,752	0.4	0.154	0.016	<.0001	1.17	1.13	1.20
dgn_104	104 - Other and ill-defined heart disease	1,174	0.0	0.285	0.082	0.0005	1.33	1.13	1.56
dgn_105	105 - Conduction disorders	9,786	0.2	0.295	0.032	<.0001	1.34	1.26	1.43
dgn_108	108 - Congestive heart failure; nonhypertensive	164,746	2.6	-0.185	0.006	<.0001	0.83	0.82	0.84
dgn_109	109 - Acute cerebrovascular disease	96,751	1.5	0.177	0.009	<.0001	1.19	1.17	1.22
dgn_110	110 - Occlusion or stenosis of precerebral arteries	9,435	0.1	0.269	0.041	<.0001	1.31	1.21	1.42
dgn_112	112 - Transient cerebral ischemia	24,155	0.4	0.222	0.018	<.0001	1.25	1.21	1.29
dgn_114	114 - Peripheral and visceral atherosclerosis	23,259	0.4	0.112	0.019	<.0001	1.12	1.08	1.16
dgn_115	115 - Aortic; peripheral; and visceral artery aneurysms	12,841	0.2	0.265	0.039	<.0001	1.30	1.21	1.41
dgn_116	116 - Aortic and peripheral arterial embolism or thrombosis	4,824	0.1	0.238	0.038	<.0001	1.27	1.18	1.37
dgn_117	117 - Other circulatory disease	19,178	0.3	0.064	0.018	0.0004	1.07	1.03	1.10
dgn_118	118 - Phlebitis; thrombophlebitis and thromboembolism	23,141	0.4	0.091	0.017	<.0001	1.10	1.06	1.13
dgn_121	121 - Other diseases of veins and lymphatics	3,438	0.1	-0.194	0.039	<.0001	0.82	0.76	0.89
dgn_122	122 - Pneumonia (except that caused by tuberculosis or sexually transmitted disease)	131,090	2.1	0.078	0.007	<.0001	1.08	1.07	1.10
dgn_123	123 - Influenza	7,044	0.1	0.430	0.034	<.0001	1.54	1.44	1.64
dgn_125	125 - Acute bronchitis	8,118	0.1	0.309	0.030	<.0001	1.36	1.28	1.44
dgn_127	127 - Chronic obstructive pulmonary disease and bronchiectasis	99,559	1.6	-0.176	0.008	<.0001	0.84	0.83	0.85
dgn_131	131 - Respiratory failure; insufficiency; arrest (adult)	44,843	0.7	-0.188	0.011	<.0001	0.83	0.81	0.85
dgn_133	133 - Other lower respiratory disease	10,362	0.2	-0.157	0.024	<.0001	0.85	0.82	0.90
dgn_142	142 - Appendicitis and other appendiceal conditions	4,148	0.1	0.512	0.065	<.0001	1.67	1.47	1.89
dgn_143	143 - Abdominal hernia	21,023	0.3	0.226	0.031	<.0001	1.25	1.18	1.33
dgn_144	144 - Regional enteritis and ulcerative colitis	3,608	0.1	-0.272	0.041	<.0001	0.76	0.70	0.83
dgn_145	145 - Intestinal obstruction without hernia	30,766	0.5	0.045	0.016	0.0064	1.05	1.01	1.08
dgn_146	146 - Diverticulosis and diverticulitis	28,312	0.4	0.100	0.017	<.0001	1.10	1.07	1.14
dgn_147	147 - Anal and rectal conditions	4,854	0.1	0.133	0.040	0.0010	1.14	1.05	1.24

Variable Name in Model	Covariate	Count	Percent Total	Estimate	Std. Error	P value	Odds Ratio	OR 95% Lower CL	OR 95% Upper CL
dgn_149	149 - Biliary tract disease	26,776	0.4	0.011	0.023	0.6456	1.01	0.97	1.06
dgn_151	151 - Other liver diseases	8,410	0.1	-0.306	0.026	<.0001	0.74	0.70	0.77
