RESPECIFYING THE HOSPITAL 30-DAY PNEUMONIA AND 30-DAY CHRONIC OBSTRUCTIVE PULMONARY DISEASE READMISSION MEASURES BY ADDING A PLANNED READMISSION ALGORITHM

Submitted By Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (YNHHSC/CORE)

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Background

The Centers for Medicare & Medicaid Services (CMS) has developed hospital risk-standardized readmission measures for pneumonia and chronic obstructive pulmonary disorder (COPD). The pneumonia measure has been approved by the National Quality Forum (NQF), and both measures are currently under review at NQF[1]. CMS has contracted with Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (YNHHSC/CORE) to update these measures to identify and remove planned readmissions from the measure outcomes. This report describes the changes to each measure for consideration by NQF.

Readmission measures are intended to capture unplanned readmissions that arise from acute clinical events requiring urgent rehospitalization within 30 days of discharge. Higher than expected unplanned readmission rates suggest lower quality of hospital and post-discharge care and are the focus of hospital quality measurement as part of efforts to promote quality improvement. In contrast, planned readmissions are generally not a signal of quality of care. Furthermore, there is concern that including planned readmissions in a readmission measure could create a disincentive to provide appropriate care to patients who are scheduled for elective or necessary procedures unrelated to the prior admissions.

During development of the readmission measures, YNHHSC/CORE clinicians, additional clinical consultants, and technical expert panels identified readmissions for each measure that are typically scheduled as follow-up care within 30 days of discharge. For pneumonia and COPD they concluded that there are no readmissions that are typically scheduled as follow-up care to treat either condition within 30 days of a discharge. However, there has been growing interest in identifying and excluding from this measure planned readmissions for procedures and treatments such as chemotherapy, which are not directly related to the index admission, but were likely planned.

To more broadly identify planned readmissions, CMS contracted with YNHHSC/CORE to develop a planned readmission "algorithm" (a set of criteria) for classifying readmissions as planned using claims data. The algorithm identifies admissions that are typically planned and may occur within 30 days of discharge from the hospital. The planned readmission algorithm was developed for a hospital-wide cohort of patients regardless of the index admission diagnosis. Since it identifies commonly planned readmissions for all types of patients, it is a comprehensive definition of planned readmissions that includes procedures and conditions that are not considered follow-up care for pneumonia or COPD admissions (e.g. elective cholecystectomy). The planned readmission algorithm therefore can be used to enhance the identification of planned readmissions in the readmission measures.

We have updated both readmission measures by applying this planned readmission algorithm. In this report we present: (1) an overview of the planned readmission algorithm; (2) our approach to applying the planned readmission algorithm to each readmission measure; (3) an impact analysis of how this

[1] Measure numbers are: pneumonia – 0506 and COPD - 1891

change in the measure affects the readmissions identified as planned, the rate of planned readmissions, model performance, and the distribution of hospital rates; and (4) a summary of the measure updates.

1. Planned Readmission Algorithm Overview

We based the planned readmission algorithm on three principles:

1. A few specific, limited types of care are always considered planned (obstetrical delivery, transplant surgery, maintenance chemotherapy, rehabilitation);
2. A planned readmission is defined as a non-acute readmission for a scheduled procedure; and
3. Admissions for acute illness or for complications of care are never planned.

Clinicians in our internal working group reviewed the full list of Agency for Healthcare Research and Quality (AHRQ) Procedure Clinical Classification Software (Proc CCS) codes and identified procedure categories that are commonly planned based on these principles. The full preliminary list of planned readmissions and acute diagnoses was posted as part of two public comment periods for the Hospital-Wide All-Cause Unplanned Readmission Measure. The details of the resulting algorithm are presented in Appendix A. In brief, the algorithm uses a flow chart (Figure A 1) and four tables of specific procedure categories and discharge diagnosis categories to classify readmissions as planned or unplanned. Specifically:

1. Table A 1 lists four procedure categories that are always planned regardless of diagnosis;
2. Table A 2 lists four diagnosis categories that are always planned regardless of procedure;
3. Table A 3 presents the list of potentially planned procedure categories (readmissions with these procedures are considered planned if not accompanied by an acute discharge diagnosis); and
4. Table A 4 presents the acute diagnosis categories that disqualify a potentially planned readmission from being considered planned.

2. Applying the Planned Readmission Algorithm

Approach to applying the planned readmission algorithm

Since we developed the planned readmission algorithm in a hospital-wide cohort of patients, our first step in applying it to condition-specific measures was to review the potentially planned procedures in the algorithm (Table A 3) and identify any procedures that should be added or removed to adapt the algorithm for each cohort of patients. Specifically, we took the following steps:

1. We applied the algorithm to each readmission measure, and examined the procedures and associated diagnoses that were identified as being potentially planned.
2. YNHHSC/CORE clinicians reviewed the results for face validity and determined whether any procedures considered planned by the algorithm were likely unplanned among each patient population.

3. Our team of clinicians also determined whether any additional procedures not identified as potentially planned by the algorithm should in fact be considered planned for these patient groups.
4. Based on these considerations, we finalized the algorithm for each readmission measure.

3. Impact Analyses

Pneumonia Measure

Based on our review, we updated the pneumonia readmission measure by applying the planned readmission algorithm without any adaptation. In reviewing the planned readmission algorithm for use in the pneumonia readmission measure (**step 2**), our clinicians did not identify any procedure categories that should be removed from the algorithm because they would unlikely be planned in this patient population. Similarly, the clinicians felt that the algorithm captured all appropriate planned readmissions for this measure (**step 3**).

We compared the results of the original, NQF-endorsed and updated pneumonia readmission measures to assess the effect of updating the measure with the planned readmission algorithm.

Data

The measures were applied to admissions during the period between July 2008 to June 2011. There were 1,096,708 index admissions for pneumonia at 4,859 hospitals.

Readmissions identified as planned in the updated measure

The updated measure identified 6,928 planned readmissions. The top 10 procedures among planned readmissions identified by the updated measure are presented in Table 1.

