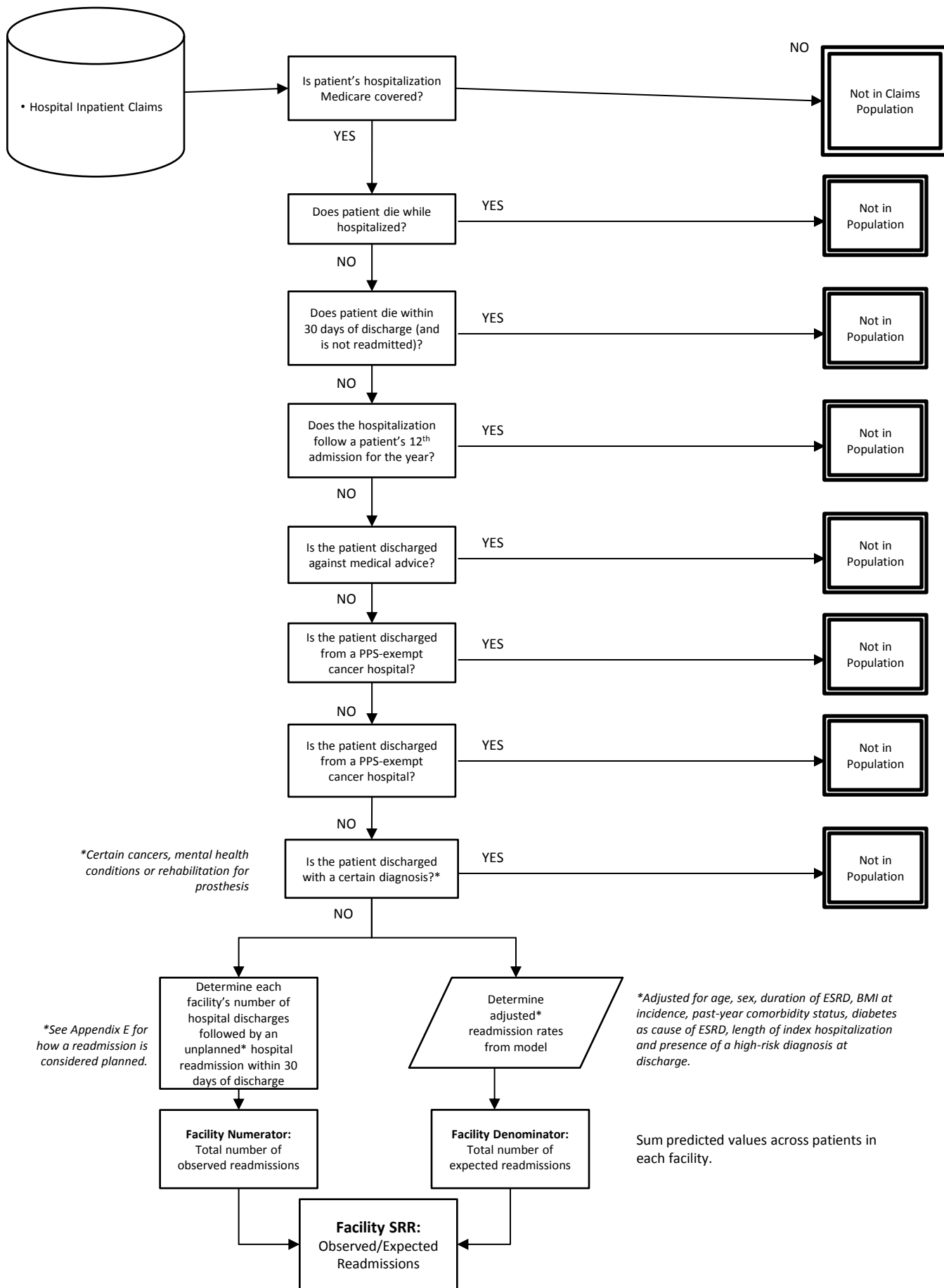


Appendix

Standardized Readmission Ratio (SRR) for dialysis facilities (NQF #2496)

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Measure Calculation Flowchart



Detailed Risk Model Specifications

To estimate the probability of 30-day unplanned readmission, we use a two-stage model, the first of which is a double random-effects logistic regression model. In this stage of the model, both dialysis facilities and hospitals are represented as random effects, and regression adjustments are made for a set of patient-level characteristics. From this model, we obtain the estimated standard deviation of the random effects of hospitals (Diggle, et. al., 2002).

The second stage of the model is a mixed-effects logistic regression model, in which dialysis facilities are modeled as fixed effects and hospitals are modeled as random effects, with the standard deviation specified as equal to its estimates from the first model. The expected number of readmissions for each facility is estimated as the summation of the probabilities of readmission of all patients in this facility and assuming the national norm (i.e., the median) for facility effect. This model accounts for a given facility's case mix using the same set of patient-level characteristics as those in the first model.

The equations used in the measure calculation are as follows:

- To estimate the probability of 30-day unplanned readmission, we use a two-stage approach. The main model, which produces the estimates used to calculate SRR, takes the form:

$$\log \frac{p_{ijk}}{1-p_{ijk}} = \gamma_i + \alpha_j + \beta^T Z_{ijk}, \quad (1)$$

where p_{ijk} represents the probability of an unplanned readmission for the k^{th} discharge among patients from the i^{th} facility who are discharged from j^{th} hospital, and Z_{ijk} represents the set of patient-level characteristics. Here, γ_i is the fixed effect for facility and α_j is the random effect for hospital j . It is assumed that the α_j s arise as independent normal variables (i.e., $\alpha_j \sim N(0, \sigma^2)$).

