
Development of the All Patient Refined DRGs (APR-DRGs)

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The Diagnosis Related Groups (DRGs) are a patient classification system that provides a means of relating the type of patients a hospital treats (i.e., its casemix) to the costs incurred by the hospital. There are currently three major versions of the DRG in use. The basic DRGs are used by the Health Care Financing Administration (HCFA) for hospital payment for Medicare beneficiaries. The All Patient DRGs (AP-DRGs) are an expansion of the basic DRGs to be more representative of non-Medicare populations such as pediatric patients. The All Patient Refined DRGs (APR-DRG) incorporate severity of illness and risk of mortality subclasses into the DRGs.

The original objective of the DRGs was to develop a patient classification system that related the types of patients treated to the resources they consumed. Thus, the DRGs focused exclusively on resource intensity. The HCFA DRGs and the AP-DRGs have remained focused on this limited objective. As the health care industry has evolved there has been increased demand for a patient classification system that can be used for applications beyond resource use, cost and payment. In particular, a patient classification system is needed for

- The comparison of hospitals across a wide range of resource and outcome measures. Such comparisons are typically disseminated to the public by state data commissions
- The evaluation of differences in inpatient mortality rates

- The implementation and support of critical pathways
- The identification of continuous quality improvement projects
- The basis of internal management and planning systems
- The management of capitated payment arrangements

In order to meet these needs, the objective of the DRG system needed to be expanded in scope to address patient severity of illness and risk of mortality as well as resource intensity. These patient attributes have the following meaning

Severity of illness: The extent of physiologic decompensation or organ system loss of function

Risk of mortality: The likelihood of dying

Resource intensity: The relative volume and types of diagnostic, therapeutic and bed services used in the management of a particular disease

The APR-DRGs expand the basic DRG structure by adding four subclasses to each DRG. The addition of the four subclasses address patient differences relating to severity of illness and risk of mortality. Severity of illness and risk of mortality relate to distinct patient attributes. Severity of illness relates to the extent of physiologic decompensation or organ system loss of function experienced by the patient while risk of mortality relates to the likelihood of dying. For example, a patient with acute cholecystitis as the only

secondary diagnosis is considered a major severity of illness but a minor risk of mortality. The severity of illness is major since there is significant organ system loss of function associated with acute cholecystitis. However, it is unlikely that the acute cholecystitis alone will result in patient mortality and thus, the risk of mortality for this patient is minor. If additional diagnoses are present along with the acute cholecystitis, patient severity of illness and risk of mortality may increase. For example, if peritonitis is present along with the acute cholecystitis, the patient is considered an extreme severity of illness and a major risk of mortality. Since severity of illness and risk of mortality are distinct patient attributes, separate subclasses are assigned to a patient for severity of illness and risk of mortality. Thus, in the APR-DRG system a patient is assigned three distinct descriptors.

- The base APR-DRG (e.g., APR-DRG 194 - Heart Failure or APR-DRG 440 - Kidney Transplant)
- The severity of illness subclass
- The risk of mortality subclass

The four severity of illness subclasses and the four risk of mortality subclasses are numbered sequentially from 1 to 4 indicating respectively, minor, moderate, major or extreme severity of illness or risk of mortality. For applications such as evaluating resource use or establishing patient care guidelines, the APR-DRGs in conjunction with severity of illness subclass is used. For evaluating patient mortality the APR-DRG in conjunction with the risk of mortality subclass is used.

Although the subclasses are numbered 1-4, the numeric values represent categories and not scores. Thus, severity subclass 4 congestive heart failure patients, are not comparable to severity subclass 4 fractured leg patients. Thus, it is not mean-

ingful to average the numeric values (i.e., 1-4) of the severity of illness or risk of mortality subclasses across a group of patients to compute an average severity score. However, the APR-DRG severity and risk of mortality subclasses can be used to compute an expected value for a measure of interest (e.g., length of stay, cost, mortality). Expected values can be computed using statistical techniques such as indirect rate standardization.

The underlying clinical principle of APR-DRGs is that the severity of illness or risk of mortality subclass of a patient is highly dependent on the patient's underlying problem and that patients with high severity of illness or risk of mortality are characterized by multiple serious diseases. In the APR-DRGs, the assessment of the severity of illness or risk of mortality of a patient is specific to the base APR-DRG to which a patient is assigned. In other words, the determination of the severity of illness and risk of mortality is disease-specific. Thus, the significance attributed to complicating or comorbid conditions is dependent on the underlying problem. For example, certain types of infections are considered a more significant problem in a patient who is immunosuppressed than in a patient with a fractured arm. In APR-DRGs, high severity of illness or risk of mortality are primarily determined by the interaction of multiple diseases. Patients with multiple comorbid conditions involving multiple organ systems constitute the difficult-to-treat patients who have poor outcomes.

The process used in the development of the APR-DRGs involved an iterative process of formulating clinical hypotheses and then testing the hypotheses with historical data. Separate clinical models were developed for each of the 355 base APR-DRGs. Once the clinical model for severity of illness and risk of mortality was devel-

oped for each base APR-DRG, it was evaluated with historical data. Patients with a high severity of illness are, in general, expected to incur greater costs and patients with a higher risk of mortality are expected to die more frequently. Historical data was used to review the clinical hypotheses. If there were discrepancies between clinical expectations and the data results, the clinical expectations were always utilized as the basis of the APR-DRGs. Thus, the APR-DRGs are a *clinical model* that has been extensively reviewed with historical data. The historical data used in the development of version 15 of the APR-DRGs was a random, nationwide, database of 5.7 million discharges which included data from 657 hospitals, in 35 states, from all payers. In addition, a database drawn from all discharges from children's hospitals in the United States was also utilized.

Development of the APR-DRGs

The AP-DRGs were initially used as the base DRGs in the formation of the APR-DRGs. A series of consolidations, additions and modifications were made to these initial APR-DRGs to create the base APR-DRGs. The first step in forming the APR-DRGs was to consolidate all splits based on age and the presence of a complication or comorbidity. The APR-DRGs also consolidated all splits based on discharge status of death. In addition to these uniform consolidations of the initial APR-DRGs the following modifications to the initial APR-DRGs were made.

Consolidate APR-DRGs Based on Complicated Principal Diagnosis

APR-DRGs that were defined based on complicated principal diagnoses were also consolidated. For example, the initial APR-DRGs for appendectomies are differenti-

ated by whether or not there is a complicated principal diagnosis (e.g., with peritonitis). The APR-DRGs for appendectomies were consolidated and recognition of the complicated principal diagnosis was subsequently incorporated into the subclass assigned within the APR-DRGs.

Pediatric Additions

While the AP-DRGs incorporated some of the pediatric modifications from the PM-DRGs, the APR-DRGs incorporated the remaining significant pediatric modifications in the PM-DRGs. In addition, in conjunction with NACHRI the APR-DRGs were reviewed with a national pediatric database. As a result of this review, additional APR-DRGs were created. For example, scoliosis is one of the primary reasons spinal fusions are performed on pediatric patients. Spinal fusions for scoliosis tend to be more complex than spinal fusions for other clinical reasons such as a herniated disk. Thus, the APR-DRG for spinal fusions was subdivided based on a principal diagnosis of scoliosis.

Restructure Newborn APR-DRGs

The base APR-DRGs for newborns were completely restructured. Surgical and medical hierarchies were created within each birthweight range. A medical hierarchy is necessary because newborns do not have a principal diagnosis in the usual sense. Most newborns have a live newborn status code as their principal diagnosis. This does not permit assignment to a medical APR-DRG based on principal diagnosis. Thus, it was necessary to create a medical hierarchy for newborns. The end result of this restructuring is the creation of 35 base APR-DRGs for newborns.

