



3M™ All Patient Refined Diagnosis Related Groups (APR DRG)

# Methodology Overview

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# Chapter 1: History of the Development of the Diagnosis Related Groups (DRGs)

The Diagnosis Related Groups (DRGs) are a patient classification scheme which provides a means of relating the type of patients a hospital treats (i.e., its case mix) to the costs incurred by the hospital. There are currently four major versions of the DRG in use: classic Centers for Medicare & Medicaid Services (CMS) DRGs, Medicare Severity DRGs (MS-DRGs), All Patient DRGs (AP-DRGs), and APR DRGs. The classic CMS DRGs (prior to FY 2008) and MS-DRGs (beginning in FY 2008) are used by CMS for hospital payment for Medicare beneficiaries. The AP-DRGs are an expansion of the basic DRGs to be more representative of non-Medicare populations such as pediatric patients. The APR DRGs incorporate severity of illness subclasses into the AP-DRGs. Since the APR DRGs include both the CMS DRGs and the AP-DRGs, the development of all three versions of the DRGs will be reviewed.

The design and development of the DRGs began in the late sixties at Yale University. The initial motivation for developing the DRGs was to create an effective framework for monitoring the quality of care and the utilization of services in a hospital setting. The first large-scale application of the DRGs was in the late seventies in the State of New Jersey. The New Jersey State Department of Health used DRGs as the basis of a prospective payment system in which hospitals were reimbursed a fixed DRG specific amount for each patient treated. In 1982, the Tax Equity and Fiscal Responsibility Act modified the Section 223 Medicare hospital reimbursement limits to include a case mix adjustment based on DRGs. In 1983 Congress amended the Social Security Act to include a national DRG-based hospital prospective payment system for all Medicare patients.

The evolution of the DRGs and their use as the basic unit of payment in Medicare's hospital reimbursement system represent a recognition of the fundamental role which a hospital's case mix plays in determining its costs. In the past, hospital characteristics such as teaching status and bed size have been used to attempt to explain the substantial cost differences which exist across hospitals. However, such characteristics failed to account adequately for the cost impact of a hospital's case mix. Individual hospitals have often attempted to justify higher cost by contending that they treated a more complex mix of patients. The usual contention was that the patients treated by the hospital were sicker. Although there was a consensus in the hospital industry that a more complex case mix results in higher costs, the concept of case mix complexity had historically lacked a precise definition. The development of the DRGs provided the first operational means of defining and measuring a hospital's case mix complexity.

## The concept of case mix complexity

The concept of case mix complexity initially appears very straightforward. However, clinicians, administrators and regulators have often attached different meanings to the concept of case mix complexity depending on their backgrounds and purposes. The term case mix complexity has been used to refer to an interrelated but distinct set of patient attributes which include severity of illness, risk of dying, prognosis, treatment difficulty, need for intervention, and resource

intensity. Each of these attributes has a very precise meaning which describes a particular aspect of a hospital's case mix.

Attribute	Description
Severity of Illness	Refers to the extent of physiologic decompensation or organ system loss of function.
Risk of Mortality	Refers to the likelihood of dying.
Prognosis	Refers to the probable outcome of an illness including the likelihood of improvement or deterioration in the severity of the illness, the likelihood for recurrence, and the probable life span.
Treatment Difficulty	Refers to the patient management problems which a particular illness presents to the healthcare provider. Such management problems are associated with illnesses without a clear pattern of symptoms, illnesses requiring sophisticated and technically difficult procedures, and illnesses requiring close monitoring and supervision.
Need for Intervention	Relates to the consequences in terms of severity of illness that lack of immediate or continuing care would produce.
Resource Intensity	Refers to the relative volume and types of diagnostic, therapeutic, and bed services used in the management of a particular illness.