- We then use the estimates from this model to calculate each facility's SRR:

$$SRR_i = \frac{O_i}{E_i} = \frac{O_i}{\sum_{j \in H(i)} \sum_{k=1}^{n_{ij}} \tilde{p}_{ijk}}, \quad (2)$$

where, for the i^{th} facility, O_i is the number of observed unplanned readmissions, E_i is the expected number of unplanned readmissions for discharges, $H(i)$ is the collection of indices of hospitals from which patients are discharged, and \tilde{p}_{ijk} is the predicted probability of unplanned readmission under the national norm for each discharge. Specifically, \tilde{p}_{ijk} takes the form

$$\tilde{p}_{ijk} = \frac{\exp(\widehat{\gamma}_M + \widehat{\alpha}_j + \widehat{\beta}^T Z_{ijk})}{1 + \exp(\widehat{\gamma}_M + \widehat{\alpha}_j + \widehat{\beta}^T Z_{ijk})}, \quad (3)$$

which estimates the probability that a discharge from hospital j of an individual in facility i with characteristics Z_{ijk} would result in an unplanned readmission if the facility effect corresponded to the median of national facility effects, denoted by $\widehat{\gamma}_M$. Here, $\widehat{\alpha}_j$ and $\widehat{\beta}$ are estimates from model (1). The sum of these probabilities is the expected number of unplanned readmissions E_i at facility i ; e.g., the number of readmissions that would have been expected in facility i had they progressed to the readmissions at the same rate as the national population of dialysis patients.

Patient-Level Risk Adjustors

As mentioned previously, the model accounts for a set of patient-level characteristics:

- Sex
- Age
- Years on dialysis
- Diabetes as cause of ESRD
- BMI at incidence of ESRD
- Length (days) of index hospitalization
- Past-year comorbidities: We identify all unique ICD-9 diagnosis codes from each patient's prior year of Medicare claims. We group these diagnosis codes by diagnosis area using HHS' Hierarchical Condition Categories (CCs). The CCs used in calculation of the SRR are:
 - CCs 177, 178: Amputation status
 - CC 108: COPD
 - CC 79: Cardiorespiratory failure/shock
 - CC 46: Coagulation defects & other specified hematological disorders
 - CCs 51, 52: Drug and alcohol disorders
 - CCs 25, 26: End-Stage Liver Disease
 - CC 109: Fibrosis of lung or other chronic lung disorders
 - CCs 67–69, 100, 101: Hemiplegia, paraplegia, paralysis
 - CC 158: Hip fracture/dislocation
 - CC 174: Major organ transplants (excl. kidney)
 - CC 7: Metastatic cancer/acute leukemia
 - CC 44: Other hematological disorders
 - CCs 6, 111–113: Other infectious disease & pneumonias
 - CCs 10–12: Other major cancers
 - CC 32: Pancreatic disease
 - CCs 54–56, 58, 60: Psychiatric comorbidity
 - CC 77: Respirator dependence/tracheostomy status
 - CC 38: Rheumatoid arthritis & inflammatory connective tissue disease
 - CC 74: Seizure disorders & convulsions
 - CC 2: Septicemia/shock
 - CCs 8,9: Severe cancer
 - CCs 1, 3–5: Severe infection

- CCs 148, 149: Ulcers
- Discharged with high-risk condition: We define a *high-risk* diagnosis as any diagnosis area that was rare in our population but had a 30-day readmission rate of at least 40%. We did not include high-risk diagnosis groups related to cancer or mental health. We group these conditions using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications Software (CCS). The CCS areas identified as high-risk are:
 - CCS 5: HIV infection
 - CCS 6: Hepatitis
 - CCS 56: Cystic fibrosis
 - CCS 57: Immunity disorders
 - CCS 61: Sickle cell anemia
 - CCS 190: Fetal distress and abnormal forces of labor
 - CCS 151: Other liver diseases
 - CCS 182: Hemorrhage during pregnancy; abruptio placenta; placenta previa
 - CCS 186: Diabetes or abnormal glucose tolerance complicating pregnancy; childbirth; or the puerperium
 - CCS 210: Systemic lupus erythematosus and connective tissue disorders
 - CCS 243: Poisoning by nonmedicinal substances

The coefficients for the patient characteristics resulting from the logistic model are shown below.

Table 1. Effects of Patient Characteristics on Readmission Rates for Medicare-Covered Dialysis Patients, 2009

Patient Characteristic	Beta	SE	<i>p</i>
Age (y)			
<25	0.33	0.03	<.0001
25–45	0.18	0.01	<.0001
45–60 (ref)	—	—	—
60–75	-0.03	0.01	<.0001
>75	0.06	0.01	<.0001
BMI			
Underweight	0.08	0.01	<.0001
Normal Weight (ref)	—	—	—
Overweight	-0.05	0.01	<.0001
Obese	-0.12	0.01	<.0001
Cause of ESRD: Diabetes	0.05	0.01	<.0001
Comorbidity (past year)			
Amputation status	0.06	0.01	<.0001
COPD	0.22	0.01	<.0001
Cardiorespiratory failure/shock	0.23	0.01	<.0001
Coagulation defects & other specified hematological	0.13	0.01	<.0001

disorders			
Drug and alcohol disorders	0.32	0.02	<.0001
End-Stage Liver Disease	0.27	0.02	<.0001
Fibrosis of lung or other chronic lung disorders	0.04	0.02	0.01
Hemiplegia, paraplegia, paralysis	0.08	0.01	<.0001
Hip fracture/dislocation	0.01	0.02	0.17
Major organ transplants (excl. kidney)	-0.04	0.03	0.04
Metastatic cancer/acute leukemia	0.29	0.04	<.0001
Other hematological disorders	0.18	0.02	<.0001
Other infectious disease & pneumonias	0.15	0.01	<.0001
Other major cancers	0.02	0.01	0.04
Pancreatic disease	0.21	0.01	<.0001
Psychiatric comorbidity	0.19	0.01	<.0001
Respirator dependence/tracheostomy status	-0.03	0.04	0.11
Rheumatoid arthritis & inflammatory connective tissue disease	0.02	0.02	0.06
Seizure disorders & convulsions	0.10	0.01	<.0001
Septicemia/shock	0.13	0.01	<.0001
Severe cancer	0.15	0.02	<.0001
Severe infection	0.06	0.02	0.0002
Ulcers	0.10	0.01	<.0001
Length of Index Hospitalization (days)			
Quartile 1 (ref)	—	—	—
Quartile 2	0.12	0.01	<.0001
Quartile 3	0.23	0.01	<.0001
Quartile 4	0.44	0.01	<.0001
Presence of high-risk diagnosis at index discharge	0.49	0.03	<.0001
Sex: Female	0.06	0.01	<.0001
Time on ESRD (y)			
<1 (ref)	—	—	—
1–2	0.0002	0.01	0.25
2–3	-0.32	0.01	<.0001
3–6	-0.35	0.01	<.0001
>6	-0.38	0.01	<.0001

For more information on the diagnosis codes for the comorbid risk factors as defined in CCs, a crosswalk of CCs to ICD-9-CM codes is available at: (<http://www.qualitynet.org>) > Hospitals – Inpatient > Claims-Based Measures > Readmission Measures > Resources.