Consolidate APR-DRGs Based on Volume

The general trend toward outpatient surgery made some initial APR-DRGs

extremely low in volume. Such APR-DRGs were consolidated into other related APR-DRGs. For example, carpal tunnel releases are now rarely performed on an inpatient basis. Thus, the APR-DRG for carpal tunnel release was consolidated into the APR-DRG for nervous system procedures for peripheral nerve disorders which includes procedures such as tarsal tunnel release.

Add APR-DRGs for Mortality

The same base APR-DRGs are used in conjunction with both the severity of illness subclasses and risk of mortality subclasses. Thus, some new APR-DRGs were necessary in order to reflect differences in mortality. For example, initial APR-DRG 45 (specific cerebrovascular disorders except TIA) was subdivided into APR-DRG 45 (CVA with infarct) and APR-DRG 44 (intracranial hemorrhage) as a result of the significantly higher mortality rate for intracranial hemorrhage patients.

The end result of the consolidation process was to create 355 base APR-DRGs. The extensive modifications to base APR-DRGs required a complete renumbering of the base APR-DRGs. Once the base APR-DRGs were completed then four severity of illness subclasses and four risk of mortality subclasses were defined for each of the APR-DRGs.

Overview of APR-DRG Subclass Assignment

The process of determining the subclasses for an APR-DRG begins by first assigning a severity of illness level and a risk of mortality level to each secondary diagnosis. The term level is used when referring to the categorization of a secondary diagnosis while the term subclass is used when referring to one of the subdivisions of an APR-DRG. For secondary

diagnoses there are four distinct severity of illness levels and four distinct risk of mortality levels. The four levels are numbered sequentially from 1 to 4 indicating, respectively, minor, moderate, major or extreme severity of illness or risk of mortality. Each secondary diagnosis is assigned to one of the four severity of illness levels and one of the four risk of mortality levels. The severity of illness level and risk of mortality level associated with a patient's secondary diagnoses is just one factor in the determination of a patient's overall severity of illness subclass and risk of mortality subclass.

The assignment of a patient to a severity of illness or risk of mortality subclass takes into consideration not only the level of the secondary diagnoses but also the interaction among secondary diagnoses, age, principal diagnosis, and the presence of certain OR procedures and non-OR procedures. The subdivision of each of the 355 APR-DRGs into the four subclasses, combined with the two error APR-DRGs (955, 956), which are not subdivided, results in 1422 APR-DRGs.

The process of determining the severity of illness or risk of mortality subclass of a patient consists of three phases. In the first phase, the level of each secondary diagnosis is determined. Once the level of each secondary diagnosis is established, the second phase determines a base subclass for the patient based on the patient's secondary diagnoses. In Phase III, the final subclass for the patient is determined by incorporating the impact of principal diagnosis, age, OR procedures, non-OR procedures and combinations of categories of secondary diagnoses. A detailed description of the determination of the severity of illness subclass and risk of mortality subclass will be presented separately.

Determination of the Severity of Illness Subclass

The three phase process of determining the severity of illness subclass is summarized in Figure 1.

Phase I - Determining the Severity of Illness Level of each Secondary Diagnosis

Eliminate secondary diagnoses associated with the principal diagnosis

If a secondary diagnosis is closely related to the principal diagnosis, then the secondary diagnosis is excluded from the determination of the severity of illness subclass. For example, a secondary diagnosis of urinary retention is excluded from the determination of the severity of illness subclass if the principal diagnosis is benign prostatic hypertrophy but is included for other principal diagnoses.

Assign each Secondary Diagnosis to its Standard Severity of Illness Level

Each secondary diagnosis is assigned to one of the four distinct severity of illness levels. Examples of the different severity of illness levels are contained in Table 1.

The severity of illness level for diabetes progresses from minor for uncomplicated diabetes to extreme for diabetes with hyperosmolar coma. Similarly, the severity of illness level for respiratory diagnoses progresses from minor for bronchitis to extreme for respiratory failure.

The process of determining the severity of illness subclass for a patient begins by assigning each secondary diagnosis its standard severity of illness level. The next step is to modify the standard severity of illness level based on other patient attributes. The patient attributes which can modify the standard severity of illness level of a secondary diagnosis are the

APR-DRG, the age of the patient and the presence of certain nonoperating room procedures.

Modify the Standard Severity of Illness Level of a Secondary Diagnosis Based on the Principal Diagnosis

The standard severity of illness level for the same secondary diagnoses will be modified depending on the principal diagnosis of the patient. For example, the severity level of a secondary diagnosis of acute anterolateral myocardial infarction, initial is moderate for patients with a principal diagnosis of acute anterior wall myocardial infarction, initial. In general, secondary diagnoses that are closely related to the principal diagnosis are excluded from the determination of the severity of illness subclass. However, an acute anterolateral myocardial infarction, initial represents an extension of the acute anterior wall myocardial infarction, initial and is therefore not excluded and is assigned a severity of illness level of moderate.

Modify the Standard Severity of Illness Level of a Secondary Diagnosis Based on the APR-DRG

The standard severity of illness level for some secondary diagnoses will be modified depending on the APR-DRG to which the patient is assigned. Some examples of APR-DRG modifications are shown in Table 2. Stridor is common for patients with bronchitis and asthma and is an integral part of the disease. Thus, stridor is reduced to a minor severity of illness level for patients in the APR-DRG for bronchitis and asthma. Chronic renal failure significantly increases the severity of illness level for patients with diabetes and, thus, is increased to a major severity of illness for the APR-DRG for diabetes. Cardiomegaly is not only common for CHF patients,