Table 1: Top 10 Planned Procedures among Planned Readmissions Following Pneumonia Discharge

Procedure CCS	Procedure Description	Number of Planned Procedures
47	Diagnostic cardiac catheterization; coronary arteriography	1,129
48	Insertion; revision; replacement; removal of cardiac pacemaker or cardioverter/defibrillator	582
84	Cholecystectomy and common duct exploration	428
67	Other therapeutic procedures; hemic and lymphatic system	310
211	Therapeutic radiology for cancer treatment	298
999	Maintenance Chemotherapy	284
78	Colorectal resection	277
169	Debridement of wound; infection or burn	274
157	Amputation of lower extremity	214
159	Other diagnostic procedures on musculoskeletal system	214

Rate of planned readmissions identified by the original NQF-endorsed and updated measures

Using the original, NQF-endorsed measure, the crude 30-day unplanned readmission rate was 18.5%. The updated measure decreased the number of readmissions counted in the outcome by identifying some readmissions as planned. For the updated measure, the crude 30-day unplanned readmission rate was 17.8%. The updated measure has a planned readmission rate of 0.6% (discrepancy due to rounding).

Comparison of model performance

To assess potential change in model performance, we calculated the c-statistic for the original, NQF-endorsed measure and the updated measure. The c-statistic changed negligibly from 0.631 to 0.634.

We also examined the odds ratios for the risk factors and their 95% confidence intervals (CIs) to determine whether this update substantially changed model variables, which would suggest they should be re-selected. The odds ratios for the original, NQF-endorsed measure and for the updated measure are in Appendix B in Table B.1. The odds ratios are nearly identical, indicating that the risk factors have a similar magnitude of effect regardless of whether or not the planned readmissions are counted in the readmission outcome.

Impact on distribution of RSRRs and relative performance of hospitals

To assess the effect on hospitals' relative performance, we examined the distribution of the Risk-Standardized Readmission Rates (RSRR) in the original, NQF-endorsed measure and the updated measure. The distribution of RSRRs shifted slightly downward from the original, NQF-endorsed measure (Figure 1) for the updated measure (Figure 2). This is expected given that the updated crude 30-day unplanned readmission rate decreased from 18.5% to 17.8%.

We then examined the distribution of the difference in hospitals' RSRR values (RSRR of the original, NQF-endorsed measure subtracted from the RSRR of the updated measure). A narrow distribution would suggest that the relative performance of hospitals is not substantially affected by the change. The median difference in hospital RSRRs was -0.6. All hospitals experienced a decrease in their rate and, for most, the difference was between -1.3 and -0.3 (Figure 3).

Figure 1: Distribution of Hospital RSRRs for the Original, NQF-Endorsed Pneumonia Measure

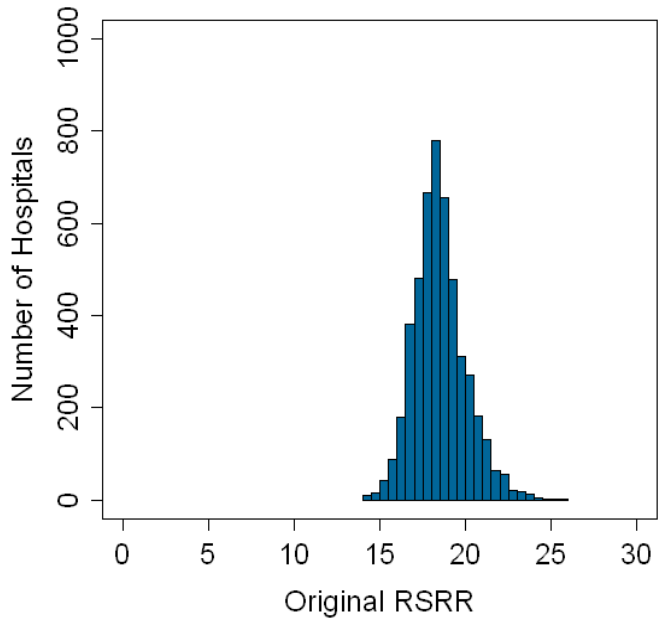


Figure 2: Distribution of Hospital RSRRs for the Updated Pneumonia Measure

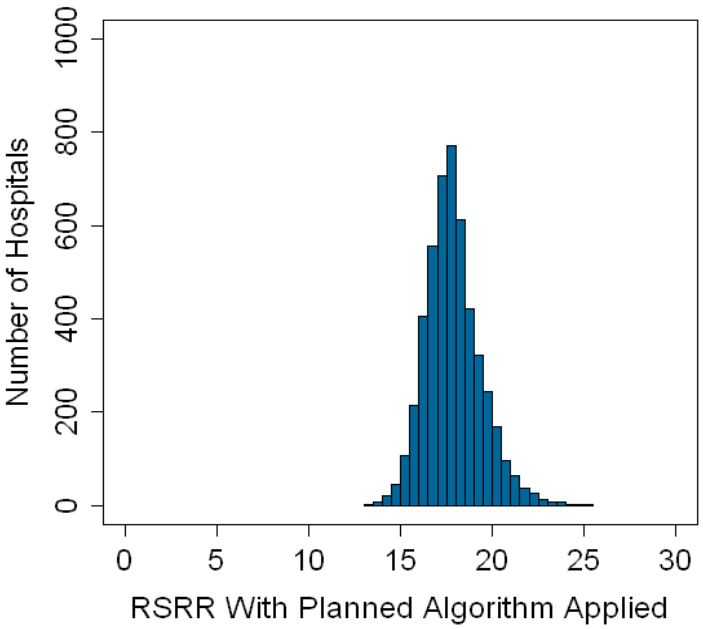
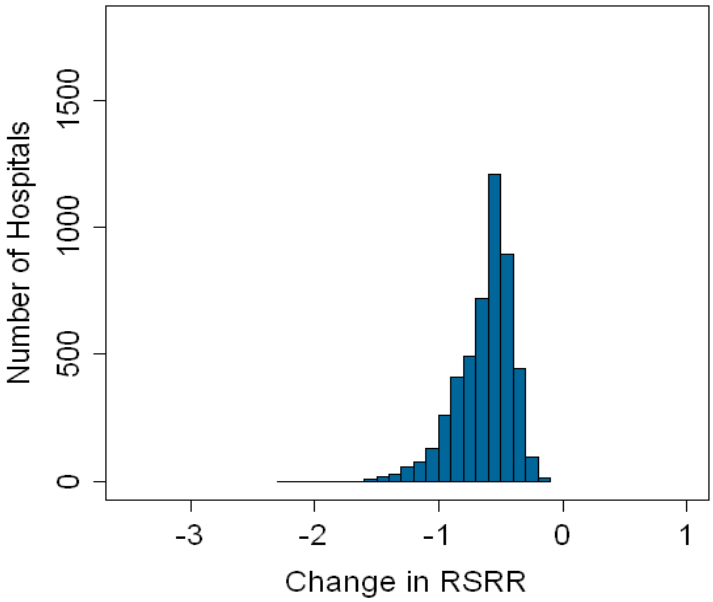


Figure 3: Distribution of Hospitals' Change in RSRR for Pneumonia after Applying the Planned Readmission Algorithm



COPD Measure

Based on our review, we updated the COPD readmission measure by applying the planned readmission algorithm without any adaptation. In reviewing the planned readmission algorithm for use in the COPD readmission measure (**step 2**), our clinicians did not identify any procedure categories that should be removed from the algorithm because they would likely be unplanned in this patient population. Similarly, the clinicians felt that the algorithm captured all appropriate planned readmissions for this measure (**step 3**).