For more information on the diagnosis codes for the discharge diagnosis categories as defined in the CCSs, a crosswalk of CCS categories to ICD-9-CM codes is available at: (<http://www.qualitynet.org>) > Hospitals – Inpatient > Claims-Based Measures > Readmission Measures > Resources. AHRQ has also developed a crosswalk of CCs to ICD-10-CM codes, which will be used after national implementation of ICD-10 coding on CMS claims: http://www.hcup-us.ahrq.gov/toolssoftware/icd_10/ccs_icd_10.jsp.

Inter-Unit Reliability (IUR) Calculation

Method Description for Reliability Testing

Suppose that there are N facilities with at least 11 discharges in the year. Let T_1, \dots, T_N be the SRR for these facilities. Within each facility, select at random and with replacement $B = 200$ bootstrap samples. That is, if the i th facility has n_i subjects, randomly draw with replacement n_i subjects from those in the same facility, find their corresponding SRR _{i} and repeat the process 200 times. Thus, for the i th facility, we have bootstrapped SRRs of $T_{i1}^*, \dots, T_{i200}^*$. Let S_i^* be the sample variance of this bootstrap sample. From this it can be seen that

$$S_{t,w}^2 = \frac{\sum_{i=1}^N [(n_i - 1) S_i^{*2}]}{\sum_{i=1}^N (n_i - 1)}$$

is a bootstrap estimate of the within-facility variance in the SRR, namely, $\sigma_{t,w}^2$. Calling on formulas from the one way analysis of variance, an estimate of the overall variance of T_i is

$$s_t^2 = \frac{1}{n'(N-1)} \sum_{i=1}^N n_i (T_i - \bar{T})^2$$

where

$$\bar{T} = \sum n_i T_i / \sum n_i$$

is the weighted mean of the observed SRR and

$$n' = \frac{1}{N-1} (\sum n_i - \sum n_i^2 / \sum n_i)$$

is approximately the average facility size (number of patients per facility). Note that s_t^2 is an estimate of $\sigma_b^2 + \sigma_{t,w}^2$, where σ_b^2 is the between-facility variance, the true signal reflecting the differences across facilities. Thus, the estimated IUR, which is defined by

$$IUR = \frac{\sigma_b^2}{\sigma_b^2 + \sigma_{t,w}^2}$$

can be estimated with $(s_t^2 - s_{t,w}^2) / s_t^2$.

Algorithm for Determining Planned Readmissions

Methodology from CMS' Hospital-Wide
Readmission Measure

Planned Readmissions Report

Section 1, Subtask 1.5b, Deliverable #74

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Methodology

Unplanned readmissions are acute clinical events experienced by a patient that require urgent hospital admission. 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 quality improvement efforts. Planned readmissions are not a signal of quality of care and should not be counted when assessing hospital quality. Furthermore, including planned readmissions in a readmissions measure could create a disincentive to provide appropriate care to patients who are scheduled for elective or necessary procedures. We have, therefore, developed an algorithm for using claims data to identify “planned readmissions” that will not count as outcomes in readmission measures.

Our algorithm is founded on three principles:

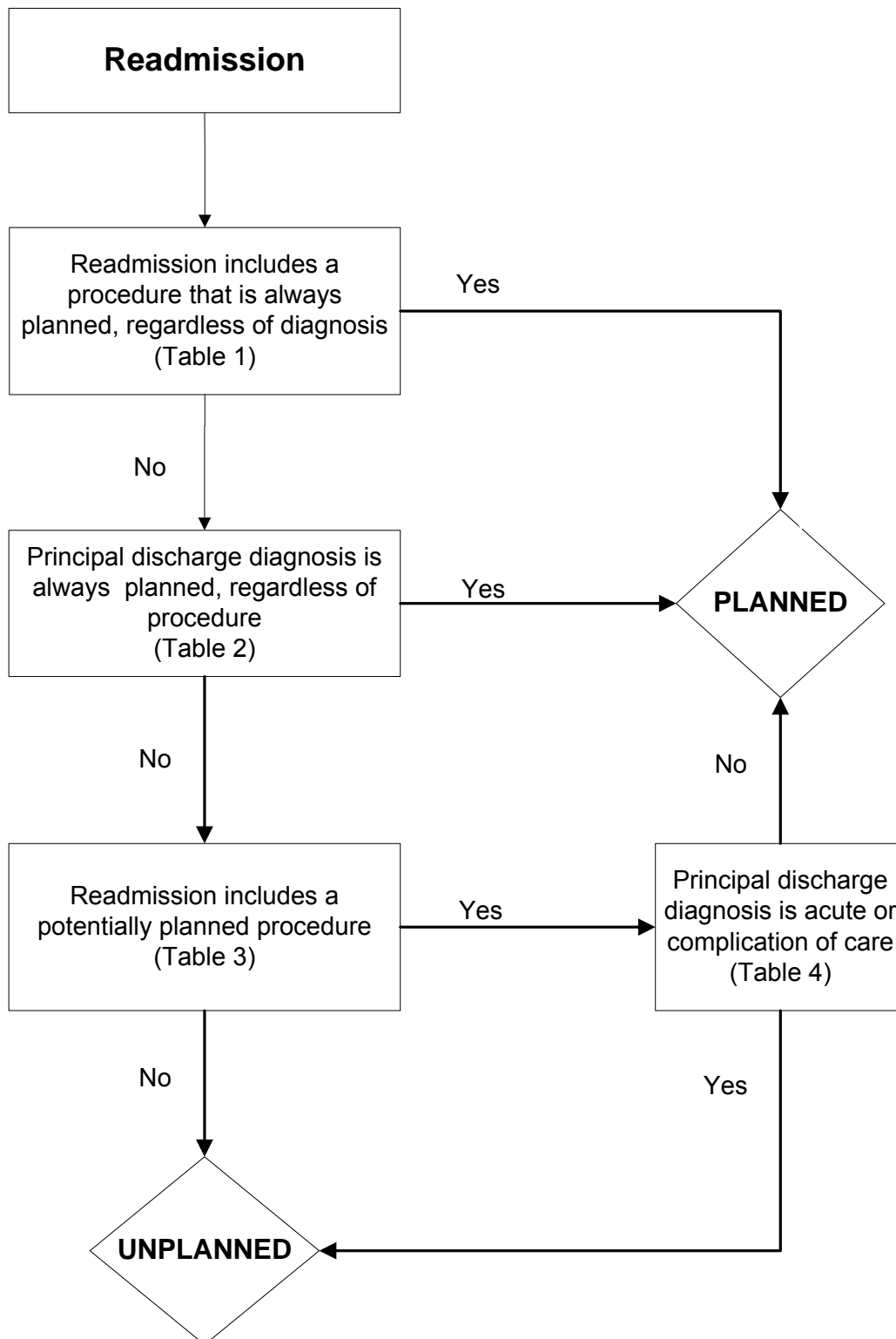
1. A few specific, limited types of care are always considered planned regardless of discharge diagnosis (rehabilitation, obstetrical delivery, transplant surgery, maintenance chemotherapy);
2. A planned readmission is defined as a non-acute readmission for a scheduled procedure; and
3. Admissions for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