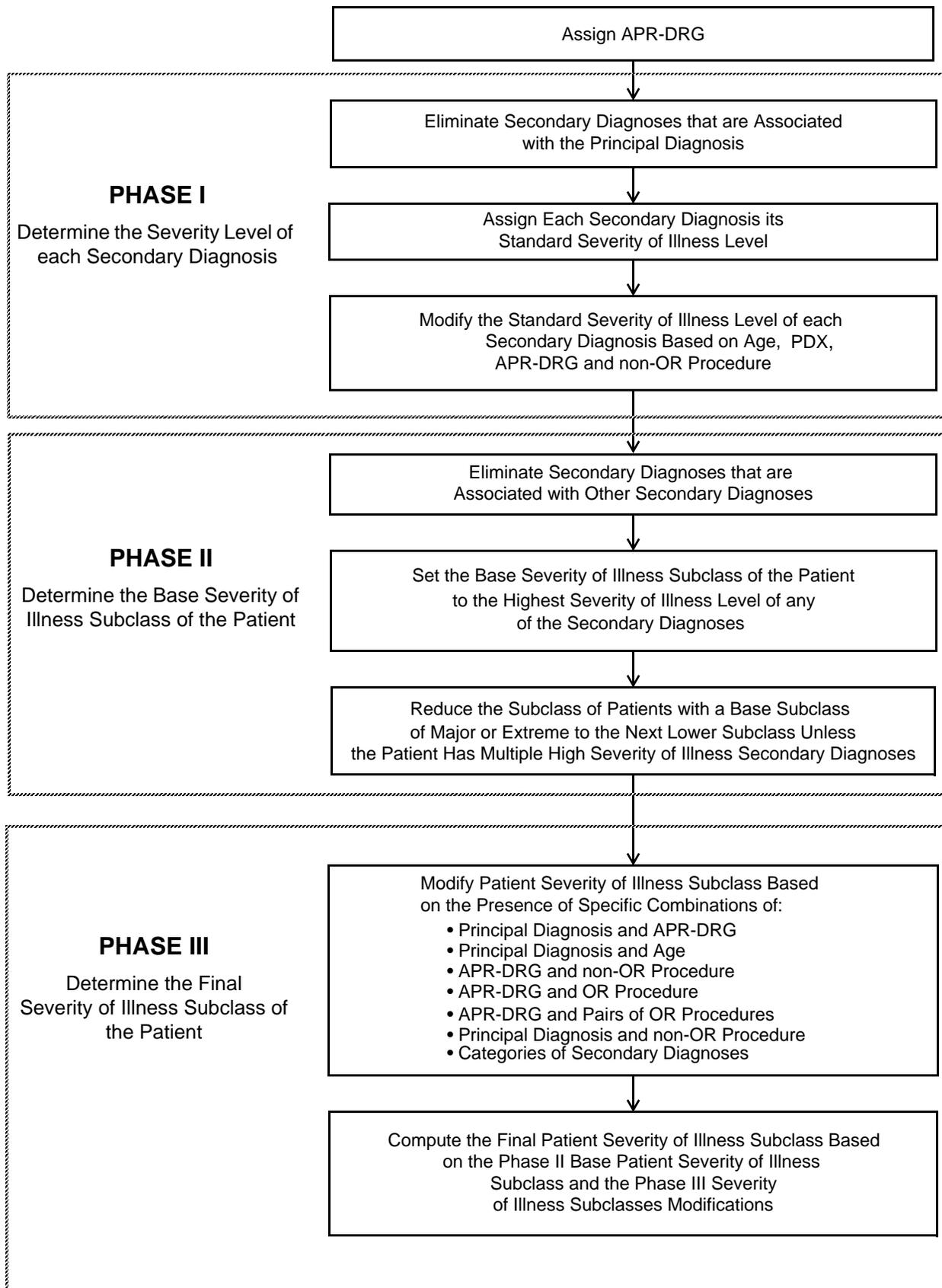


Figure 1: Three Phase Process for Determining Patient Severity of Illness Subclass

but it is also an integral part of the disease

| Severity of Illness Level | | Examples | |
|---------------------------|------------------------------------|----------|--------------------------------|
| Minor | Uncomplicated Diabetes | | Bronchitis |
| Moderate | Diabetes with Renal Manifestations | | Asthma with Status Asthmaticus |
| Major | Diabetes with Ketoacidosis | | Viral Pneumonia |
| Extreme | Diabetes with Hyperosmolar Coma | | Respiratory Failure |

Table 1: Examples of Severity of Illness Levels

and is reduced to a minor severity of illness level for the APR-DRG for CHF. Uncomplicated diabetes is a minor secondary diagnosis, but for a vaginal delivery, represents a more difficult delivery and is, therefore increased to a moderate severity of illness level.

In general, for surgical APR-DRGs, secondary diagnoses that constituted or were associated with the reason for performing the procedure had their standard severity of illness level decreased. In general, for medical APR-DRGs, secondary diagnoses that were closely related to the reason for the admission had their standard severity of illness level decreased. In essence, the standard severity of illness level of every secondary diagnosis was reviewed with every APR-DRG and modified when appropriate.

Modify the Standard Severity of Illness Level of a Secondary Diagnosis Based on Age

The age of the patient will also modify the standard severity of illness level assignment for some secondary diagnoses. For example, while ascites has a severity of illness level of major for adults, it is considered an extreme severity of ill-

ness level for pediatric patients. Ascites in pediatric patients is more severe since it indicates a more acute condition for a pediatric patient. Conversely, asthma with status asthmaticus has a severity of illness level of moderate for non elderly patients but is major for elderly patients (e.g., age greater than 69).

Modify the Standard Severity of Illness Level of a Secondary Diagnosis Based on non-OR Procedures

Some secondary diagnoses can vary significantly in terms of their clinical impact on patients. For example, a trifascicular block can frequently be of relatively minimal significance but for some patients can be more serious. The presence of certain non-OR procedures indicates a more extensive disease process. Thus, certain non-OR procedures will sometimes be used to modify the standard severity of illness level of some secondary diagnoses. Trifascicular block has a standard severity of illness level of moderate but is considered major if the patient had a temporary pacemaker inserted. The need for the temporary pacemaker is used as an indicator of the clinical significance of the trifascicular block. Nephritis is a minor

| Secondary Diagnosis | Standard Severity Of Illness Level | APR-DRG | Modified Severity Of Illness Level |
|------------------------|------------------------------------|---------------------|------------------------------------|
| Stridor | Moderate | Asthma & Bronchitis | Minor |
| Chronic Renal Failure | Moderate | Diabetes | Major |
| Cardiomegaly | Moderate | Heart Failure | Minor |
| Uncomplicated Diabetes | Minor | Vaginal Delivery | Moderate |

Table 2: Examples of Modification of Standard Severity of Illness Level Based on APR-DRG

severity of illness level but is considered a major severity of illness if dialysis is performed. The dialysis is used to indicate that the nephritis is more extensive.

Phase II - Determine the Base Severity of Illness Subclass for the Patient

Once each secondary diagnosis has been assigned its standard severity of illness level and the standard severity of illness level of each secondary diagnosis has been modified based on the APR-DRG, age and presence of certain non-OR procedures, then the base severity of illness subclass for the patient can be determined. The process of determining the base patient severity of illness subclass begins with the elimination of certain secondary diagnoses that are closely related to other secondary diagnoses. The elimination of these diagnoses prevents the double counting of clinically similar diagnoses in the determination of the severity of illness subclass of the patient. Once redundant diagnoses have been eliminated, the base severity of illness subclass is determined based on the remaining secondary diagnoses.

Eliminate Certain Secondary Diagnoses from the Determination of the Severity of Illness Subclass of the Patient

Combinations of secondary diagnoses, which are closely related, are eliminated. Groups of closely related secondary diagnoses have been identified. If more than one secondary diagnosis from the same group is present then only the secondary diagnosis with the highest severity of illness level is preserved. All other secondary diagnoses in the group are eliminated. For example, the secondary diagnoses of CVA and precerebral occlusion are in the same secondary diagnosis group. Since the CVA is an extreme severity of illness level and the precerebral occlusion is a

moderate severity of illness level the CVA will be preserved and the precerebral occlusion will be eliminated if they are both present as secondary diagnoses.

Combine all Secondary Diagnoses to Determine the Base Severity of Illness Subclass of the Patient

Once secondary diagnoses that are related to other secondary diagnoses have been eliminated, then the base patient severity of illness subclass is set equal to the maximum severity of illness level across all of the remaining secondary diagnoses. For example, if there are five remaining secondary diagnoses and one is a major severity of illness level and four are a moderate severity of illness level then the base patient subclass is major.

Reduce the Base Severity of Illness Subclass of Patients with a Major or Extreme Subclass unless the Patient has Multiple Secondary Diagnoses at a High Severity Level

In order to be assigned to the major or extreme severity of illness subclass a patient must have multiple secondary diagnoses at a high severity of illness level. High severity of illness patients are characterized by the presence of multiple high severity of illness secondary diagnoses. Patients with an extreme base severity of illness subclass must have two or more secondary diagnoses that are an extreme severity of illness level or one secondary diagnoses at an extreme severity of illness level plus at least two other secondary diagnoses at a major severity of illness level, otherwise the base severity of illness level is reduced to major. Patients with a major base severity of illness subclass must have two or more secondary diagnoses that are a major severity of illness level or one secondary diagnosis at a major severity of illness level plus at

least two other secondary diagnoses at a moderate severity of illness level. Otherwise the base severity of illness level is reduced to moderate. Thus, a secondary diagnosis of AMI is not sufficient to assign a patient to an extreme severity of illness subclass. In addition to the AMI, there must be at least one additional extreme severity of illness secondary diagnosis (e.g., acute renal failure) or two or more additional major severity of illness secondary diagnoses (e.g., CHF and diabetic ketoacidosis).