We compared the results of the original, NQF-endorsed and updated readmission measures to assess the effect of updating the measure with the planned readmission algorithm.

Data

The measures were applied to admissions during the 2008 calendar year. There were 352,631 index admissions for COPD at 4,637 hospitals.

Readmissions identified as planned in the updated measure

The updated measure identified 2,219 planned readmissions. The top 10 procedures among planned readmissions identified by the updated measure are presented in Table 2.

Table 2: Top 10 Planned Procedures among Planned Readmissions Following COPD Discharge

Procedure CCS	Procedure Description	Number of Planned Procedures
47	Diagnostic cardiac catheterization; coronary arteriography	601
48	Insertion; revision; replacement; removal of cardiac pacemaker or cardioverter/defibrillator	153
84	Cholecystectomy and common duct exploration	132
78	Colorectal resection	91
159	Other diagnostic procedures on musculoskeletal system	79
211	Therapeutic radiology for cancer treatment	75
113	Transurethral resection of prostate (TURP)	69
51	Endarterectomy; vessel of head and neck	57
5	Insertion of catheter or spinal stimulator and injection into spinal canal	54
86	Other hernia repair	53

Rate of planned readmissions identified by original NQF-endorsed and updated measures

Using the original, NQF-endorsed measure, the crude 30-day unplanned readmission rate was 21.9%. The updated measure decreased the number of readmissions counted in the outcome by identifying some readmissions as planned. For the updated measure, the crude 30-day unplanned readmission rate was 21.3%. The revised measure has a planned readmission rate of 0.6%.

Comparison of model performance

To assess potential change in model performance, we calculated the c-statistic for the original, NQF-endorsed measure and the updated measure. The c-statistic changed negligibly from 0.629 to 0.631.

We also examined the odds ratios for the risk factors and their 95% confidence intervals (CIs) to determine whether this update substantially changed model variables, which would suggest they should be re-selected. The odds ratios for the original, NQF-endorsed measure and for the updated measure are in Appendix B in Table B 2. The odds ratios are nearly identical, indicating that the risk factors have a similar magnitude of effect regardless of whether or not the planned readmissions are counted in the readmission outcome.

Impact on distribution of RSRRs and relative performance of hospitals

To assess the effect on hospitals' relative performance, we examined the distribution of the Risk-Standardized Readmission Rates (RSRR) in the original, NQF-endorsed measure and the updated measure. The distribution of RSRRs shifted slightly downward from the original, NQF-endorsed measure (Figure 4) for the updated measure (Figure 5). This is expected given that the updated measured readmission rate decreased from 21.9% to 21.3%.

We then examined the distribution of the difference in hospitals' RSRR values (RSRR of the original, NQF-endorsed measure subtracted from the RSRR of the updated measure). A narrow distribution would suggest that the relative performance of hospitals is not substantially affected by the change. The median difference in hospital RSRRs was -0.6. All hospitals experienced a decrease in their rate and, for most, the difference was between -1.2 and -0.4. (Figure 6)

Figure 4: Distribution of Hospital RSRRs for the Original, NQF-Endorsed COPD Measure