Therefore, we classify as planned all readmissions for a *non-acute* diagnosis in which a typically planned procedure takes place and all readmissions for a limited set of conditions. See Figure 1 for a schematic of the planned readmissions algorithm.

We identify planned readmissions using the 231 mutually-exclusive procedure categories and 285 clinically-coherent, mutually-exclusive condition categories (diagnosis groups) defined by the Agency for Healthcare Research and Quality (AHRQ) Clinical Classification Software (CCS).

Although we developed the planned readmissions algorithm for use with CMS’ hospital-wide all-cause unplanned readmission (HWR) measure (National Quality Forum [NQF] #1789), the algorithm could be used with condition-specific readmission measures since it identifies planned readmissions without consideration of the index admission condition.

Figure 1. Schematic of the planned readmission algorithm



We developed our planned readmissions algorithm in three steps:

Step 1. Internal working group discussions

Clinicians in our internal working group reviewed the full list of AHRQ procedure CCS and identified procedure categories that are commonly planned. We considered procedures planned if they were typically: (1) elective and/or scheduled in advance; (2) the main reason for admission; and (3) not commonly done to treat a complication of care. This process identified as planned 31 procedure categories, one diagnosis group, and one group of ICD-9 codes within heterogeneous procedure categories.

Clinicians also reviewed the top 10 AHRQ condition CCS associated with the preliminary list of planned readmissions using data both from the Medicare fee-for-service (FFS) population aged 65 years and older in 2008 and from the California adult population (aged 18 years and older) in 2006. We identified 33 discharge diagnosis groups considered acute or complications of care. If a diagnosis group contained a mix of acute and chronic diagnoses, we tended to categorize it as acute.

Step 2. Public comment

The full preliminary list of planned readmissions and acute diagnoses was posted as part of the HWR measure for public comment by CMS from August 15-29, 2011, and again as part of the National Quality Forum public and member comment process from January 9-20, 2012. We received 27 comments about planned procedures in these two public comment periods. In response, we added two procedure categories and one group of ICD-9 codes to the list of potentially planned procedures. We also added one discharge diagnosis group to the list of acute diagnoses and complications of care list.

The planned readmissions algorithm submitted to the NQF as part of the HWR measure (NQF #1789) contained two “always planned” diagnosis groups, 33 procedure categories and two sets of ICD-9 codes on the potentially planned procedures list, and 34 diagnosis groups in the acute diagnosis and complications of care list. The algorithm counted 77,371 readmissions (5.5% of total readmissions) as planned.

Step 3. Consultations with expert surgeons

To further verify and refine the preliminary list of planned procedures and acute conditions, we contacted 15 surgical specialty societies to identify experts available for further consultation. Eleven societies recommended a total of 30 experts. Seventeen experts from nine societies reviewed relevant portions of the algorithm (e.g., cardiologists reviewed cardiac procedures). We also consulted with 10 additional surgeons recommended by internal team members or expert surgeons. We sought input on the appropriateness of our existing algorithm, and reviewed both the procedures that had been

categorized as unplanned and the diagnosis groups that had either been unclassified (i.e. not in the top 10 diagnoses for any procedure) or categorized as chronic, for potential addition to the algorithm.

The following specialty societies recommended experts who provided feedback for the algorithm:

- American Academy of Otolaryngology — Head and Neck Surgery, Inc.
- American Association of Neurological Surgeons
- American Society of Colon and Rectal Surgeons
- American Society of Metabolic & Bariatric Surgeons
- American Society of Plastic Surgeons
- Heart Rhythm Society
- Society for Vascular Surgery
- Society of Interventional Radiology
- Society of Thoracic Surgeons

We received input from experts in the following specialties:

Specialty	Number of experts
Colon and rectal surgery	2
Electrophysiology	4
Interventional radiology	1
Metabolic and bariatric surgery	1
Neurological surgery	2
Orthopedic surgery	2
Otolaryngology	3
Plastic surgery	2
Surgical oncology	1
Thoracic surgery	2
Trauma surgery	1
Urology	1
Vascular surgery	5

Consultation with specialists added 27 procedure categories, two groups of ICD-9 codes, and three individual ICD-9 codes within an existing group of ICD-9 codes to the list of potentially planned procedures and removed two procedure categories. In addition, two procedure groups and two diagnosis groups, intended for use in all-payer data but not applicable in readmission measures using CMS data, and which define maternity patients, were added to the list of always planned procedures and diagnoses. Finally, 73 diagnosis groups were added to the list of acute diagnoses and complications

of care, and 8 diagnosis groups were removed, four of which are now instead split at the ICD-9 level into acute and chronic diagnoses.