dgn_153	153 - Gastrointestinal hemorrhage	34,425	0.5	0.110	0.014	<.0001	1.12	1.08	1.15
dgn_155	155 - Other gastrointestinal disorders	20,875	0.3	0.107	0.018	<.0001	1.11	1.07	1.15
dgn_157	157 - Acute and unspecified renal failure	70,073	1.1	-0.086	0.009	<.0001	0.92	0.90	0.93
dgn_159	159 - Urinary tract infections	79,034	1.2	-0.056	0.009	<.0001	0.95	0.93	0.96
dgn_160	160 - Calculus of urinary tract	4,609	0.1	0.226	0.040	<.0001	1.25	1.16	1.36
dgn_164	164 - Hyperplasia of prostate	3,861	0.1	0.065	0.052	0.2078	1.07	0.96	1.18
dgn_165	165 - Inflammatory conditions of male genital organs	1,967	0.0	0.170	0.063	0.0065	1.19	1.05	1.34
dgn_167	167 - Nonmalignant breast conditions	1,069	0.0	0.409	0.090	<.0001	1.50	1.26	1.79
dgn_170	170 - Prolapse of female genital organs	1,889	0.0	0.469	0.140	0.0008	1.60	1.22	2.10
dgn_197	197 - Skin and subcutaneous tissue infections	68,484	1.1	0.005	0.010	0.6422	1.00	0.99	1.02
dgn_199	199 - Chronic ulcer of skin	7,001	0.1	-0.328	0.027	<.0001	0.72	0.68	0.76
dgn_201	201 - Infective arthritis and osteomyelitis (except that caused by tuberculosis or sexually transmitted disease)	10,665	0.2	0.145	0.026	<.0001	1.16	1.10	1.22
dgn_203	203 - Osteoarthritis	399,503	6.3	0.540	0.016	<.0001	1.72	1.66	1.77
dgn_204	204 - Other non-traumatic joint disorders	9,233	0.1	0.318	0.034	<.0001	1.37	1.29	1.47
dgn_205	205 - Spondylosis; intervertebral disc disorders; other back problems	81,539	1.3	0.291	0.017	<.0001	1.34	1.29	1.38
dgn_208	208 - Acquired foot deformities	785	0.0	0.611	0.130	<.0001	1.84	1.43	2.38
dgn_209	209 - Other acquired deformities	11,220	0.2	0.439	0.040	<.0001	1.55	1.43	1.68
dgn_210	210 - Systemic lupus erythematosus and connective tissue disorders	924	0.0	-0.508	0.073	<.0001	0.60	0.52	0.69
dgn_211	211 - Other connective tissue disease	20,676	0.3	0.196	0.019	<.0001	1.22	1.17	1.26
dgn_212	212 - Other bone disease and musculoskeletal deformities	13,162	0.2	0.220	0.031	<.0001	1.25	1.17	1.32
dgn_217	217 - Other congenital anomalies	2,865	0.0	0.416	0.076	<.0001	1.52	1.31	1.76
dgn_225	225 - Joint disorders and dislocations; trauma-related	3,638	0.1	0.246	0.056	<.0001	1.28	1.14	1.43
dgn_226	226 - Fracture of neck of femur (hip)	85,761	1.4	0.022	0.018	0.2128	1.02	0.99	1.06
dgn_228	228 - Skull and face fractures	2,593	0.0	0.326	0.058	<.0001	1.38	1.24	1.55
dgn_229	229 - Fracture of upper limb	19,930	0.3	0.311	0.026	<.0001	1.36	1.30	1.43

Variable Name in Model	Covariate	Count	Percent Total	Estimate	Std. Error	P value	Odds Ratio	OR 95% Lower CL	OR 95% Upper CL
dgn_230	230 - Fracture of lower limb	28,113	0.4	0.311	0.025	<.0001	1.36	1.30	1.43
dgn_231	231 - Other fractures	45,148	0.7	0.328	0.014	<.0001	1.39	1.35	1.43