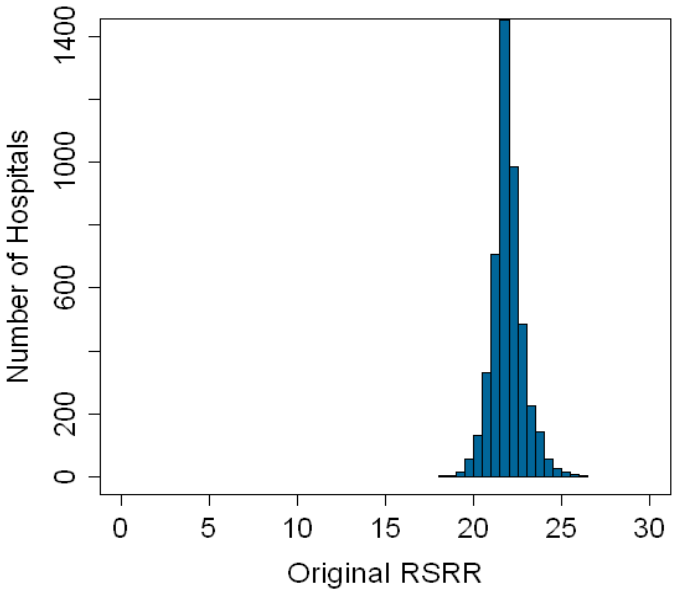


Figure 5: Distribution of Hospital RSRRs for the Updated COPD Measure

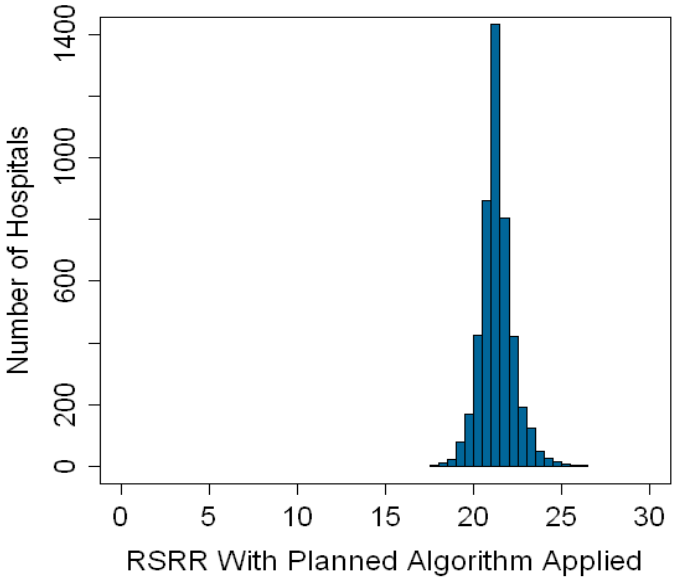
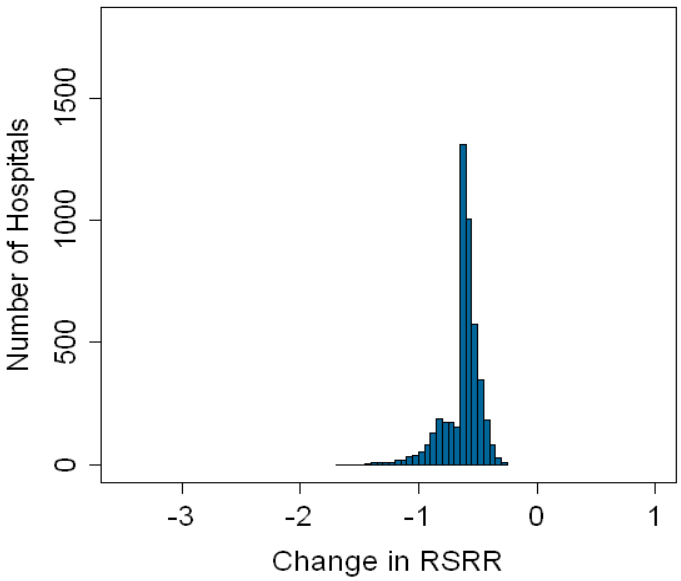


Figure 6: Distribution of Hospitals' Change in RSRR for COPD after Applying the Planned Readmission Algorithm



4. Summary of Measure Updates

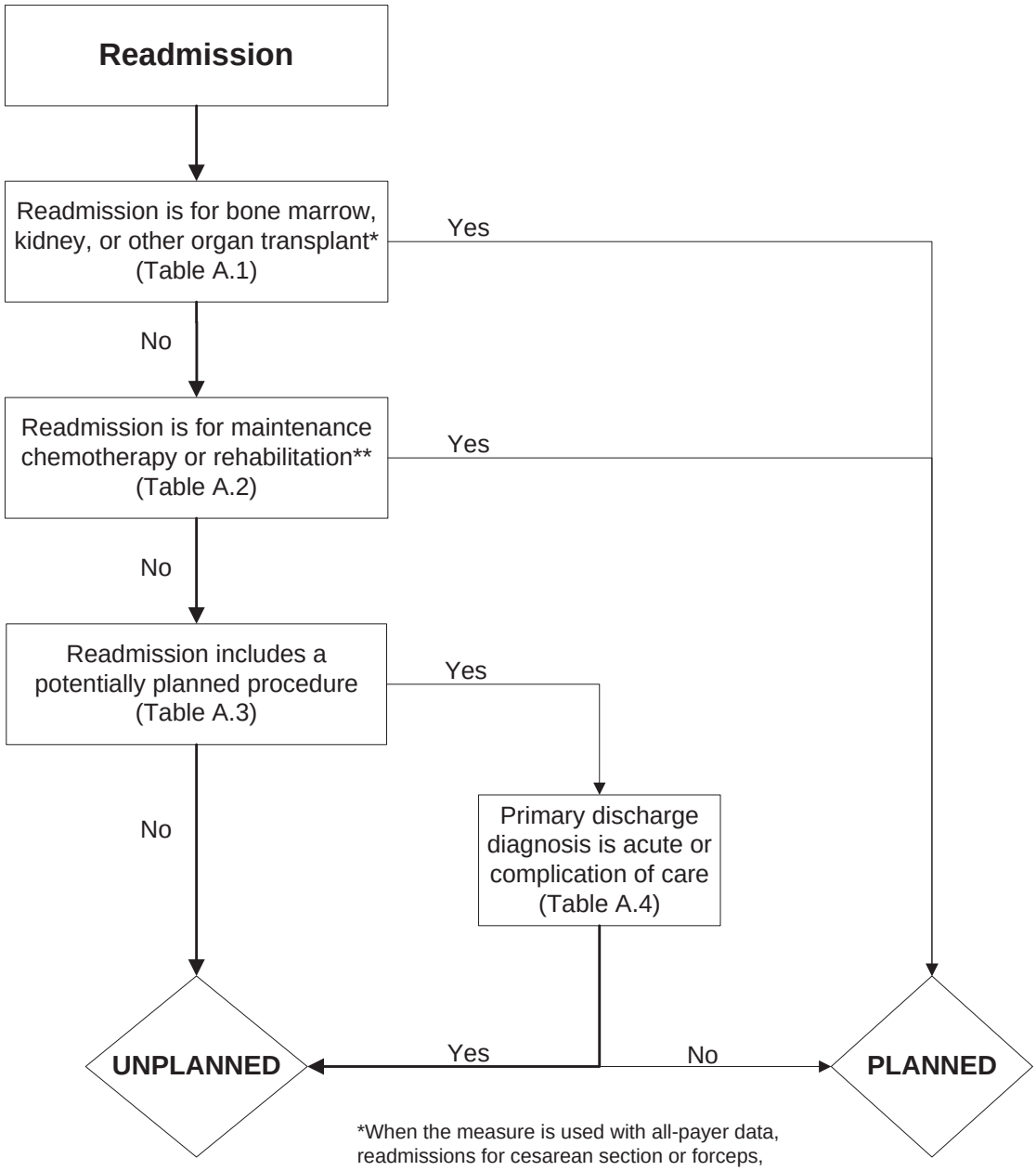
For the pneumonia readmission measure, we applied the planned readmission algorithm without adaptation to the original, NQF-endorsed measure. In the updated measure, the measured crude readmission rate was 17.8%.

For the COPD readmission measure, we also applied the planned readmission algorithm without adaptation to the original, NQF-endorsed measure. In the updated measure, the measured crude readmission rate was 21.3%.

Using the planned readmission algorithm improves the way the readmission measures identify planned readmissions. These measure updates further strengthen the measures' validity and minimizes any incentive on the part of hospitals to postpone appropriate care for patients who are scheduled for elective or necessary procedures.