When clinicians use the notion of case mix complexity, they typically are referring to one or more aspects of clinical complexity. For clinicians, increased case mix complexity refers to greater severity of illness, greater risk of mortality, greater treatment difficulty, poorer prognoses, and/or a greater need for intervention. Thus, from a clinical perspective, case mix complexity refers to the condition of the patients treated and the treatment difficulty associated with providing care. On the other hand, administrators and regulators usually use the concept of case mix complexity to indicate that the patients treated require more resources which results in a higher cost of providing care. Thus, from an administrative or regulatory perspective, case mix complexity refers to the resource intensity demands that patients place on an institution. While the two interpretations of case mix complexity are often closely related, they can be very different for certain kinds of patients. For example, while terminal cancer patients are very severely ill and have a poor prognosis, they require few hospital resources beyond basic nursing care. No measure of case mix complexity can be equally effective for all the different aspects of case mix complexity.

There has sometimes been confusion regarding the use and interpretation of the Diagnosis Related Groups (DRGs) because the aspect of case mix complexity measured by the DRGs has not been clearly understood. The purpose of the DRGs is to relate a hospital's case mix to the resource demands and associated costs experienced by the hospital. Therefore, a hospital having a more complex case mix from a DRG perspective means that the hospital treats patients who require more hospital resources, but not necessarily that the hospital treats patient having a greater severity of illness, a greater risk of dying, a greater treatment difficulty, a poorer prognosis, or a greater need for intervention.



## Patient classification

Given that the purpose of the Diagnosis Related Groups (DRGs) is to relate a hospital's case mix to its resource intensity, it was necessary to develop an operational means of determining the types of patients treated and relating each patient type to the resources they consumed. While all patients are unique, groups of patients have demographic, diagnostic, and therapeutic attributes in common that determine their level of resource intensity. By developing clinically similar groups of patients with similar resource intensity, patients can be aggregated into meaningful patient groups. Moreover, if these patient groups covered the entire range of patients seen in an inpatient setting, then collectively they would constitute a patient classification scheme that would provide a means of establishing and measuring hospital case mix complexity. The DRGs were therefore developed as a patient classification scheme consisting of groups of patients who were similar, both clinically, and in terms of their consumption of hospital resources.

During the process of developing the DRG patient classification scheme, several alternative approaches to constructing the patient groups were investigated. Initially, a normative approach was used which involved having clinicians define the DRGs using the patient characteristics they felt were important for determining resource intensity. There was a tendency for these definitions to include an extensive set of specifications requiring information which might not always be collected through a hospital's medical information system. If the entire range of patients were classified in this manner, there would ultimately be thousands of DRGs, most of which described patients seen infrequently in a typical hospital. It therefore became evident that the process of DRG definition would be facilitated if data from acute care hospitals could be examined to determine the general characteristics and relative frequency of different patient types. In addition, statistical algorithms applied to this data would be useful to suggest ways of forming DRGs that were similar in terms of resource intensity. However, it was also discovered that statistical algorithms applied to historical data in the absence of clinical input would not yield a satisfactory set of DRGs. The DRGs resulting from such a statistical approach, while similar in terms of resource intensity, would often contain patients with a diverse set of characteristics which could not be interpreted from a clinical perspective. Thus, it became apparent that the development of the DRG patient classification scheme required that physician judgment, statistical analysis and verification with historical data be merged into a single process. It was necessary to be able to examine large amounts of historical data with statistical algorithms available for suggesting alternative ways of forming DRGs but to do so in such a way that physicians could review the results at each step to ensure that the DRGs formed were clinically coherent.

## Basic characteristics of the DRG patient classification system

Given the limitations of previous patient classification systems and the experience of attempting to develop Diagnosis Related Groups (DRGs) with physician panels and statistical analysis, it was concluded that in order for the DRG patient classification system to be practical and meaningful, it should have the following characteristics:

- The patient characteristics used in the definition of the DRGs should be limited to information routinely collected on hospital abstract systems.
- There should be a manageable number of DRGs which encompass all patients seen on an inpatient basis.
- Each DRG should contain patients with a similar pattern of resource intensity.
- Each DRG should contain patients who are similar from a clinical perspective (i.e., each group should be clinically coherent).