dgn_232	232 - Sprains and strains	4,084	0.1	0.371	0.047	<.0001	1.45	1.32	1.59
dgn_233	233 - Intracranial injury	22,167	0.4	0.139	0.020	<.0001	1.15	1.10	1.20
dgn_234	234 - Crushing injury or internal injury	4,879	0.1	0.430	0.041	<.0001	1.54	1.42	1.67
dgn_237	237 - Complication of device; implant or graft	106,096	1.7	0.008	0.010	0.4405	1.01	0.99	1.03
dgn_238	238 - Complications of surgical procedures or medical care	53,620	0.8	0.257	0.012	<.0001	1.29	1.26	1.32
dgn_239	239 - Superficial injury; contusion	7,359	0.1	0.168	0.031	<.0001	1.18	1.11	1.26
dgn_240	240 - Burns	1,985	0.0	0.346	0.062	<.0001	1.41	1.25	1.60
dgn_245	245 - Syncope	24,056	0.4	0.148	0.017	<.0001	1.16	1.12	1.20
dgn_246	246 - Fever of unknown origin	2,930	0.0	0.149	0.046	0.0013	1.16	1.06	1.27
dgn_248	248 - Gangrene	6,121	0.1	-0.267	0.031	<.0001	0.77	0.72	0.81
dgn_254	254 - Rehabilitation care; fitting of prostheses; and adjustment of devices	7,270	0.1	0.645	0.037	<.0001	1.91	1.77	2.05
dgn_257	257 - Other aftercare	1,402	0.0	0.435	0.083	<.0001	1.54	1.31	1.82
dgn_653	653 - Delirium, dementia, and amnestic and other cognitive disorders	19,779	0.3	-0.203	0.017	<.0001	0.82	0.79	0.84
dgn_657	657 - Mood disorders	18,437	0.3	-0.117	0.018	<.0001	0.89	0.86	0.92
dgn_659	659 - Schizophrenia and other psychotic disorders	12,616	0.2	-0.324	0.021	<.0001	0.72	0.69	0.75
dgn_misc	Composite of all excluded CCS Diagnosis groups	432,368	6.8	-0.011	0.004	0.0157	0.99	0.98	1.00
CCS Procedure Groups (Reference group: Composite of all other CCS procedure groups)									
prc_001	1 - Incision and excision of CNS	8,411	0.1	0.132	0.033	<.0001	1.14	1.07	1.22
prc_002	2 - Insertion; replacement; or removal of extracranial ventricular shunt	3,144	0.0	0.180	0.050	0.0003	1.20	1.09	1.32
prc_003	3 - Laminectomy; excision intervertebral disc	58,724	0.9	0.354	0.020	<.0001	1.42	1.37	1.48
prc_004	4 - Diagnostic spinal tap	15,965	0.3	0.155	0.021	<.0001	1.17	1.12	1.22
prc_009	9 - Other OR therapeutic nervous system procedures	15,455	0.2	0.055	0.027	0.0398	1.06	1.00	1.11
prc_032	32 - Other non-OR therapeutic procedures on nose; mouth and pharynx	1,714	0.0	0.274	0.072	0.0001	1.32	1.14	1.51
prc_033	33 - Other OR therapeutic procedures on nose; mouth and pharynx	1,909	0.0	0.298	0.066	<.0001	1.35	1.18	1.53

Variable Name in Model	Covariate	Count	Percent Total	Estimate	Std. Error	P value	Odds Ratio	OR 95% Lower CL	OR 95% Upper CL
prc_034	34 - Tracheostomy; temporary and permanent	4,593	0.1	0.188	0.038	<.0001	1.21	1.12	1.30
prc_036	36 - Lobectomy or pneumonectomy	3,517	0.1	0.500	0.050	<.0001	1.65	1.49	1.82