Appendix A

Figure A 1: Planned Readmission Algorithm



*When the measure is used with all-payer data, readmissions for cesarean section or forceps, vacuum, or breech delivery are considered planned

**When the measure is used with all-payer data, readmissions for forceps or normal delivery are considered planned

Planned Readmission Algorithm

1. There are several procedures (Table A.1) and diagnoses (Table A.2) for which readmissions are always considered planned

Table A 1: Procedure Categories that are Always Planned regardless of Diagnosis

Procedure CCS[2]	Description
64	Bone marrow transplant
105	Kidney transplant
134	Cesarean section[3]
135	Forceps; vacuum; and breech delivery[3]
176	Other organ transplantation

Table A 2: Diagnosis Categories that are Always Planned regardless of Procedure

Diagnosis CCS[2]	Description
45	Maintenance chemotherapy
194	Forceps delivery[3]
196	Normal pregnancy and/or delivery[3]
254	Rehabilitation

[2] CCS: Clinical Classification Software, developed by the Agency for Healthcare Research and Quality (AHRQ). The software creates clinically-coherent, mutually-exclusive condition categories (diagnosis groups) and procedure categories.

[3] CCS to be included only in all-payer settings, not intended for inclusion in CMS' claims-based readmission measures for Medicare fee-for-service beneficiaries aged 65+ years

2. Readmissions that include any typically scheduled or elective procedures are considered planned *if the readmission is not for an acute diagnosis*

    - The algorithm identifies a finite list of typically scheduled or elective procedures

    - The list includes 60 AHRQ procedure categories from among 231 AHRQ procedure categories, plus 11 individual ICD-9 procedure codes (Table A.3)
        Examples: total hip replacement; hernia repair

    - Readmissions with these specific procedures are considered planned unless the readmission diagnosis is acute
        - Example: hip replacement is considered unplanned if hip fracture is the discharge diagnosis

3. Readmissions for acute diagnoses or complications of care are not considered planned

    - The algorithm identifies a finite list of acute diagnoses (Table A.4)

    - The list includes 99 diagnosis groups from among 285 AHRQ condition categories, plus 4 groupings of individual ICD-9 diagnosis codes that represent cardiac diagnoses that would not be associated with a planned readmission
        - Examples: sepsis, acute myocardial infarction, fracture, ischemic stroke, pneumonia

    - No readmissions with these specific discharge diagnoses are considered planned (unless a procedure always considered planned, such as transplant or obstetrical delivery, occurred)

Table A 3: List of Potentially Planned Procedure Categories

Procedure CCS[4]	Description
3	Laminectomy; excision intervertebral disc
5	Insertion of catheter or spinal stimulator and injection into spinal
9	Other OR therapeutic nervous system procedures
10	Thyroidectomy; partial or complete
12	Other therapeutic endocrine procedures
33	Other OR therapeutic procedures on nose; mouth and pharynx
36	Lobectomy or pneumonectomy
38	Other diagnostic procedures on lung and bronchus
40	Other diagnostic procedures of respiratory tract and mediastinum
43	Heart valve procedures
44	Coronary artery bypass graft (CABG)
45	Percutaneous transluminal coronary angioplasty (PTCA)
47	Diagnostic cardiac catheterization; coronary arteriography
48	Insertion; revision; replacement; removal of cardiac pacemaker or cardioverter/defibrillator
49	Other OR heart procedures
51	Endarterectomy; vessel of head and neck
52	Aortic resection; replacement or anastomosis
53	Varicose vein stripping; lower limb
55	Peripheral vascular bypass
56	Other vascular bypass and shunt; not heart
59	Other OR procedures on vessels of head and neck
62	Other diagnostic cardiovascular procedures
66	Procedures on spleen
67	Other therapeutic procedures; hemic and lymphatic system
74	Gastrectomy; partial and total
78	Colorectal resection
79	Local excision of large intestine lesion (not endoscopic)
84	Cholecystectomy and common duct exploration
85	Inguinal and femoral hernia repair
86	Other hernia repair
99	Other OR gastrointestinal therapeutic procedures
104	Nephrectomy; partial or complete
106	Genitourinary incontinence procedures
107	Extracorporeal lithotripsy; urinary
109	Procedures on the urethra
112	Other OR therapeutic procedures of urinary tract
113	Transurethral resection of prostate (TURP)

[4] CCS: Clinical Classification Software, developed by the Agency for Healthcare Research and Quality (AHRQ). The software creates clinically-coherent, mutually-exclusive condition categories (diagnosis groups) and procedure categories.

Procedure CCS[4]	Description
114	Open prostatectomy
119	Oophorectomy; unilateral and bilateral
120	Other operations on ovary
124	Hysterectomy; abdominal and vaginal
129	Repair of cystocele and rectocele; obliteration of vaginal vault
132	Other OR therapeutic procedures; female organs
142	Partial excision bone
152	Arthroplasty knee
153	Hip replacement; total and partial
154	Arthroplasty other than hip or knee
157	Amputation of lower extremity
158	Spinal fusion
159	Other diagnostic procedures on musculoskeletal system
166	Lumpectomy; quadrantectomy of breast
167	Mastectomy
169	Debridement of wound; infection or burn
172	Skin graft
211	Therapeutic radiology for cancer treatment
ICD-9 Codes	**Description**
30.1, 30.29, 30.3, 30.4, 31.74, 34.6	Laryngectomy, revision of tracheostomy, scarification of pleura (from Proc CCS 42- Other OR Rx procedures on respiratory system and mediastinum)
38.18	Endarterectomy leg vessel (from Proc CCS 60- Embolectomy and endarterectomy of lower limbs)
55.03, 55.04	Percutaneous nephrostomy with and without fragmentation (from Proc CCS 103- Nephrotomy and nephrostomy)
94.26, 94.27	Electroshock therapy (from Proc CCS 218- Psychological and psychiatric evaluation and therapy)

Table A 4: Acute Diagnosis Categories that Disqualify a Readmission from Being Considered Planned