Phase III - Determine the Final Severity of Illness Subclass of the Patient

Once the base patient severity of illness subclass is computed then the patient severity of illness subclass may be increased or decreased based on specific values of the following patient attributes.

- Combinations of principal diagnosis and APR-DRG
- Combinations of age and principal diagnosis
- Combinations of non-OR procedures and principal diagnoses
- Combinations of non-OR procedures and APR-DRGs
- Combinations of APR-DRGs and OR procedures
- Combinations of APR-DRGs and pairs of OR procedures
- Combinations of categories of secondary diagnoses

Previously, age and non-OR procedures were used to modify the standard severity of illness level of a secondary diagnosis. However, age and non-OR procedures can also be associated with the principal diagnosis or the APR- DRG of the patient. Thus, the impact of age and non-OR procedures is reassessed as part of the determination of the severity of illness subclass

of the patient. Based on the patient attributes listed above, a series of modifications to the base patient severity of illness subclass are made during Phase III. The final patient severity of illness subclass is computed based on the Phase II base patient severity of illness subclass and the modification to the base severity of illness subclass made in Phase III.

Modify Severity of Illness Subclass for the Patient Based on Combinations of Principal Diagnosis and APR-DRG

The ICD-9-CM coding system will sometimes include in a single diagnosis code both the underlying disease and an associated manifestation of the disease. For example, the code 25020 is diabetes with hyperosmolar coma. When this code is used as principal diagnosis the patient is assigned to the APR-DRG for diabetes. If the patient has no secondary diagnoses then the patient severity of illness subclass would be minor. However, a diabetic patient with hyperosmolar coma should be at a higher patient severity of illness subclass than minor. In order to accommodate this ICD-9-CM idiosyncrasy, if an ICD-9-CM diagnosis code that represents multiple diagnoses is principal diagnosis the severity of illness subclass of the patient is increased by a specified increment up to a specified maximum subclass. For example, if diabetes with hyperosmolar coma is the principal diagnosis, the severity of illness subclass of the patient is increased by 1 up to a maximum of a major subclass.

Within specific APR-DRGs some principal diagnoses are indicative of higher severity of illness relative to the other principal diagnoses in the APR-DRG. For example, the severity of illness subclass of patients in APR-DRG 221 (major small and large bowel procedures) with a principal diagnosis of acute vascular insufficiency of the intestine is increased by 1 up

to a maximum of a moderate subclass. Relative to the other principal diagnoses associated with the procedures in APR-DRG 221 (e.g., bowel malignancies) acute vascular insufficiency of the intestine represents a more severely ill patient.

Conversely, within specific APR-DRGs some principal diagnoses are indicative of lower severity of illness relative to the other principal diagnoses in the APR-DRG. For example, the severity of illness subclass of patients in APR-DRG 404 (thyroid, parathyroid & thyroglossal procedures) with a principal diagnosis of nontoxic uninodular goiter is decreased by 1 for patients with a severity of illness subclass that is major or lower. Relative to the other principal diagnoses associated with the procedures in APR-DRG 404 (e.g., malignant neoplasm of thyroid) nontoxic uninodular goiter represents a less severely ill patient.

Modify Severity of Illness Subclass for the Patient Based Combinations of APR-DRG, Age and Principal Diagnosis

For some principal diagnoses in specific APR-DRGs, the patient's age essentially represents a complicating factor. For specific principal diagnoses and age combinations in certain APR-DRGs, the severity of illness subclass of the patient is increased by a specified increment up to a specified maximum subclass. For example, for pediatric patients in APR-DRG 344 (osteomyelitis) if bone infection is principal diagnosis the severity of illness subclass is increased by 1 up to a maximum of a moderate subclass. The increase in the severity of illness subclass indicates that bone infection in a pediatric patient represents a more severely ill patient.

Modify the Severity of Illness Subclass for the Patient Based on Combinations of non-OR Procedure and APR-DRG or Prin-

cipal Diagnosis

For some APR-DRGs the presence of certain non-OR procedures represents a complicating factor. For certain APR-DRG and non-OR procedure combinations, the patient severity of illness subclass is increased by a specific increment up to a specified maximum severity of illness subclass. For example, for patients in APR-DRG 220 (major stomach, esophageal and duodenal procedures) the severity of illness subclass is increased to the next higher subclass up to a maximum of major if a gastrostomy is performed. In addition, specific principal diagnoses with an APR-DRG in combination with certain non-OR procedures will increase the severity of illness subclass by a specified increment up to a specified maximum severity of illness subclass. For example, principal diagnoses of malignancy in APR-DRG 343 (pathological fractures and musculoskeletal and connective tissue malignancy) are increased by one level up to a maximum of major if radiation therapy or chemotherapy is performed.

Modify the Severity of Illness Subclass for the Patient Based on Combinations of OR Procedure and APR-DRG

Within specific APR-DRGs some OR procedures are indicative of higher severity of illness relative to the other OR procedures in the APR-DRG. For example, the severity of illness subclass of patients in APR-DRG 362 (mastectomy procedures) with an OR procedure of bilateral extended radical mastectomy is increased by 1 up to a maximum of a moderate subclass. Relative to the other OR procedures in APR-DRG 362 (e.g., unilateral simple mastectomy) a bilateral extended radical mastectomy represents a patient that is more severely ill.

Conversely, within specific APR-DRGs

some OR procedures are indicative of lower severity of illness relative to the other OR procedures in the APR-DRG. For example, the severity of illness subclass of patient in APR-DRG 21 (craniotomy except for trauma) with an OR procedure of skull biopsy is decreased by 1 for patients with a severity of illness subclass that is major or lower.

Modify the Severity of Illness Subclass for the Patient Based on Combinations of APR-DRGs and Pairs of OR Procedures

Within specific APR-DRGs some pairs of OR procedures are indicative of higher severity of illness relative to the OR procedures in the APR-DRG. For example, the severity of illness subclass of a patient in the APR-DRG 172 (amputation for circulatory system disorder) with both a peripheral vascular bypass and an above the knee amputation is increased by 1 up to a maximum of a major subclass. Relative to the other amputation patients in APR-DRG 172, those with a peripheral vascular bypass followed by an above the knee amputation are more severely ill.

Establish a Minimum Severity of Illness Subclass for the Patient Based on Combinations of Secondary Diagnoses

The presence of certain combinations of secondary diagnoses has great clinical significance. The interaction of specific combinations of secondary diagnoses make treatment more difficult and typically indicate a more extensive disease process. Therefore, a minimum patient severity of illness subclass is established if certain combinations of secondary diagnoses are present. The presence of multiple interacting diagnoses is characteristic of high severity of illness patients. A subset of secondary diagnoses will interact with each other causing patient severity of illness to be increased. This subset of diagnosis codes consists of 4068 individual codes that have been assigned to one of 60 secondary diagnosis categories. The secondary diagnoses in each category are similar clinically and have the same standard severity of illness level. A complete list of the secondary diagnosis categories is in Table 4. The secondary diagnosis categories listed in Table 4 apply only to non-newborn patients. A separate set of categories is used for newborns. The severity of illness level of the secondary diagnoses in each category is shown in parentheses in Table 4. As summarized in Table 3 there are six different types of combinations of

| Combination Type | Combination of Categories | Additional Secondary Diagnoses Required | Minimum Severity of Illness |
|------------------|---|---|-----------------------------|
| 1 | Specified combinations of two major categories | At least two additional secondary diagnoses of major or higher | Extreme (4) |
| 2 | Specified combinations of a major and moderate category | At least two additional secondary diagnoses of major or higher | Extreme (4) |
| 3 | Specified combinations of two moderate categories | At least two additional secondary diagnoses of moderate or higher | Major (3) |
| 4 | Specified combinations of a moderate and minor category | At least two additional secondary diagnoses of moderate or higher | Major (3) |
| 5 | Specified combinations of two minor categories | At least two additional secondary diagnoses of minor or higher | Moderate (2) |
| 6 | Specified combination of two moderate categories | None | Major (3) |