prc_037	37 - Diagnostic bronchoscopy and biopsy of bronchus	33,814	0.5	-0.054	0.014	<.0001	0.95	0.92	0.97
prc_039	39 - Incision of pleura; thoracentesis; chest drainage	54,871	0.9	-0.080	0.011	<.0001	0.92	0.90	0.94
prc_042	42 - Other OR Rx procedures on respiratory system and mediastinum	10,549	0.2	0.264	0.028	<.0001	1.30	1.23	1.38
prc_043	43 - Heart valve procedures	46,616	0.7	0.260	0.028	<.0001	1.30	1.23	1.37
prc_044	44 - Coronary artery bypass graft (CABG)	67,681	1.1	0.452	0.021	<.0001	1.57	1.51	1.64
prc_048	48 - Insertion; revision; replacement; removal of cardiac pacemaker or cardioverter/defibrillator	54,507	0.9	0.253	0.013	<.0001	1.29	1.26	1.32
prc_050	50 - Extracorporeal circulation auxiliary to open heart procedures	87,610	1.4	0.368	0.021	<.0001	1.44	1.39	1.51
prc_051	51 - Endarterectomy; vessel of head and neck	9,388	0.1	0.244	0.044	<.0001	1.28	1.17	1.39
prc_052	52 - Aortic resection; replacement or anastomosis	8,969	0.1	0.278	0.046	<.0001	1.32	1.21	1.45
prc_054	54 - Other vascular catheterization; not heart	253,836	4.0	-0.047	0.006	<.0001	0.95	0.94	0.96
prc_055	55 - Peripheral vascular bypass	14,803	0.2	0.155	0.024	<.0001	1.17	1.11	1.22
prc_058	58 - Hemodialysis	100,074	1.6	-0.154	0.009	<.0001	0.86	0.84	0.87
prc_061	61 - Other OR procedures on vessels other than head and neck	109,036	1.7	0.014	0.010	0.1579	1.01	0.99	1.03
prc_062	62 - Other diagnostic cardiovascular procedures	9,465	0.1	0.098	0.027	0.0003	1.10	1.05	1.16
prc_063	63 - Other non-OR therapeutic cardiovascular procedures	61,581	1.0	0.102	0.012	<.0001	1.11	1.08	1.13
prc_065	65 - Bone marrow biopsy	5,623	0.1	-0.172	0.031	<.0001	0.84	0.79	0.90
prc_069	69 - Esophageal dilatation	6,104	0.1	-0.033	0.032	0.3008	0.97	0.91	1.03
prc_070	70 - Upper gastrointestinal endoscopy; biopsy	112,254	1.8	-0.038	0.008	<.0001	0.96	0.95	0.98
prc_071	71 - Gastrostomy; temporary and permanent	16,004	0.3	-0.210	0.019	<.0001	0.81	0.78	0.84
prc_073	73 - Ileostomy and other enterostomy	5,858	0.1	-0.300	0.033	<.0001	0.74	0.69	0.79
prc_074	74 - Gastrectomy; partial and total	1,654	0.0	0.241	0.071	0.0007	1.27	1.11	1.46
prc_075	75 - Small bowel resection	12,789	0.2	0.132	0.027	<.0001	1.14	1.08	1.20
prc_078	78 - Colorectal resection	28,480	0.5	0.134	0.019	<.0001	1.14	1.10	1.19
prc_080	80 - Appendectomy	6,910	0.1	0.144	0.047	0.0023	1.15	1.05	1.27

Variable Name in Model	Covariate	Count	Percent Total	Estimate	Std. Error	P value	Odds Ratio	OR 95% Lower CL	OR 95% Upper CL
prc_084	84 - Cholecystectomy and common duct exploration	25,737	0.4	0.502	0.024	<.0001	1.65	1.58	1.73
prc_085	85 - Inguinal and femoral hernia repair	5,164	0.1	0.308	0.048	<.0001	1.36	1.24	1.50
prc_086	86 - Other hernia repair	23,197	0.4	0.233	0.028	<.0001	1.26	1.20	1.33