Diagnosis CCS[5]	Description
1	Tuberculosis
2	Septicemia (except in labor)
3	Bacterial infection; unspecified site
4	Mycoses
5	HIV infection
7	Viral infection
8	Other infections; including parasitic
9	Sexually transmitted infections (not HIV or hepatitis)
54	Gout and other crystal arthropathies
55	Fluid and electrolyte disorders
60	Acute posthemorrhagic anemia
61	Sickle cell anemia
63	Diseases of white blood cells
76	Meningitis (except that caused by tuberculosis or sexually transmitted disease)
77	Encephalitis (except that caused by tuberculosis or sexually transmitted disease)
78	Other CNS infection and poliomyelitis
82	Paralysis
83	Epilepsy; convulsions
84	Headache; including migraine
85	Coma; stupor; and brain damage
87	Retinal detachments; defects; vascular occlusion; and retinopathy
89	Blindness and vision defects
90	Inflammation; infection of eye (except that caused by tuberculosis or sexually transmitted disease)
91	Other eye disorders
92	Otitis media and related conditions
93	Conditions associated with dizziness or vertigo
100	Acute myocardial infarction
102	Nonspecific chest pain
104	Other and ill-defined heart disease
107	Cardiac arrest and ventricular fibrillation
109	Acute cerebrovascular disease
112	Transient cerebral ischemia
116	Aortic and peripheral arterial embolism or thrombosis
118	Phlebitis; thrombophlebitis and thromboembolism
120	Hemorrhoids
122	Pneumonia (except that caused by TB or sexually transmitted disease)
123	Influenza

[5] CCS: Clinical Classification Software, developed by the Agency for Healthcare Research and Quality (AHRQ). The software creates clinically-coherent, mutually-exclusive condition categories (diagnosis groups) and procedure categories.

Diagnosis CCS[5]	Description
124	Acute and chronic tonsillitis
125	Acute bronchitis
126	Other upper respiratory infections
127	Chronic obstructive pulmonary disease and bronchiectasis
128	Asthma
130	Pleurisy; pneumothorax; pulmonary collapse
131	Respiratory failure; insufficiency; arrest (adult)
135	Intestinal infection
137	Diseases of mouth; excluding dental
139	Gastroduodenal ulcer (except hemorrhage)
140	Gastritis and duodenitis
142	Appendicitis and other appendiceal conditions
145	Intestinal obstruction without hernia
146	Diverticulosis and diverticulitis
148	Peritonitis and intestinal abscess
153	Gastrointestinal hemorrhage
154	Noninfectious gastroenteritis
157	Acute and unspecified renal failure
159	Urinary tract infections
165	Inflammatory conditions of male genital organs
168	Inflammatory diseases of female pelvic organs
169	Debridement of wound; infection or burn
172	Ovarian cyst
197	Skin and subcutaneous tissue infections
198	Other inflammatory condition of skin
225	Joint disorders and dislocations; trauma-related
226	Fracture of neck of femur (hip)
227	Spinal cord injury
228	Skull and face fractures
229	Fracture of upper limb
230	Fracture of lower limb
232	Sprains and strains
233	Intracranial injury
234	Crushing injury or internal injury
235	Open wounds of head; neck; and trunk
237	Complication of device; implant or graft
238	Complications of surgical procedures or medical care
239	Superficial injury; contusion
240	Burns
241	Poisoning by psychotropic agents
242	Poisoning by other medications and drugs

Diagnosis CCS[5]	Description
243	Poisoning by nonmedicinal substances
244	Other injuries and conditions due to external causes
245	Syncope
246	Fever of unknown origin
247	Lymphadenitis
249	Shock
250	Nausea and vomiting
251	Abdominal pain
252	Malaise and fatigue
253	Allergic reactions
259	Residual codes; unclassified
650	Adjustment disorders
651	Anxiety disorders
652	Attention-deficit, conduct, and disruptive behavior disorders
653	Delirium, dementia, and amnestic and other cognitive disorders
656	Impluse control disorders, NEC
658	Personality disorders
660	Alcohol-related disorders
661	Substance-related disorders
662	Suicide and intentional self-inflicted injury
663	Screening and history of mental health and substance abuse codes
670	Miscellaneous disorders
ICD-9 codes	**Description**
Acute ICD-9 codes within Dx CCS 97: Peri-; endo-; and myocarditis; cardiomyopathy	
03282	Diphtheritic myocarditis
03640	Meningococcal carditis nos
03641	Meningococcal pericarditis
03642	Meningococcal endocarditis
03643	Meningococcal myocarditis
07420	Coxsackie carditis nos
07421	Coxsackie pericarditis
07422	Coxsackie endocarditis
07423	Coxsackie myocarditis
11281	Candidal endocarditis
11503	Histoplasma capsulatum pericarditis
11504	Histoplasma capssulatum endocarditis
11513	Histoplasma duboisii pericarditis
11514	Histoplasma duboisii endocarditis
11593	Histoplasmosis pericarditis
11594	Histoplasmosis endocarditis
1303	Toxoplasma myocarditis
3910	Acute rheumatic pericarditis

Diagnosis CCS[5]	Description
3911	Acute rheumatic endocarditis
3912	Acute rheumatic myocarditis
3918	Acute rheumatic heart disease nec
3919	Acute rheumatic heart disease nos
3920	Rheumatic chorea w heart involvement
3980	Rheumatic myocarditis
39890	Rheumatic heart disease nos
39899	Rheumatic heart disease nec
4200	Acute pericarditis in other disease
42090	Acute pericarditis nos
42091	Acute idiopath pericarditis
42099	Acute pericarditis nec
4210	Acute/subacute bacterial endocarditis
4211	Acute endocarditis in other diseases
4219	Acute/subacute endocarditis nos
4220	Acute myocarditis in other diseases
42290	Acute myocarditis nos
42291	Idiopathic myocarditis
42292	Septic myocarditis
42293	Toxic myocarditis
42299	Acute myocarditis nec
4230	Hemopericardium
4231	Adhesive pericarditis
4232	Constrictive pericarditis
4233	Cardiac tamponade
4290	Myocarditis nos
Acute ICD-9 codes within Dx CCS 105: Conduction disorders	
4260	Atrioventricular block complete
42610	Atrioventricular block nos
42611	Atrioventricular block-1st degree
42612	Atrioventricular block-mobitz ii
42613	Atrioventricular block-2nd degree nec
4262	Left bundle branch hemiblock
4263	Left bundle branch block nec
4264	Right bundle branch block
42650	Bundle branch block nos
42651	Right bundle branch block/left posterior fascicular block
42652	Right bundle branch block/left ant fascicular block
42653	Bilateral bundle branch block nec
42654	Trifascicular block
4266	Other heart block
4267	Anomalous atrioventricular excitation
42681	Lown-ganong-levine syndrome