Table 3: Combinations of Secondary Diagnosis Categories

| | | | |
|-----|---|-----|---|
| 001 | Alcohol & Drug Abuse (1) | 031 | Genitourinary Diagnoses (1) |
| 002 | Arteries & Veins (Major) (1) | 032 | Hematological Malignancy (1) |
| 003 | Arteries & Veins (3) | 033 | Hematological Diagnoses (1) |
| 004 | Atrial Fibrillation (2) | 034 | Hematological & Immunological Diagnoses (2) |
| 005 | Asthma (2) | 035 | Hematological & Immunological Diagnoses (3) |
| 006 | Bacterial Infections (1) | 036 | Hypovolemia (1) |
| 007 | Bacterial Infections (2) | 037 | Hemiplegia (2) |
| 008 | Bacterial Infections (3) | 038 | Hypotension (2) |
| 009 | Cardiac Diagnoses (1) | 039 | Iron Deficiency Anemia (1) |
| 010 | Cardiac Diagnoses (2) | 040 | Iron Deficiency Anemia (2) |
| 011 | Cardiac Diagnoses (3) | 041 | Lung Malignancy (1) |
| 012 | Cerebrovascular (1) | 042 | Malnutrition (3) |
| 013 | Chronic Renal Failure (2) | 043 | Neurological Diagnoses (1) |
| 014 | Coma (2) | 044 | Neurological Diagnoses (3) |
| 015 | Decubitus Ulcer (3) | 045 | Other Malignancy (1) |
| 016 | Delirium Tremens (3) | 046 | Obstetrics (1) |
| 017 | Diabetes (1) | 047 | Obstetrics (2) |
| 018 | Diabetes (2) | 048 | Pleural Effusion (3) |
| 019 | Dialysis (1) | 049 | Protozoan & Fungal Infections (1) |
| 020 | Digestive Malignancy (1) | 050 | Protozoan & Fungal Infections (2) |
| 021 | Dysrhythmia (2) | 051 | Protozoan & Fungal Infections (3) |
| 022 | Electrolytes Except Hypovolemia (2) | 052 | Pulmonary (1) |
| 023 | Electrolytes Except Hypovolemia (3) | 053 | Pulmonary (2) |
| 024 | Endo, Nutrit, Fluid & Elect, Immune (1) | 054 | Pulmonary (3) |
| 025 | Endo, Nutrit, Fluid & Elect, Immune (2) | 055 | Sickle Cell Anemia (2) |
| 026 | Endo, Nutrit, Fluid & Elect, Immune (3) | 056 | Thrombophlebitis (3) |
| 027 | Eye Diagnoses (2) | 057 | Transplant (3) |
| 028 | Gastrointestinal Diagnoses (1) | 058 | Viral Infections (1) |
| 029 | Gastrointestinal Diagnoses (2) | 059 | Viral Infections (2) |
| 030 | Gastrointestinal Diagnoses (3) | 060 | Viral Infections (3) |

Table 4: Categories of Secondary Diagnoses

secondary diagnosis categories that will result in a minimum severity of illness subclass for a patient.

In general, four significant secondary diagnoses are required in order to increase the severity of illness subclass of a patient and two of the four significant secondary diagnoses must constitute one of the secondary diagnosis category combinations. The addition of the third and fourth secondary diagnoses increases the

likelihood that the specific combination of secondary diagnosis categories represents a severe case.

There are six different types of secondary diagnosis category combinations. A type 1 combination consists of two categories that contain major severity of illness level diagnoses, plus any third and fourth secondary diagnosis that is at least a major severity of illness level. When a type 1 combination occurs the minimum patient

severity of illness subclass is extreme. An example of a type 1 combination would be a major bacterial infection (Category 8) with a transplanted organ (Category 57). If a diagnosis from both these categories is present plus at least two other secondary diagnoses that are at least a major severity of illness level, then the minimum patient severity of illness subclass will be extreme. A type 2 combination is the same as a type one combination except that the two categories consist of a major severity of illness category and a moderate severity of illness category. A type 3 combination consists of two categories that contain moderate severity of illness level diagnoses plus any third and fourth secondary diagnosis that is at least a moderate level. When a type 3 combination occurs, the minimum patient severity of illness subclass is major. An example of a type 3 combination would be a moderate viral infection (category 59) with asthma (category 5).

A type 4 combination consists of a moderate severity of illness category and a minor severity of illness category plus any third and fourth diagnosis that is at least a moderate severity of illness level. When a type 4 combination occurs, the minimum patient severity of illness subclass is major. An example of a type 4 combination would be minor obstetrics (category 46) with moderate diabetes (category 18). A type 5 combination consists of two categories that contain minor severity of illness level diagnoses plus two additional minor severity of illness level diagnoses. When a type 5 combination occurs the maximum patient severity of illness subclass is moderate. An example of a type 5 combination would be diabetes (category 17) with minor bacterial infection (category 6). Combination type 6 is a special combination type for normal newborns (APR-DRGs 626 and 640).

Compute the Final Patient Severity of Illness Subclass

The final patient severity of illness subclass is computed based on the Phase II base patient severity of illness subclass and the Phase III modified patient severity of illness subclasses. If all the modified Phase III modified severity subclasses are greater than or equal to the Phase II base severity of illness subclass, then the final severity of illness subclass is computed as the maximum of the Phase II and III severity subclasses. If all of the modified Phase III severity of illness subclasses are less than or equal to the Phase II base severity of illness subclass the final severity of illness subclass is computed as the Phase II base severity of illness subclass minus one. If the Phase III modified severity of illness subclasses includes modified severity of illness subclasses that are both greater and less than the Phase II based severity of illness subclass, then the modified Phase III subclass relating to combinations of secondary diagnoses and procedures will take priority in determining the final severity of illness subclass. The combination of the APR-DRG and the final patient severity of illness subclass constitute the complete APR-DRG description of the severity of illness of the patient.

Summary of APR-DRG Severity of Illness Subclass Assignment Logic

The following is a summary of the steps involved in computing the APR-DRG severity of illness subclass of a patient.

Phase I - Determine the Severity of Illness Level of Each Secondary Diagnosis

1. Eliminate secondary diagnoses that are associated with the principal diagnosis.
2. Assign each secondary diagnosis its standard severity of illness level.

3. Modify the standard severity of illness level of each secondary diagnosis based on the age of the patient.
4. Modify the standard severity of illness level of each secondary diagnosis based on the principal diagnosis and the APR-DRG to which the patient is assigned.
5. Modify the standard severity of illness level of each secondary diagnosis based on the APR-DRG to which the patient is assigned.
6. Modify the standard severity of illness level of each secondary diagnoses based on the presence of certain non-OR procedures.

Phase II - Determine the Base Severity of Illness Subclass of the Patient

7. Eliminate all secondary diagnoses that are in the same secondary diagnosis group except the secondary diagnosis with the highest severity of illness level.
8. Compute the base patient severity of illness subclass as the maximum of all the secondary diagnosis severity of illness levels.
9. If the base patient severity of illness subclass from Step 8 is major or extreme, then reduce the base patient severity of illness subclass to the next lower severity of illness subclass unless there are multiple secondary diagnoses at a high severity of illness level.

Phase III - Determine the final severity of illness subclass of the patient

10. Modify the patient severity of illness subclass based on the principal diagnosis.
11. Modify the patient severity of illness subclass based on the age of the patient.
12. Modify the patient severity of illness

subclass based on a combination of the APR-DRG and the presence of certain non-OR procedures.