prc_087	87 - Laparoscopy (GI only)	2,427	0.0	0.160	0.059	0.0068	1.17	1.05	1.32
prc_088	88 - Abdominal paracentesis	18,719	0.3	-0.335	0.018	<.0001	0.72	0.69	0.74
prc_090	90 - Excision; lysis peritoneal adhesions	31,192	0.5	0.187	0.019	<.0001	1.21	1.16	1.25
prc_091	91 - Peritoneal dialysis	4,250	0.1	-0.438	0.034	<.0001	0.65	0.60	0.69
prc_110	110 - Other diagnostic procedures of urinary tract	2,948	0.0	-0.270	0.042	<.0001	0.76	0.70	0.83
prc_111	111 - Other non-OR therapeutic procedures of urinary tract	9,184	0.1	-0.211	0.025	<.0001	0.81	0.77	0.85
prc_113	113 - Transurethral resection of prostate (TURP)	3,477	0.1	0.295	0.052	<.0001	1.34	1.21	1.49
prc_114	114 - Open prostatectomy	562	0.0	0.977	0.166	<.0001	2.66	1.92	3.68
prc_117	117 - Other non-OR therapeutic procedures; male genital	1,725	0.0	0.215	0.068	0.0017	1.24	1.08	1.42
prc_119	119 - Oophorectomy; unilateral and bilateral	3,606	0.1	0.159	0.070	0.0239	1.17	1.02	1.35
prc_124	124 - Hysterectomy; abdominal and vaginal	2,725	0.0	0.358	0.090	<.0001	1.43	1.20	1.70
prc_129	129 - Repair of cystocele and rectocele; obliteration of vaginal vault	1,594	0.0	0.316	0.147	0.0313	1.37	1.03	1.83
prc_130	130 - Other diagnostic procedures; female organs	656	0.0	-0.298	0.094	0.0016	0.74	0.62	0.89
prc_132	132 - Other OR therapeutic procedures; female organs	3,521	0.1	0.171	0.059	0.0035	1.19	1.06	1.33
prc_142	142 - Partial excision bone	53,253	0.8	0.019	0.017	0.2632	1.02	0.99	1.05
prc_143	143 - Bunionectomy or repair of toe deformities	691	0.0	0.493	0.134	0.0002	1.64	1.26	2.13
prc_145	145 - Treatment; fracture or dislocation of radius and ulna	7,617	0.1	0.193	0.040	<.0001	1.21	1.12	1.31
prc_146	146 - Treatment; fracture or dislocation of hip and femur	68,683	1.1	0.404	0.018	<.0001	1.50	1.45	1.55
prc_147	147 - Treatment; fracture or dislocation of lower extremity (other than hip or femur)	22,163	0.4	0.335	0.028	<.0001	1.40	1.32	1.48
prc_148	148 - Other fracture and dislocation procedure	22,870	0.4	0.164	0.023	<.0001	1.18	1.12	1.23
prc_152	152 - Arthroplasty knee	291,705	4.6	0.672	0.016	<.0001	1.96	1.90	2.02
prc_153	153 - Hip replacement; total and partial	182,857	2.9	0.663	0.015	<.0001	1.94	1.88	2.00
prc_154	154 - Arthroplasty other than hip or knee	25,051	0.4	0.473	0.026	<.0001	1.60	1.53	1.69
prc_155	155 - Arthrocentesis	13,320	0.2	0.042	0.024	0.0729	1.04	1.00	1.09
prc_157	157 - Amputation of lower extremity	23,720	0.4	0.277	0.017	<.0001	1.32	1.27	1.36

Variable Name in Model	Covariate	Count	Percent Total	Estimate	Std. Error	P value	Odds Ratio	OR 95% Lower CL	OR 95% Upper CL
prc_158	158 - Spinal fusion	66,508	1.1	0.439	0.022	<.0001	1.55	1.49	1.62