Diagnosis CCS[5]	Description
42682	Long qt syndrome
4269	Conduction disorder nos
Acute ICD-9 codes within Dx CCS 106: Dysrhythmia	
4272	Paroxysmal tachycardia nos
7850	Tachycardia nos
42789	Cardiac dysrhythmias nec
4279	Cardiac dysrhythmia nos
42769	Premature beats nec
Acute ICD-9 codes within Dx CCS 108: Congestive heart failure; nonhypertensive	
39891	Rheumatic heart failure
4280	Congestive heart failure
4281	Left heart failure
42820	Unspecified systolic heart failure
42821	Acute systolic heart failure
42823	Acute on chronic systolic heart failure
42830	Unspecified diastolic heart failure
42831	Acute diastolic heart failure
42833	Acute on chronic diastolic heart failure
42840	Unpec combined syst & dias heart failure
42841	Acute combined systolic & diastolic heart failure
42843	Acute on chronic combined systolic & diastolic heart failure
4289	Heart failure nos

Appendix B

Table B 1: Pneumonia Measure Odds Ratios and 95% Confidence Intervals

Pneumonia Effect	NQF Endorsed Measure OR (Lower CI - Upper CI)	Updated Measure OR (Lower CI - Upper CI)	diff
Demographic			
Age-65 (years above 65, continuous)	1.00 (1.00-1.00)	1.00 (1.00-1.00)	0.00
Male	1.07 (1.06-1.08)	1.07 (1.05-1.08)	0.00
Comorbidity			
History of CABG	0.88 (0.86-0.90)	0.89 (0.87-0.91)	-0.01
History of infection (CC 1, 3-6)	1.04 (1.03-1.05)	1.05 (1.04-1.06)	-0.01
Septicemia/shock (CC 2)	1.07 (1.05-1.09)	1.06 (1.04-1.08)	0.01
Metastatic cancer or acute leukemia (CC 7)	1.21 (1.18-1.24)	1.21 (1.18-1.24)	0.00
Lung or other server cancers (CC 8)	1.20 (1.18-1.22)	1.20 (1.17-1.23)	0.01
Other major cancer (CC 9-10)	1.02 (1.01-1.01)	1.01 (0.99-1.02)	0.01
Diabetes mellitus (DM) or DM complications (CC 15-20, 119-120)	1.08 (1.07-1.09)	1.08 (1.07-1.10)	0.00
Protein-calorie malnutrition (CC 21)	1.16 (1.15-1.18)	1.17 (1.15-1.19)	-0.01
Disorders of fluid, electrolyte, acid-base (CC 22-23)	1.16 (1.15-1.17)	1.16 (1.15-1.18)	0.00
Other gastrointestinal disorders (CC 36)	1.03 (1.02-1.05)	1.03 (1.02-1.05)	0.00
Severe hematological disorders (CC 44)	1.21 (1.18-1.23)	1.20 (1.18-1.23)	0.01
Iron deficiency or other anemias and blood disease (CC 47)	1.12 (1.11-1.14)	1.13 (1.12-1.14)	-0.01
Dementia or other specified brain disorders (CC 49-50)	1.01 (1.00-1.02)	1.02 (1.01-1.03)	-0.01
Drug/alcohol abuse/dependence/psychosis (CC 51-53)	1.08 (1.07-1.10)	1.09 (1.07-1.10)	-0.01
Major psychiatric disorders (CC 54-56)	1.04 (1.03-1.06)	1.05 (1.04-1.07)	-0.01
Other psychiatric disorders (CC 60)	1.09 (1.08-1.11)	1.10 (1.08-1.12)	-0.01
Hemiplegia, paraplegia, paralysis, functional disability (CC 67-69, 100-102, 177, 178)	1.08 (1.06-1.10)	1.08 (1.06-1.10)	0.00
Cardio-respiratory failure or shock (CC 79)	1.15 (1.13-1.16)	1.17 (1.15-1.18)	-0.02
Congestive heart failure (CC 80)	1.19 (1.17-1.20)	1.19 (1.17-1.20)	0.00
Acute coronary syndrome (CC 81-82)	1.10 (1.08-1.12)	1.09 (1.07-1.11)	0.01
Coronary atherosclerosis or angina (CC 83-84)	1.06 (1.05-1.07)	1.05 (1.04-1.06)	0.01
Valvular or rheumatic heart disease (CC 86)	1.07 (1.06-1.08)	1.06 (1.05-1.08)	0.01
Specified Arrhythmias (CC 92-93)	1.10 (1.09-1.11)	1.09 (1.08-1.10)	0.01
Stroke (CC 95-96)	1.06 (1.05-1.07)	1.06 (1.04-1.07)	0.00
Vascular or circulatory disease (CC 104-106)	1.06 (1.05-1.07)	1.06 (1.05-1.07)	-0.01
Chronic obstructive pulmonary disease (CC 108)	1.18 (1.16-1.19)	1.19 (1.18-1.21)	-0.01
Fibrosis of lung or other chronic lung disorders (CC 109)	1.09 (1.07-1.10)	1.09 (1.07-1.10)	0.00
Asthma (CC 110)	0.98 (0.97-1.00)	0.98 (0.97-1.00)	0.00
Pneumonia (CC 111-113)	1.06 (1.05-1.07)	1.07 (1.05-1.08)	-0.01
Pleural effusion/pneumothorax (CC 114)	1.12 (1.10-1.13)	1.12 (1.10-1.13)	0.00
Other lung disorder (CC 115)	1.03 (1.02-1.04)	1.03 (1.02-1.04)	0.00
End stage renal disease or dialysis (CC 129-130)	1.20 (1.17-1.23)	1.21 (1.17-1.24)	-0.01

Pneumonia Effect	NQF Endorsed Measure OR (Lower CI - Upper CI)	Updated Measure OR (Lower CI - Upper CI)	diff
Renal failure (CC 131)	1.16 (1.15-1.17)	1.17 (1.16-1.19)	-0.01
Urinary tract Infection (CC 135)	1.06 (1.04-1.07)	1.06 (1.04-1.07)	0.00
Other urinary tract disorders (CC 136)	1.03 (1.02-1.04)	1.04 (1.02-1.05)	-0.01
Decubitus ulcer or chronic skin ulcer (CC 148-149)	1.11 (1.09-1.12)	1.09 (1.08-1.11)	0.01
Vertebral fractures (CC 157)	1.10 (1.08-1.12)	1.09 (1.07-1.11)	0.01
Other injuries (CC 162)	1.05 (1.04-1.07)	1.05 (1.04-1.06)	0.00