13. Modify the patient severity of illness subclass based on combinations of APR-DRGs and OR procedures.
14. Modify the patient severity of illness subclass based on combinations of APR-DRGs and pairs of OR procedures.
15. Modify the patient severity of illness subclass based on the combination of principal diagnosis and the presence of certain non-OR procedures.
16. Modify the patient severity of illness subclass based on the presence of specific combinations of categories of secondary diagnoses.
17. Compute the final patient severity of illness subclass based on the Phase II base patient severity of illness subclass from Step 9 and the modifications of the patient severity of illness subclasses from Steps 10-16.

Determination of the Risk of Mortality Subclass

The three phase process of determining the risk of mortality subclass is summarized in Figure 2. The three phase process of determining the risk of mortality subclass parallels the three phases in the determination of the severity of illness subclass. In the first phase, the risk of mortality of each secondary diagnosis is determined. Once the risk of mortality level of each secondary diagnosis is established, the second phase determines a base risk of mortality subclass for the patient based on the patient's secondary diagnoses. In Phase III the final subclass for the patient is determined by incorporating the impact of principal diagnosis, OR procedures, non-OR procedures and combinations of categories of secondary diag-

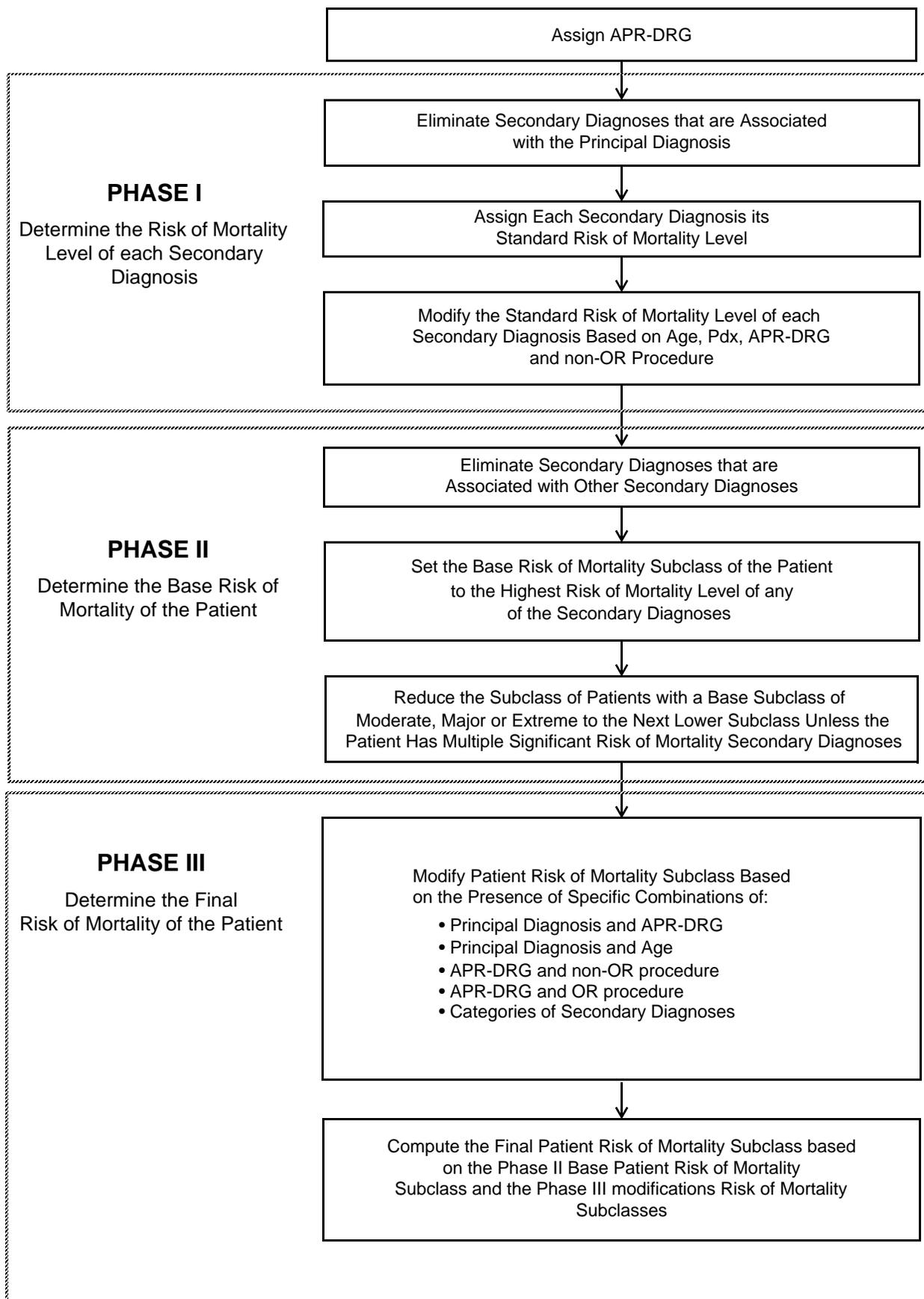


Figure 2: Three Phase Process for Determining Patient Risk of Mortality

noses.

Phase I - Determining the Risk of Mortality Level of each Secondary Diagnosis

Eliminate Secondary Diagnoses Associated with the Principal Diagnosis

This step is identical to the corresponding step in the determination of the severity of illness subclass.

Assign each Secondary Diagnosis its Standard Risk of Mortality Level

Each secondary diagnosis is assigned one of four distinct risk of mortality levels. In general, except for malignancies and certain extreme acute diseases such as acute renal failure, the risk of mortality level tends to be lower than the severity of illness level for the same diagnosis. Mortality is relatively rare. There are a limited number of diagnoses that significantly increase the risk of mortality. For example, traumatic amputation of the arm, acute cholecystitis and acute osteomyelitis are all at a major severity of illness level since they represent serious disease with significant loss of organ function. However, they present relatively low risk of mortality and therefore are assigned to a minor risk of mortality level. Example of secondary diagnoses that would have an extreme risk of mortality are intracranial hemorrhage, acute vascular insufficiency of intestine, AMI and acute renal failure.

Modify the Standard Risk of Mortality of a Secondary Diagnosis Based on the APR-DRG

The standard risk of mortality level for some secondary diagnoses will be modified depending on the APR-DRG to which the patient is assigned. For example, a minor risk of mortality diagnosis such as right bundle branch block is increased to a moderate risk of mortality for the APR-

DRG for circulatory disorders with AMI.

Modify the Standard Risk of Mortality Level of a Secondary Diagnosis Based on Age

The age of the patient modifies the standard risk of mortality level of some diagnoses. In general, the risk of mortality is lower for pediatric patients. For example, the risk of mortality for diabetes with ketoacidosis is lowered from moderate to minor for pediatric patients. Conversely, in general, the risk of mortality is higher for elderly patients. For example, the risk of mortality for atrial flutter is increased from a minor risk of mortality to a moderate risk of mortality for patients with age greater than 69.

Modify the Standard Risk of Mortality Level of a Secondary Diagnosis Based on the Principal Diagnosis

The standard risk of mortality level for some secondary diagnoses will be modified depending on the principal diagnosis of the patient. For example, the risk of mortality of a secondary diagnosis of acute anterolateral myocardial infarction, initial is moderate for patients with a principal diagnosis of acute anterior wall myocardial infarction, initial. In general, secondary diagnoses that are closely related to the principal diagnosis are excluded from the determination of the risk of mortality subclass. However, an anterolateral acute myocardial infarction represents an extension of the anterior wall myocardial infarction and is therefore not excluded and is assigned a risk of mortality level of moderate.