In total, the final planned readmissions algorithm contains:

- List of “always planned” procedures and diagnoses (Table 1 and Table 2)
 - 5 procedure categories that are always planned (Table 1)
 - 4 diagnosis groups that are always planned (Table 2)
- List of potentially planned procedures
 - 60 procedure categories that are planned if not accompanied by an acute diagnosis (Table 3)
 - 4 procedures identified by ICD-9 code(s) that are planned if not accompanied by an acute diagnosis (bottom of Table 3)
- List of acute diagnoses
 - 99 diagnosis groups that disqualify a readmission as planned (Table 4)
 - 4 additional subsets of diagnoses identified by ICD-9 codes within diagnosis groups (bottom of Table 4)

Under the final algorithm, 112,557 readmissions in the HWR measure in 2008 Medicare FFS data (8.0% of total readmissions) are categorized as planned. This represents an increase of 35,186 readmissions categorized as planned compared to the algorithm that was submitted to NQF. The median hospital will have 6.8% of all its readmissions characterized as planned, with an interquartile range (IQR) of 4.3 to 9.1%.

Final Algorithm

Table 1. Procedures that are always planned regardless of diagnosis

Proc CCS	Description	Total readmissions
64	Bone marrow transplant	490
105	Kidney transplant	517
134	Cesarean section*	
135	Forceps; vacuum; and breech delivery*	
176	Other organ transplantation	646

*CCS only to be included in all-payer settings, not intended for inclusion in CMS claims-based readmission measures

Table 2. Diagnoses that are always planned regardless of procedure

Dx CCS	Description	Total readmissions
45	Maintenance Chemotherapy (condition CCS 45)	17,232
194	Forceps delivery*	
196	Normal pregnancy and/or delivery*	
254	Rehabilitation (condition CCS 254)	259

Bolded conditions were added to the algorithm after NQF submission of the algorithm as part of the HWR measure

*CCS only to be included in all-payer settings, not intended for inclusion in CMS claims-based readmission measures

Table 3. Potentially planned procedures, if accompanied by non-acute diagnosis (Proc CCS)

Proc CCS	Description	Total readmissions
1	Incision and excision of CNS	-
3	Laminectomy; excision intervertebral disc	3,951
5	Insertion of catheter or spinal stimulator and injection into spinal	4,781
9	Other OR therapeutic nervous system procedures	3,230
10	Thyroidectomy; partial or complete	503
12	Other therapeutic endocrine procedures	825
33	Other OR therapeutic procedures on nose; mouth and pharynx	927
36	Lobectomy or pneumonectomy	1,519
38	Other diagnostic procedures on lung and bronchus	610
40	Other diagnostic procedures of respiratory tract and mediastinum	3,221
43	Heart valve procedures	1,791
44	Coronary artery bypass graft (CABG)	6,829
45	Percutaneous transluminal coronary angioplasty (PTCA)	6,708
47	Diagnostic cardiac catheterization; coronary arteriography	57,514
48	Insertion; revision; replacement; removal of cardiac pacemaker or cardioverter/defibrillator	22,922
49	Other OR heart procedures	5,032
51	Endarterectomy; vessel of head and neck	5,581
52	Aortic resection; replacement or anastomosis	1,828
53	Varicose vein stripping; lower limb	26
55	Peripheral vascular bypass	3,624
56	Other vascular bypass and shunt; not heart	514
59	Other OR procedures on vessels of head and neck	1,764
60	Embolectomy and endarterectomy of lower limbs	-
62	Other diagnostic cardiovascular procedures	6,216
64	Bone marrow transplant	490
66	Procedures on spleen	726
67	Other therapeutic procedures; hemic and lymphatic system	4,771
74	Gastrectomy; partial and total	802
78	Colorectal resection	11,547
79	Local excision of large intestine lesion (not endoscopic)	91
84	Cholecystectomy and common duct exploration	11,793
85	Inguinal and femoral hernia repair	1,318
86	Other hernia repair	4,991
99	Other OR gastrointestinal therapeutic procedures	10,637
104	Nephrectomy; partial or complete	1,564
105	Kidney transplant	517
106	Genitourinary incontinence procedures	160
107	Extracorporeal lithotripsy; urinary	524
109	Procedures on the urethra	1,981

Proc CCS	Description	Total readmissions
112	Other OR therapeutic procedures of urinary tract	2,735
113	Transurethral resection of prostate (TURP)	4,759
114	Open prostatectomy	303
119	Oophorectomy; unilateral and bilateral	1,180
120	Other operations on ovary	128
124	Hysterectomy; abdominal and vaginal	131
129	Repair of cystocele and rectocele; obliteration of vaginal vault	143
132	Other OR therapeutic procedures; female organs	738
134	Cesarean section*	
135	Forceps; vacuum; and breech delivery*	
142	Partial excision bone	5,740
152	Arthroplasty knee	4,323
153	Hip replacement; total and partial	11,164
154	Arthroplasty other than hip or knee	1,187
157	Amputation of lower extremity	12,930
158	Spinal fusion	3,978
159	Other diagnostic procedures on musculoskeletal system	4,880
166	Lumpectomy; quadrantectomy of breast	298
167	Mastectomy	649
169	Debridement of wound; infection or burn	27,665
172	Skin graft	3,646
176	Other organ transplantation	646
211	Therapeutic radiology for cancer treatment	7,784
ICD-9 Codes	Description	Total readmissions
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)	1,329
38.18	Endarterectomy leg vessel (from Proc CCS 60- Embolectomy and endarterectomy of lower limbs)	2,340
55.03, 55.04	Percutaneous nephrostomy with and without fragmentation (from Proc CCS 103- Nephrotomy and nephrostomy)	2,625
94.26, 94.27	Electroshock therapy (from Proc CCS 218- Psychological and psychiatric evaluation and therapy)	243