Table B 2: COPD Measure Odds Ratios and 95% Confidence Intervals

COPD Effect	Originally Submitted Measure OR (Lower CI - Upper CI)	Updated Measure OR (Lower CI - Upper CI)	diff
Demographics			
Age-65 (continuous)	1.00 (1.00 - 1.00)	1.00 (1.00 - 1.00)	0.00
Cardiovascular/Respiratory			
Sleep Apnea (ICD-9 codes: 327.20, 327.21, 327.23, 327.27, 327.29, 780.51, 780.53, 780.57)	1.01 (0.98 - 1.03)	1.00 (0.98 - 1.03)	0.01
History of Mechanical Ventilation (ICD-9 codes: 93.90, 96.70, 96.71, 96.72)	1.14 (1.10 - 1.17)	1.13 (1.09 - 1.16)	0.01
Respirator Dependence/Respiratory Failure (CC 77-78)	1.10 (1.03 - 1.17)	1.11 (1.04 - 1.18)	-0.01
Cardio-Respiratory Failure and Shock (CC 79)	1.22 (1.19 - 1.24)	1.20 (1.18 - 1.23)	0.02
Congestive Heart Failure (CC 80)	1.23 (1.21 - 1.26)	1.23 (1.21 - 1.25)	0.00
Chronic Atherosclerosis (CC 83-84)	1.09 (1.07 - 1.11)	1.10 (1.08 - 1.12)	-0.01
Arrhythmias (CC 92-93)	1.14 (1.12 - 1.17)	1.15 (1.13 - 1.17)	-0.01
Other and Unspecified Heart Disease (CC 94)	1.07 (1.05 - 1.10)	1.07 (1.05 - 1.09)	0.00
Vascular or Circulatory Disease (CC 104-106)	1.09 (1.07 - 1.11)	1.09 (1.07 - 1.11)	0.00
Fibrosis of Lung and Other Chronic Lung Disorder (CC 109)	1.09 (1.07 - 1.12)	1.09 (1.07 - 1.12)	0.00
Pneumonia (CC 111-113)	1.10 (1.09 - 1.12)	1.10 (1.08 - 1.12)	0.00
Comorbidities			
History of Infection (CC 1, 3-6)	1.07 (1.05 - 1.09)	1.07 (1.05 - 1.09)	0.00
Metastatic Cancer and Acute Leukemia (CC 7)	1.19 (1.13 - 1.25)	1.20 (1.14 - 1.27)	-0.01
Lung, Upper Digestive Tract, and Other Severe Cancers (CC 8)	1.17 (1.13 - 1.21)	1.18 (1.14 - 1.22)	-0.01
Lymphatic, Head and Neck, Brain, and Other Major Cancers; Breast, Prostate, Colorectal and Other Cancers and Tumors; Other Respiratory and Heart Neoplasms (CC 9-11)	1.03 (1.01 - 1.06)	1.04 (1.02 - 1.07)	-0.01
Other Digestive and Urinary Neoplasms(CC 12)	0.98 (0.95 - 1.01)	0.98 (0.95 - 1.01)	0.00
Diabetes Mellitus (DM) or DM Complications (CC 15-20, 119-120)	1.07 (1.05 - 1.09)	1.07 (1.05 - 1.09)	0.00
Protein-calorie Malnutrition (CC 21)	1.16 (1.13 - 1.20)	1.15 (1.12 - 1.18)	0.01
Disorders of Fluid/Electrolyte/Acid-Base (CC 22-23)	1.16 (1.14 - 1.18)	1.15 (1.13 - 1.18)	0.01
Other Endocrine/Metabolic/Nutritional Disorders (CC 24)	0.92 (0.90 - 0.94)	0.92 (0.91 - 0.94)	0.00
Pancreatic Disease (CC 32)	1.13 (1.09 - 1.17)	1.12 (1.08 - 1.16)	0.01
Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders (CC 34)	1.08 (1.05 - 1.11)	1.08 (1.06 - 1.11)	0.00
Other Gastrointestinal Disorders (CC 36)	1.06 (1.05 - 1.08)	1.07 (1.05 - 1.09)	-0.01
Severe Hematological Disorders (CC44)	1.15 (1.09 - 1.21)	1.14 (1.09 - 1.21)	0.01
Iron Deficiency and Other/Unspecified Anemias and Blood Disease (CC 47)	1.13 (1.11 - 1.15)	1.13 (1.11 - 1.15)	0.00
Dementia and Senility (CC 49-50)	0.99 (0.97 - 1.02)	0.99 (0.97 - 1.01)	0.00
Drug/Alcohol Induced Dependence/Psychosis (CC 51-52)	1.14 (1.10 - 1.19)	1.14 (1.09 - 1.18)	0.00
Major Psychiatric Disorders (CC 54-56)	1.06 (1.04 - 1.09)	1.06 (1.04 - 1.09)	0.00
Depression (CC 58)	1.05 (1.03 - 1.07)	1.05 (1.02 - 1.07)	0.00
Anxiety Disorders (CC 59)	1.14 (1.09 - 1.19)	1.13 (1.09 - 1.18)	0.01
Other Psychiatric Disorders (CC 60)	1.13 (1.11 - 1.16)	1.13 (1.11 - 1.15)	0.00
Quadriplegia, Paraplegia, Functional Disability (CC 67-69, 100-102, 177-178)	1.06 (1.02 - 1.09)	1.06 (1.02 - 1.10)	0.00
Polyneuropathy (CC 71)	1.11 (1.07 - 1.14)	1.10 (1.07 - 1.14)	0.01
Acute Coronary Syndrome (CC 81-82)	1.09 (1.06-1.12)	1.10 (1.07 - 1.13)	-0.01

COPD Effect	Originally Submitted Measure OR (Lower CI - Upper CI)	Updated Measure OR (Lower CI - Upper CI)	diff
Hypertensive Heart and Renal Disease or Encephalopathy (CC 89)	1.12 (1.09 - 1.16)	1.12 (1.09 - 1.15)	0.00
Stroke (CC 95-96)	1.03 (1.00 - 1.07)	1.03 (1.00 - 1.07)	0.00
Renal Failure (CC 131)	1.10 (1.07 - 1.13)	1.10 (1.07 - 1.13)	0.00
Decubitus Ulcer or Chronic Skin Ulcer (CC 148-149)	1.05 (1.02 - 1.09)	1.06 (1.03 - 1.09)	-0.01
Cellulitis, Local Skin Infection (CC 152)	1.06 (1.04 - 1.09)	1.06 (1.03 - 1.09)	0.00
Vertebral Fractures (CC 157)	1.17 (1.13 - 1.21)	1.17 (1.13 - 1.21)	0.00