Modify the Standard Risk of Mortality Level of a Secondary Diagnosis Based on non-OR Procedures

Certain non-OR procedures will sometimes be used to modify the standard risk

of mortality level of some secondary diagnoses. Subendocardial infarction has a standard risk of mortality level of moderate but is considered extreme if the patient had a pulsation balloon implanted. The need for the pulsation balloon is used as an indicator of the clinical significance of the subendocardial infarction.

Phase II - Determine the Base Risk of Mortality Subclass for the Patient

Once each secondary diagnosis has been assigned its standard risk of mortality level and the standard risk of mortality level of each secondary diagnosis has been modified based on the APR-DRG, principal diagnosis, non-OR procedure and age, then the base risk of mortality subclass for the patient can be determined. The process of determining the base patient risk of mortality subclass begins with the elimination of certain secondary diagnoses that are closely related to other secondary diagnoses. The elimination of these diagnoses prevents the double counting of clinically similar diagnoses in the determination of the risk of mortality subclass of the patient. Once redundant diagnoses have been eliminated, the base risk of mortality subclass is determined based on the remaining secondary diagnoses. Eliminate Certain Secondary Diagnoses from the Determination of the Risk of Mortality Subclass of the Patient

This step is identical to the corresponding step in the determination of the severity of illness subclass.

Combine all Secondary Diagnoses to Determine the Base Risk of Mortality Subclass of the Patient

Once secondary diagnoses that are related to other secondary diagnoses have been eliminated, then the base patient risk

of mortality subclass is set equal to the maximum risk of mortality level across all of the remaining secondary diagnoses. For example, if there are five remaining secondary diagnoses and one is a major risk of mortality level and four are a moderate risk of mortality level then the base patient risk of mortality subclass is major.

Except for Certain Secondary Diagnoses Reduce the Base Risk of Mortality Subclass unless the Patient has Multiple Secondary Diagnoses with a Significant Risk of Mortality

In general, high risk of mortality patients are characterized by multiple secondary diagnoses with a significant risk of mortality. In order for the base risk of mortality subclass to be extreme, there must be two or more extreme risk of mortality secondary diagnoses present or a single extreme risk of mortality secondary diagnosis plus two or more major risk of mortality secondary diagnoses. The only exception is that for a limited set of extreme risk of mortality secondary diagnoses such as ruptured aortic aneurysm no additional secondary diagnoses are necessary or only one additional major risk of mortality secondary diagnosis is necessary. If the above multiple high risk of mortality criteria is not met then the base patient subclass is reduced to major or moderate depending on the specific additional diagnoses that are present. Patients with a base risk of mortality subclass of major are reduced to moderate unless in addition to the major risk of mortality secondary diagnosis there are at least one additional major risk of mortality secondary diagnosis or two more additional secondary diagnoses with a moderate risk of mortality. The only exception is that for a limited set of major risk of mortality secondary diagnoses such as acute pulmonary edema. no additional secondary diagnoses are necessary.

Patients with a base risk of mortality subclass of moderate are reduced to minor unless there are two or more additional moderate risk of mortality secondary diagnoses present.

Phase III - Determine the Final Risk of Mortality Subclass of the Patient

Once the base patient risk of mortality subclass is computed then the risk of mortality subclass may be increased or decreased based on specific values of the following patient attributes.

- Combinations of principal diagnosis and APR-DRG
- Combination of age and principal diagnosis
- Combinations of non-OR procedures and APR-DRG
- Combinations of APR-DRGs and OR procedures
- Combinations of categories of secondary diagnoses

Previously, age and non-OR procedures were used to modify the standard risk of mortality level of a secondary diagnosis. However, age and non-OR procedures can also be associated with the principal diagnosis or the APR-DRG of the patient. Thus, the impact of age and non-OR procedures is reassessed as part of the determination of the risk of mortality subclass of the patient. Based on the patient attributes listed above, a series of modifications to the base patient risk of mortality subclass will be made during Phase III. The final patient risk of mortality subclass will be computed based on the Phase II base patient risk of mortality subclass and the modification to the base risk of mortality subclass made in Phase III.

Modify the Risk of Mortality Subclass for the Patient Based on Principal Diagnosis

Within specific APR-DRGs some principal diagnoses are indicative of higher risk of mortality relative to the other principal diagnoses in the APR-DRGs. For example, the risk of mortality subclass of patients in APR-DRG 309 (hip and femur procedures except major joint for non-trauma) with a principal diagnosis of secondary malignant neoplasm of bone is increased by 1 up to a maximum of a moderate subclass. Relative to the other principal diagnoses associated with the procedures in APR-DRG 309, secondary malignant neoplasm of bone represents a greater risk of mortality.

Modify the Risk of Mortality Subclass for the Patient Based on Combinations of APR-DRG, Age and Principal Diagnosis

For some principal diagnoses in specific APR-DRGs, the patient's age essentially represents a complicating factor. For specific principal diagnoses and age combinations in certain APR-DRGs, the risk of mortality subclass of the patient is increased by a specified increment up to a specified maximum subclass. For example, for elderly patients more than 80 years old in APR-DRG 44 (intracranial hemorrhage) if intracerebral hemorrhage is the principal diagnosis, the risk of mortality subclass is increased by 1 up to a maximum of a moderate subclass. The increase in the risk of mortality subclass indicates that intracranial hemorrhage in an elderly patient represents a higher risk of mortality.

Modify the Risk of Mortality Subclass for the Patient Based on Combinations of non-OR Procedure and APR-DRG

For some APR-DRGs the presence of certain non-OR procedures represents a complicating factor. For certain APR-DRG and non-OR procedure combinations, the risk of mortality subclass is increased by a

specific increment up to a specified maximum risk of mortality subclass. For example, for patients in APR-DRG 194 (heart failure) the risk of mortality subclass is increased by two up to a maximum of extreme if mechanical ventilation greater than 96 hours is performed.

Modify the Risk of Mortality Subclass for the Patient Based on Combinations of OR Procedure and APR-DRG

Within specific APR-DRGs some OR procedures are indicative of higher risk of mortality relative to the other OR procedures in the APR-DRG. For example, the risk of mortality subclass of patients in APR-DRG 443 (kidney and urinary tract procedures for non-malignancy), is increased by 2 up to a maximum of major if the procedure bilateral nephrectomy is performed. Relative to other procedures in DRG 443, a bilateral nephrectomy represents a patient that has a higher risk of mortality.

Modify the Risk of Mortality Subclass for the Patient Based on Combinations of Secondary Diagnoses

The presence of certain combinations of secondary diagnoses has great clinical significance. The interaction of specific combinations of secondary diagnoses increase the risk of mortality. Therefore, a minimum patient risk of mortality subclass is established if certain combinations of secondary diagnoses are present. The presence of multiple interacting diagnoses

is characteristic of high risk of mortality patients. A subset of secondary diagnoses will interact with each other causing patient risk of mortality to be increased. This subset of diagnosis codes consists of 1784 individual codes that have been assigned to one of 50 secondary diagnosis categories. The secondary diagnoses in each category are similar clinically and have the same standard risk of mortality level. A complete list of the secondary diagnosis categories is in Table 6. The secondary diagnosis categories listed in Table 6 apply only to non-newborn patients. A separate set of categories is used for newborns. The risk of mortality level of the secondary diagnoses in each category is shown in parentheses in Table 6. As summarized in Table 5 there are three different types of combinations of secondary diagnosis categories that will result in a minimum risk of mortality subclass for a patient. In general, four significant secondary diagnoses are required in order to increase the risk of mortality subclass of a patient and two of the four significant secondary diagnoses must constitute one of the secondary diagnosis category combinations. The addition of the third and fourth secondary diagnosis increases the likelihood that the specific combination of secondary diagnosis categories represents a high risk of mortality case.