Bolded procedures were added to the algorithm after NQF submission of the algorithm as part of the HWR measure

~~Strikethrough~~ procedures were removed from the algorithm after NQF submission of the algorithm as part of the HWR measure

*procedure only to be included in all-payer settings, not intended for inclusion in CMS claims-based readmission measures

Table 4. Diagnoses that disqualify a readmission from being considered planned

Dx CCS	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
97	Peri-, endo-, and myocarditis; cardiomyopathy (except that caused by tuberculosis or sexually transmitted disease) *split by ICD-9 codes- see below
100	Acute myocardial infarction
102	Nonspecific chest pain
104	Other and ill-defined heart disease
105	Conduction disorders *split by ICD-9 codes- see below
106	Cardiac dysrhythmias *split by ICD-9 codes- see below
107	Cardiac arrest and ventricular fibrillation
108	Congestive heart failure; nonhypertensive *split by ICD-9 codes- see below
109	Acute cerebrovascular disease
112	Transient cerebral ischemia
116	Aortic and peripheral arterial embolism or thrombosis

Dx CCS	Description
118	Phlebitis; thrombophlebitis and thromboembolism
120	Hemorrhoids
122	Pneumonia (except that caused by TB or sexually transmitted disease)
123	Influenza
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
160	Calculus of urinary tract
165	Inflammatory conditions of male genital organs
168	Inflammatory diseases of female pelvic organs
172	Ovarian cyst
197	Skin and subcutaneous tissue infections
198	Other inflammatory condition of skin
201	Infective arthritis and osteomyelitis (except that caused by TB or sexually transmitted disease)
207	Pathological fracture
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
231	Other fractures
232	Sprains and strains
233	Intracranial injury
234	Crushing injury or internal injury

Dx CCS	Description
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
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	Impulse 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: Per-; 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

Dx CCS	Description
11504	Histoplasma capsulatum endocarditis
11513	Histoplasma duboisii pericarditis
11514	Histoplasma duboisii endocarditis
11593	Histoplasmosis pericarditis
11594	Histoplasmosis endocarditis
1303	Toxoplasma myocarditis
3910	Acute rheumatic pericarditis
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

Dx CCS	Description
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
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	
42821	Acute systolic heart failure
42823	Acute on chronic systolic heart failure
42831	Acute diastolic heart failure
42833	Acute on chronic diastolic heart failure
42841	Acute combined systolic & diastolic heart failure
42843	Acute on chronic combined systolic & diastolic heart failure

Bolded diagnosis groups were added to the algorithm after NQF submission of the algorithm as part of the HWR measure

~~Strikethrough~~ diagnosis groups were removed from the algorithm after NQF submission of the algorithm as part of the HWR measure

Additional updates to planned readmission algorithm based on feedback from dry run question and answer period

Updates to Planned Readmission Algorithm

1. AHRQ Procedure CCS 170 – Excision of skin lesion

- *Update:* Add to list of potentially planned procedures (Table A3 in report).
- *Rationale:* Typically performed as planned procedure for cutaneous malignancy; this omission was noted by a hospital during dry run period.

2. AHRQ Procedure CCS 224 – Cancer chemotherapy

- *Update:* Add to list of potentially planned procedures (Table A3 in report).
- *Rationale:* Currently, patients readmitted with Diagnosis CCS 45 – Maintenance chemotherapy are considered planned readmissions. However, some patients who receive scheduled chemotherapy during hospitalization have a principal diagnosis of malignancy and only a procedure code of chemotherapy (procedure CCS 45); consequently they were previously missed by the planned readmission algorithm. This omission was noted by a hospital during the dry run period.

3. AHRQ Diagnosis CCS 129 - Aspiration pneumonitis; food/vomitus

- *Update:* Add to list of acute diagnosis list (Table A4 in report); this will prevent an accompanying potentially planned procedure from being considered planned.
- *Rationale:* Aspiration pneumonitis is an acute event; readmissions for aspiration pneumonitis are not typically planned.

4. ICD-9 Diagnosis Codes 410.x2 – Acute myocardial infarction, subsequent episode of care

- *Update:* Remove from acute diagnosis list (Table A4 in report).
- *Rationale:* ICD-9 410.x2 specifically refers to a subsequent episode of care for a previous acute MI, and does not refer to an acute MI. It was previously included in the overall diagnosis CCS 100, Acute Myocardial Infarction, and was thus incorrectly considered an acute event. This error was noted by a hospital during the dry run period.

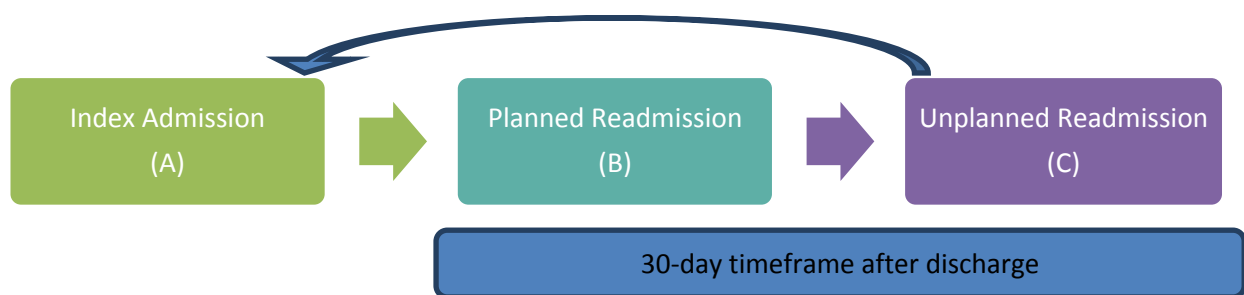
Effect of update for each measure:

Measure	Planned readmission rate		
	Original specification	With new planned readmission algorithm	After addition of these updates to algorithm
Acute myocardial infarction	1.6%	2.2%	2.3%
Heart failure	N/A	1.3%	1.3%
Total hip and total knee arthroplasty	0.2%	0.5%	0.5%

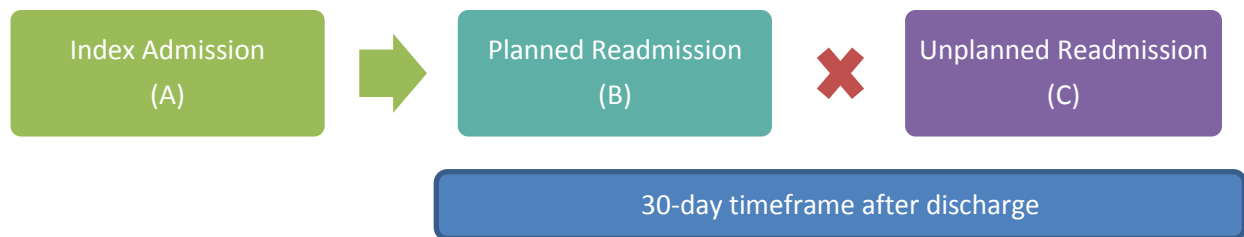
Update to how subsequent readmissions after a planned readmission are handled

Previously, the AMI and hip and knee measures included some planned readmissions. For these measures, unplanned readmissions (C in diagram below) following planned readmissions (B) were counted as readmissions for the index admission (A) if they occurred within 30 days of discharge from the index admission. All measures are being updated to include a more comprehensive planned readmission algorithm and also to **end the measurement period for a readmission when a patient has been rehospitalized for any reason**, including for a planned readmission. In other words, unplanned readmissions that fall within the 30-day post discharge timeframe will no longer be counted as outcomes for the index admission if they are preceded by a planned readmission.

Current Approach for AMI, and for total hip and total knee arthroplasty



Updated Approach for all Measures



Effect of update for each measure:

Measure	Unplanned readmission rate	
	Revised measure, including updated planned readmission algorithm	After applying subsequent readmission update
Acute myocardial infarction	18.9%	18.7%
Heart failure	23.5%	23.3%
Total hip and total knee arthroplasty	5.5%	5.5%

ICD-9 to ICD-10 Mapping
Clinician Review of
Individual ICD-9 Codes in SRR

SRR Measure: One-to-One ICD Matches

ICD-9	Description	ICD-10	Description
3282	Diphtheritic myocarditis	A3681	Diphtheritic cardiomyopathy
3640	Meningococcal carditis, unspecified	A3950	Meningococcal carditis, unspecified
3641	Meningococcal pericarditis	A3953	Meningococcal pericarditis
3642	Meningococcal endocarditis	A3951	Meningococcal endocarditis
3643	Meningococcal myocarditis	A3952	Meningococcal myocarditis
7420	Coxsackie carditis, unspecified	B3320	Viral carditis, unspecified
7421	Coxsackie pericarditis	B3323	Viral pericarditis
7422	Coxsackie endocarditis	B3321	Viral endocarditis
7423	Coxsackie myocarditis	B3322	Viral myocarditis
11281	Candidal endocarditis	B376	Candidal endocarditis
1303	Myocarditis due to toxoplasmosis	B5881	Toxoplasma myocarditis
3029	Unspecified psychosexual disorder	F659	Paraphilia, unspecified
3910	Acute rheumatic pericarditis	I010	Acute rheumatic pericarditis
3911	Acute rheumatic endocarditis	I011	Acute rheumatic endocarditis
3912	Acute rheumatic myocarditis	I012	Acute rheumatic myocarditis
3918	Other acute rheumatic heart disease	I018	Other acute rheumatic heart disease
3919	Acute rheumatic heart disease, unspecified	I019	Acute rheumatic heart disease, unspecified
3920	Rheumatic chorea with heart involvement	I020	Rheumatic chorea with heart involvement
3980	Rheumatic myocarditis	I090	Rheumatic myocarditis
39890	Rheumatic heart disease, unspecified	I099	Rheumatic heart disease, unspecified
39899	Other rheumatic heart diseases	I0989	Other specified rheumatic heart diseases
4200	Acute pericarditis in diseases classified elsewhere	I32	Pericarditis in diseases classified elsewhere
42090	Acute pericarditis, unspecified	I309	Acute pericarditis, unspecified
42091	Acute idiopathic pericarditis	I300	Acute nonspecific idiopathic pericarditis
42099	Other acute pericarditis	I308	Other forms of acute pericarditis
4210	Acute and subacute bacterial endocarditis	I330	Acute and subacute infective endocarditis
4211	Acute and subacute infective endocarditis in diseases classified elsewhere	I39	Endocarditis and heart valve disorders in diseases classified elsewhere
4219	Acute endocarditis, unspecified	I339	Acute and subacute endocarditis, unspecified
4220	Acute myocarditis in diseases classified elsewhere	I41	Myocarditis in diseases classified elsewhere
42290	Acute myocarditis, unspecified	I409	Acute myocarditis, unspecified
42291	Idiopathic myocarditis	I401	Isolated myocarditis
42292	Septic myocarditis	I400	Infective myocarditis
42293	Toxic myocarditis	I408	Other acute myocarditis