prc_160	160 - Other therapeutic procedures on muscles and tendons	39,072	0.6	0.049	0.015	0.0011	1.05	1.02	1.08
prc_162	162 - Other OR therapeutic procedures on joints	24,411	0.4	0.091	0.021	<.0001	1.10	1.05	1.14
prc_164	164 - Other OR therapeutic procedures on musculoskeletal system	3,293	0.1	0.247	0.044	<.0001	1.28	1.17	1.39
prc_168	168 - Incision and drainage; skin and subcutaneous tissue	28,504	0.5	0.227	0.017	<.0001	1.25	1.21	1.30
prc_170	170 - Excision of skin lesion	5,375	0.1	0.084	0.037	0.0225	1.09	1.01	1.17
prc_171	171 - Suture of skin and subcutaneous tissue	19,350	0.3	0.077	0.020	0.0001	1.08	1.04	1.12
prc_173	173 - Other diagnostic procedures on skin and subcutaneous tissue	3,385	0.1	-0.262	0.040	<.0001	0.77	0.71	0.83
prc_174	174 - Other non-OR therapeutic procedures on skin and breast	22,713	0.4	-0.087	0.016	<.0001	0.92	0.89	0.95
prc_175	175 - Other OR therapeutic procedures on skin and breast	3,949	0.1	0.146	0.049	0.0031	1.16	1.05	1.27
prc_176	176 - Organ transplantation (other than bone marrow, corneal or kidney)	1,541	0.0	0.392	0.064	<.0001	1.48	1.30	1.68
prc_177	177 - Computerized axial tomography (CT) scan head	27,512	0.4	0.014	0.017	0.3968	1.01	0.98	1.05
prc_190	190 - Contrast arteriogram of femoral and lower extremity arteries	25,747	0.4	-0.159	0.017	<.0001	0.85	0.83	0.88
prc_193	193 - Diagnostic ultrasound of heart (echocardiogram)	139,468	2.2	0.029	0.008	0.0002	1.03	1.01	1.05
prc_198	198 - Magnetic resonance imaging	23,978	0.4	0.037	0.018	0.0443	1.04	1.00	1.08
prc_199	199 - Electroencephalogram (EEG)	8,653	0.1	0.067	0.028	0.0173	1.07	1.01	1.13
prc_202	202 - Electrocardiogram	7,806	0.1	0.009	0.030	0.7521	1.01	0.95	1.07
prc_203	203 - Electrographic cardiac monitoring	8,272	0.1	-0.025	0.029	0.4005	0.98	0.92	1.03
prc_204	204 - Swan-Ganz catheterization for monitoring	10,242	0.2	-0.132	0.028	<.0001	0.88	0.83	0.93
prc_211	211 - Radiation therapy	2,846	0.0	-0.438	0.047	<.0001	0.65	0.59	0.71
prc_214	214 - Traction; splints; and other wound care	14,466	0.2	0.018	0.023	0.4197	1.02	0.97	1.06
prc_218	218 - Psychological and psychiatric evaluation and therapy	4,002	0.1	0.071	0.041	0.0821	1.07	0.99	1.16
prc_221	221 - Nasogastric tube	12,648	0.2	0.050	0.024	0.0381	1.05	1.00	1.10
prc_222	222 - Blood transfusion	383,923	6.1	-0.109	0.005	<.0001	0.90	0.89	0.91
prc_224	224 - Cancer chemotherapy	2,261	0.0	-0.531	0.046	<.0001	0.59	0.54	0.64
prc_227	227 - Other diagnostic procedures	41,170	0.7	0.016	0.013	0.2364	1.02	0.99	1.04

Variable Name in Model	Covariate	Count	Percent Total	Estimate	Std. Error	P value	Odds Ratio	OR 95% Lower CL	OR 95% Upper CL
prc_231	231 - Other therapeutic procedures	160,499	2.5	-0.002	0.007	0.7405	1.00	0.98	1.01