A type 1 combination consists of two categories that contain major risk of mor-

| Combination Type | Combination of Categories | Additional Secondary Diagnosis Required | Minimum Risk of Mortality Subclass |
|------------------|---|---|------------------------------------|
| 1 | Specified combinations of two major categories | At least two additional secondary diagnoses of major or higher | Extreme (4) |
| 3 | Specified combinations of two moderate categories | At least two additional secondary diagnoses of moderate or higher | Major (3) |
| 5 | Specified combinations of two minor categories | At least two additional secondary diagnoses of minor or higher | Moderate (2) |

Table 5: Combinations of Secondary Diagnosis Categories

| | | | |
|-----|--------------------------------------|-----|------------------------------------|
| 001 | AMI -Subsequent/Unspecified (1) | 026 | Hematological Diagnoses (2) |
| 002 | Ascites (3) | 027 | Hemiplegia (2) |
| 003 | Atherosclerosis (1) | 028 | Hemorrhage (1) |
| 004 | Bacterial Infections (2) | 029 | History of Major Organ Surgery (1) |
| 005 | CABG (1) | 030 | HIV (2) |
| 006 | Cardiac Diagnoses (1) | 031 | Hypertension (1) |
| 007 | Cardiac Diagnoses (2) | 032 | Hypotension (3) |
| 008 | Cardiac-prime (1) | 033 | Hypovolemia (2) |
| 009 | Cerebrovascular (1) | 034 | Kaposi's Sarcoma (2) |
| 010 | Chronic Renal Failure (2) | 035 | Malnutrition (2) |
| 011 | Cirrhosis (2) | 036 | Malnutrition (3) |
| 012 | Congenital Anomaly (1) | 037 | Neurological Diagnoses (1) |
| 013 | CVA (2) | 038 | Pathological Fracture (2) |
| 014 | Diabetes (1) | 039 | Pleural Effusion (2) |
| 015 | Dialysis (1) | 040 | Poisoning (2) |
| 016 | Dysrhythmia (2) | 041 | Protozoan & Fungal Infections (2) |
| 017 | Electrolytes Except Hypovolemia (1) | 042 | Protozoan & Fungal Infections (3) |
| 018 | Electrolytes Except Hypovolemia (2) | 043 | Pulmonary (1) |
| 019 | Electrolytes Except Hypovolemia (3) | 044 | Pulmonary (2) |
| 020 | Endo,Nutrit,Fluid & Elect,Immune (1) | 045 | Pulmonary (3) |
| 021 | Endo,Nutrit,Fluid & Elect,Immune (2) | 046 | Sickle Cell Anemia (1) |
| 022 | Endo,Nutrit,Fluid & Elect,Immune (3) | 047 | Thrombophlebitis (2) |
| 023 | Gastrointestinal (1) | 048 | Thrombophlebitis (1) |
| 024 | Gastrointestinal (2) | 049 | Transplant (2) |
| 025 | Hematological Diagnoses (1) | 050 | Viral Infections (2) |

Table 6: Categories of Secondary Diagnoses

tality level diagnoses, plus any two additional secondary diagnoses that are at least major level. When a type 1 combination occurs, the minimum patient risk of mortality subclass is extreme. An example of a type 1 combination is a major pulmonary diagnosis (category 45) such as acute pulmonary edema with ascites (category 002) combined with any other two major secondary diagnoses. A type 3 combination consists of two categories that contain moderate risk of mortality level diagnoses, plus any two additional secondary diagnoses that are at least a moderate risk of mortality level. When a type 3 combination occurs, the minimum patient risk of mortality is major. An exam-

ple of a type 3 combination is a moderate bacterial infection (category 4) such as staphylococcal enteritis with chronic renal failure (category 10) combined with any other two moderate secondary diagnoses. A type 5 combination consists of two categories that contain minor risk of mortality level diagnoses, plus any two additional secondary diagnoses that are at least a minor risk of mortality level. When a type 5 combination occurs, the minimum patient risk of mortality is moderate. An example of a type 5 combination is a minor gastrointestinal diagnosis with a minor neurological diagnosis combined with any other two minor secondary diagnoses. Compute the Final Risk of Mortality Subclass

The final patient risk of mortality subclass is computed based on the Phase II base patient risk of mortality subclass and the Phase III modified patient severity of illness subclasses. If all the modified Phase III modified risk of mortality are greater than or equal to the Phase II base risk of mortality subclass, then the final risk of mortality subclass is computed as the maximum of the Phase II and III risk of mortality subclasses. If all of the modified Phase III risk of mortality subclasses are less than or equal to the Phase II base risk of mortality subclass the final risk of mortality subclass is computed as the Phase II base risk of mortality subclass minus one. If the Phase II modified risk of mortality subclasses includes modified risk of mortality subclasses that are both greater and less than the Phase II based risk of mortality subclass, then the modified Phase III subclass relating to combinations of secondary diagnoses and procedures will take priority in determining the final risk of mortality subclass. The combination of the APR-DRG and the final patient risk of mortality subclass constitute the complete APR-DRG description of the risk of mortality of the patient.

Summary of APR-DRG Risk of Mortality Subclass Assignment Logic

The following is a summary of the steps involved in computing the APR- DRG risk of mortality subclass of a patient.

Phase I - Determine the Risk of Mortality Level of each Secondary Diagnosis

1. Eliminate all secondary diagnoses that are associated with the principal diagnosis of the patient.
2. Assign each secondary diagnosis its standard risk of mortality.
3. Modify the standard risk of mortality level of each secondary diagnosis

based on the age of the patient.

4. Modify the standard risk of mortality level of each secondary diagnosis based on the principal diagnosis and the APR-DRG to which the patient is assigned.
5. Modify the standard risk of mortality level of each secondary diagnosis based on the APR-DRG to which the patient is assigned.
6. Modify the standard risk of mortality level of each secondary diagnosis based on the presence of certain non-OR procedures.

Phase II - Determine the Base Risk of Mortality Subclass of the Patient

7. Eliminate all secondary diagnoses that are in the same secondary diagnosis group except the secondary diagnosis with the highest risk of mortality level.
8. Compute the base patient risk of mortality subclass as the maximum of all the secondary diagnosis risk of mortality levels.
9. Reduce the base patient risk of mortality subclass unless there are multiple secondary diagnoses at a significant risk of mortality.

Phase III - Determine the Final Risk of Mortality Subclass of the Patient

10. Modify the patient risk of mortality subclass based on the principal diagnosis.
11. Modify the patient risk of mortality subclass based on the age of the patient.
12. Modify the patient risk of mortality subclass based on a combination of the APR-DRG and the presence of certain non-OR procedures.
13. Modify the patient risk of mortality subclass based on combinations of APR-DRGs and OR procedures.
14. Modify the patient risk of mortality subclass based on the presence of specific combinations of categories of

secondary diagnoses.

15. Compute the final patient risk of mortality subclass based on the Phase II base patient severity of illness subclass from Step 9; and the modifications of the patient risk of mortality subclasses from Steps 10-14.

Conclusion

The APR-DRGs form a clinically coherent set of severity of illness and risk of mortality adjusted patient groups. The APR-DRGs are designed to describe the complete cross-section of patients seen in acute care hospitals.

Through APR-DRGs hospitals, consumers, payers and regulators can gain an understanding of the patients being treated, the costs incurred and within reasonable limits, the services and outcomes expected. Through APR-DRGs, areas for improvement in efficiency and areas with potential quality problems can be identified. The classification of patients into APR-DRGs is constantly evolving. As the ICD-9-CM coding scheme changes or as medical technology or practice changes, the APR-DRG definitions will be updated to reflect these changes.

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