SRR Measure: One-to-One ICD Matches

ICD-9	Description	ICD-10	Description
42299	Other acute myocarditis	I408	Other acute myocarditis
4230	Hemopericardium	I312	Hemopericardium, not elsewhere classified
4231	Adhesive pericarditis	I310	Chronic adhesive pericarditis
4232	Constrictive pericarditis	I311	Chronic constrictive pericarditis
4233	Cardiac tamponade	I314	Cardiac tamponade
4260	Atrioventricular block, complete	I442	Atrioventricular block, complete
42610	Atrioventricular block, unspecified	I4430	Unspecified atrioventricular block
42611	First degree atrioventricular block	I440	Atrioventricular block, first degree
42612	Mobitz (type) II atrioventricular block	I441	Atrioventricular block, second degree
42613	Other second degree atrioventricular block	I441	Atrioventricular block, second degree
4264	Right bundle branch block	I4510	Unspecified right bundle-branch block
42650	Bundle branch block, unspecified	I454	Nonspecific intraventricular block
42651	Right bundle branch block and left posterior fascicular block	I452	Bifascicular block
42652	Right bundle branch block and left anterior fascicular block	I452	Bifascicular block
42653	Other bilateral bundle branch block	I452	Bifascicular block
42654	Trifascicular block	I453	Trifascicular block
4266	Other heart block	I455	Other specified heart block
4267	Anomalous atrioventricular excitation	I456	Pre-excitation syndrome
42681	Lown-Ganong-Levine syndrome	I456	Pre-excitation syndrome
42682	Long QT syndrome	I4581	Long QT syndrome
4269	Conduction disorder, unspecified	I459	Conduction disorder, unspecified
4272	Paroxysmal tachycardia, unspecified	I479	Paroxysmal tachycardia, unspecified
42769	Other premature beats	I4949	Other premature depolarization
4279	Cardiac dysrhythmia, unspecified	I499	Cardiac arrhythmia, unspecified
42821	Acute systolic heart failure	I5021	Acute systolic (congestive) heart failure
42823	Acute on chronic systolic heart failure	I5023	Acute on chronic systolic (congestive) heart failure
42831	Acute diastolic heart failure	I5031	Acute diastolic (congestive) heart failure
42833	Acute on chronic diastolic heart failure	I5033	Acute on chronic diastolic (congestive) heart failure
42841	Acute combined systolic and diastolic heart failure	I5041	Acute combined systolic (congestive) and diastolic (congestive) heart failure
42843	Acute on chronic combined systolic and diastolic heart failure	I5043	Acute on chronic combined systolic (congestive) and diastolic (congestive) heart failure
4290	Myocarditis, unspecified	I514	Myocarditis, unspecified
7850	Tachycardia, unspecified	R000	Tachycardia, unspecified

Needs Clinician Review: Choose Appropriate ICD-10 Code(s)

ICD-9	Description	ICD-10	Description	Which ICD-10?
11503	Infection by Histoplasma capsulatum, pericarditis	B394	Histoplasmosis capsulati, unspecified	x
		I32	Pericarditis in diseases classified elsewhere	x
11504	Infection by Histoplasma capsulatum, endocarditis	B394	Histoplasmosis capsulati, unspecified	x
		I39	Endocarditis and heart valve disorders in diseases classified elsewhere	x
11513	Infection by Histoplasma duboisii, pericarditis	B395	Histoplasmosis duboisii	x
		I32	Pericarditis in diseases classified elsewhere	x
11514	Infection by Histoplasma duboisii, endocarditis	B395	Histoplasmosis duboisii	x
		I39	Endocarditis and heart valve disorders in diseases classified elsewhere	x
11593	Histoplasmosis, unspecified, pericarditis	B399	Histoplasmosis, unspecified	x
		I32	Pericarditis in diseases classified elsewhere	x
11594	Histoplasmosis, unspecified, endocarditis	B399	Histoplasmosis, unspecified	x
		I39	Endocarditis and heart valve disorders in diseases classified elsewhere	x
41002	Acute myocardial infarction of anterolateral wall, subsequent episode of care	I2109	ST elevation (STEMI) myocardial infarction involving other coronary artery of anterior wall	x
		R0989	Other specified symptoms and signs involving the circulatory and respiratory systems	x
41012	Acute myocardial infarction of other anterior wall, subsequent episode of care	I2109	ST elevation (STEMI) myocardial infarction involving other coronary artery of anterior wall	x
		R0989	Other specified symptoms and signs involving the circulatory and respiratory systems	
41022	Acute myocardial infarction of inferolateral wall, subsequent episode of care	I2119	ST elevation (STEMI) myocardial infarction involving other coronary artery of inferior wall	x
		R0989	Other specified symptoms and signs involving the circulatory and respiratory systems	
41032	Acute myocardial infarction of inferoposterior wall, subsequent episode of care	I2111	ST elevation (STEMI) myocardial infarction involving right coronary artery	x
		R0989	Other specified symptoms and signs involving the circulatory and respiratory systems	
41042	Acute myocardial infarction of other inferior wall, subsequent episode of care	I2119	ST elevation (STEMI) myocardial infarction involving other coronary artery of inferior wall	x
		R0989	Other specified symptoms and signs involving the circulatory and respiratory systems	
41052	Acute myocardial infarction of other lateral wall, subsequent episode of care	I2129	ST elevation (STEMI) myocardial infarction involving other sites	x
		R0989	Other specified symptoms and signs involving the circulatory and respiratory systems	
41062	True posterior wall infarction, subsequent episode of care	I2129	ST elevation (STEMI) myocardial infarction involving other sites	x
		R0989	Other specified symptoms and signs involving the circulatory and respiratory systems	
41072	Subendocardial infarction, subsequent episode of care	I214	Non-ST elevation (NSTEMI) myocardial infarction	x
		R0989	Other specified symptoms and signs involving the circulatory and respiratory systems	
41082	Acute myocardial infarction of other specified sites, subsequent episode of care	I2121	ST elevation (STEMI) myocardial infarction involving left circumflex coronary artery	x
		R0989	Other specified symptoms and signs involving the circulatory and respiratory systems	
41092	Acute myocardial infarction of unspecified site, subsequent episode of care	I213	ST elevation (STEMI) myocardial infarction of unspecified site	x
		R0989	Other specified symptoms and signs involving the circulatory and respiratory systems	
4262	Left bundle branch hemiblock	I444	Left anterior fascicular block	x
		I445	Left posterior fascicular block	x
4263	Other left bundle branch block	I4469	Other fascicular block	x
		I447	Left bundle-branch block, unspecified	x
42789	Other specified cardiac dysrhythmias	I498	Other specified cardiac arrhythmias	x
		R001	Bradycardia, unspecified	x