HCC Comorbidities									
hcc_2	2 - Septicemia/Shock	616,672	9.7	0.010	0.004	<.0001	1.01	1.02	1.04
hcc_5	5 - Opportunistic Infections	70,460	1.1	-0.081	0.009	<.0001	0.92	1.02	1.07
hcc_7	7 - Metastatic Cancer and Acute Leukemia	178,814	2.8	-0.551	0.006	<.0001	0.58	0.89	0.90
hcc_8	8 - Lung, Upper Digestive Tract, and Other Severe Cancers	131,592	2.1	-0.255	0.007	<.0001	0.77	0.95	0.96
hcc_9	9 - Lymphatic, Head and Neck, Brain, and Other Major Cancers	185,596	2.9	-0.141	0.006	<.0001	0.87	0.74	0.86
hcc_10	10 - Breast, Prostate, Colorectal and Other Cancers and Tumors	665,679	10.5	0.029	0.004	<.0001	1.03	0.85	0.86
hcc_15	15 - Diabetes with Renal or Peripheral Circulatory Manifestation	758,357	12.0	-0.162	0.004	<.0001	0.85	1.02	1.05
hcc_16	16 - Diabetes with Neurologic or Other Specified Manifestation	563,175	8.9	-0.120	0.004	<.0001	0.89	0.93	0.96
hcc_18	18 - Diabetes with Ophthalmologic or Unspecified Manifestation	129,150	2.0	-0.069	0.007	<.0001	0.93	0.76	0.78
hcc_19	19 - Diabetes without Complication	1,412,823	22.3	-0.036	0.003	<.0001	0.96	0.86	0.87
hcc_21	21 - Protein-Calorie Malnutrition	570,416	9.0	-0.116	0.004	<.0001	0.89	0.75	0.76
hcc_25	25 - End-Stage Liver Disease	75,942	1.2	-0.272	0.009	<.0001	0.76	0.82	0.84
hcc_26	26 - Cirrhosis of Liver	68,733	1.1	-0.150	0.009	<.0001	0.86	0.84	0.86
hcc_27	27 - Chronic Hepatitis	51,118	0.8	-0.077	0.011	0.0566	0.93	1.00	1.16
hcc_31	31 - Intestinal Obstruction/Perforation	393,003	6.2	0.048	0.005	<.0001	1.05	1.03	1.06
hcc_38	38 - Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	744,800	11.8	-0.030	0.003	<.0001	0.97	0.93	0.95
hcc_44	44 - Severe Hematological Disorders	125,317	2.0	-0.173	0.007	<.0001	0.84	1.17	1.19
hcc_45	45 - Disorders of Immunity	145,896	2.3	-0.093	0.007	<.0001	0.91	0.88	0.89
hcc_52	52 - Drug/Alcohol Dependence	187,084	3.0	-0.104	0.006	<.0001	0.90	1.10	1.14
hcc_54	54 - Schizophrenia	152,307	2.4	-0.144	0.007	<.0001	0.87	0.91	0.96
hcc_67	67 - Quadriplegia, Other Extensive Paralysis	61,915	1.0	-0.167	0.010	<.0001	0.85	0.87	0.89
hcc_68	68 - Paraplegia	54,000	0.9	-0.169	0.010	<.0001	0.84	0.93	0.96
hcc_70	70 - Muscular Dystrophy	9,293	0.1	0.039	0.026	<.0001	1.04	0.92	0.95

Variable Name in Model	Covariate	Count	Percent Total	Estimate	Std. Error	P value	Odds Ratio	OR 95% Lower CL	OR 95% Upper CL
hcc_71	71 - Polyneuropathy	1,227,244	19.4	-0.022	0.003	<.0001	0.98	0.96	0.97
hcc_72	72 - Multiple Sclerosis	72,083	1.1	-0.117	0.009	0.0123	0.89	1.00	1.02
hcc_73	73 - Parkinsons and Huntingtons Diseases	294,613	4.7	-0.092	0.005	<.0001	0.91	0.88	0.90
hcc_74	74 - Seizure Disorders and Convulsions	483,024	7.6	-0.037	0.004	<.0001	0.96	0.75	0.78
hcc_77	77 - Respirator Dependence/Tracheostomy Status	87,002	1.4	0.036	0.009	<.0001	1.04	0.85	0.88
hcc_78	78 - Respiratory Arrest	22,117	0.3	-0.062	0.016	<.0001	0.94	0.91	0.95
hcc_79	79 - Cardio-Respiratory Failure and Shock	1,269,195	20.1	-0.076	0.003	<.0001	0.93	1.04	1.06
hcc_80	80 - Congestive Heart Failure	2,526,406	39.9	-0.206	0.003	<.0001	0.81	0.96	0.98
hcc_82	82 - Unstable Angina and Other Acute Ischemic Heart Disease	368,220	5.8	0.005	0.004	<.0001	1.00	0.83	0.85
hcc_92	92 - Specified Heart Arrhythmias	2,188,883	34.6	-0.106	0.002	<.0001	0.90	0.90	0.92
hcc_95	95 - Cerebral Hemorrhage	153,499	2.4	0.069	0.008	<.0001	1.07	0.91	0.94
hcc_96	96 - Ischemic or Unspecified Stroke	871,583	13.8	-0.005	0.003	<.0001	1.00	0.89	0.91
hcc_101	101 - Cerebral Palsy and Other Paralytic Syndromes	46,764	0.7	0.047	0.012	<.0001	1.05	0.85	0.88
hcc_104	104 - Vascular Disease with Complications	561,336	8.9	-0.111	0.004	<.0001	0.90	0.83	0.86
hcc_105	105 - Vascular Disease	2,128,556	33.6	-0.047	0.002	<.0001	0.95	0.83	0.86
hcc_107	107 - Cystic Fibrosis	3,965	0.1	-0.224	0.039	<.0001	0.80	0.57	0.58
hcc_108	108 - Chronic Obstructive Pulmonary Disease	2,205,324	34.9	-0.156	0.002	0.1332	0.86	0.99	1.09
hcc_112	112 - Pneumococcal Pneumonia, Emphysema, Lung Abscess	86,331	1.4	0.035	0.008	<.0001	1.04	0.97	0.98
hcc_119	119 - Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	108,745	1.7	-0.057	0.008	<.0001	0.94	0.87	0.91
hcc_130	130 - Dialysis Status	149,414	2.4	-0.261	0.008	<.0001	0.77	0.90	0.92
hcc_131	131 - Renal Failure	2,059,048	32.6	-0.141	0.002	<.0001	0.87	0.96	0.97
hcc_148	148 - Decubitus Ulcer of Skin	464,596	7.3	-0.287	0.004	<.0001	0.75	1.02	1.05
hcc_149	149 - Chronic Ulcer of Skin, Except Decubitus	400,818	6.3	-0.186	0.004	<.0001	0.83	0.91	0.97
hcc_154	154 - Severe Head Injury	4,293	0.1	0.074	0.039	<.0001	1.08	0.92	0.93
hcc_155	155 - Major Head Injury	173,207	2.7	0.047	0.007	<.0001	1.05	0.76	0.79
hcc_157	157 - Vertebral Fractures without Spinal Cord Injury	331,489	5.2	-0.063	0.005	<.0001	0.94	0.81	0.82
hcc_158	158 - Hip Fracture/Dislocation	495,738	7.8	0.167	0.004	0.2630	1.18	1.00	1.01
hcc_161	161 - Traumatic Amputation	53,199	0.8	0.114	0.011	<.0001	1.12	0.86	0.88
hcc_174	174 - Major Organ Transplant Status	31,233	0.5	-0.071	0.014	<.0001	0.93	0.90	0.90
hcc_176	176 - Artificial Openings for Feeding or Elimination	211,522	3.3	-0.129	0.006	<.0001	0.88	1.06	1.09

Variable Name in Model	Covariate	Count	Percent Total	Estimate	Std. Error	P value	Odds Ratio	OR 95% Lower CL	OR 95% Upper CL
hcc_177	177 - Amputation Status, Lower Limb/Amputation Complications	101,968	1.6	-0.053	0.008	0.1225	0.95	0.99	1.00