Restricting the patient characteristics used in the definition of the DRGs to those readily available insured that the DRGs could be extensively applied. The patient information routinely collected includes age, principal diagnosis, secondary diagnoses and the surgical procedures performed. Creating DRGs based on information that is collected only in a few settings, or on information that is difficult to collect or measure, would have resulted in a patient classification scheme which could not be applied uniformly across hospitals. This is not to say that information beyond that currently collected might not be useful for defining the DRGs. As additional information becomes routinely available, it must be evaluated to determine if it could result in improvements in the ability to classify patients.

Limiting the number of DRGs to manageable numbers (i.e., hundreds of patient groups, not thousands) insures that for most of the DRGs, a typical hospital will have enough experience to allow meaningful comparative analysis to be performed. If there were only a few patients in each DRG, it would be difficult to detect patterns in case mix complexity and cost performance and to communicate the results to the physician staff.

The resource intensity of the patients in each DRG must be similar in order to establish a relationship between the case mix of a hospital and the resources it consumes. Similar resource intensity means that the resources used are relatively consistent across the patients in each DRG. However, some variation in resource intensity will remain among the patients in each DRG. In other words, the definition of the DRG will not be so specific that every patient is identical, but the level of variation is known and predictable. Thus, while the precise resource intensity of a particular patient cannot be predicted by knowing to which DRG he belongs, the average pattern of resource intensity of a group of patients in a DRG can be accurately predicted.

Since one of the major applications of the DRGs is communicating with the physician community, the patients in each DRG must be similar from a clinical perspective. In other words, the definition of each DRG must be clinically coherent. The concept of clinical coherence requires that the patient characteristics included in the definition of each DRG relate to a common organ system or etiology and that a specific medical specialty should typically provide care to the patients in the DRG. For example, patients who are admitted for a D&C or a Tonsillectomy are similar in terms of most measures of resource intensity, such as length of stay, preoperative stay, operating room time, and use of ancillary services. However, different organ systems and different medical specialties are involved. Thus, the requirement that the DRGs be clinically coherent precludes the possibility of these types of patients being in the same DRG.

A common organ system or etiology and a common clinical specialty are necessary but not sufficient requirements for a DRG to be clinically coherent. In addition, all available patient characteristics, which medically would be expected to consistently affect resource intensity, should be included in the definition of the DRG. Furthermore, the definition of a DRG should not

be based on patient characteristics that medically would not be expected to consistently affect resource intensity. For example, patients with appendicitis may or may not have peritonitis. Although these patients are the same from an organ system, etiology, and medical specialist perspective, the DRG definitions must form separate patient groups since the presence of peritonitis would be expected to consistently increase the resource intensity of appendicitis patients. On the other hand, sets of unrelated surgical procedures cannot be used to define a DRG since there would not be a medical rationale to substantiate that the resource intensity would be expected to be similar.

The definition of clinical coherence is, of course, dependent on the purpose for the formation of the DRG classification. For the DRGs, the definition of clinical coherence relates to the medical rationale for differences in resource intensity. On the other hand, if the purpose of the DRGs related to mortality, the patient characteristics which were clinically coherent and therefore included in the DRG definitions might be different. Finally, it should be noted that the requirement that the DRGs be clinically coherent caused more patient groups to be formed than would be necessary for explaining resource intensity alone.



# Chapter 2: 3M™ All Patient Refined Diagnosis Related Groups (APR DRGs)

## Expanding the scope of the DRG system

The original objective of the Diagnosis Related Groups (DRGs) was to develop a patient classification methodology that related the types of patients treated to the resources they consumed. Thus, the DRGs focused exclusively on resource intensity. As the healthcare industry has evolved there has been increased demand for a patient classification methodology that can be used for applications beyond resource use, cost, and payment. In particular, a patient classification methodology 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:

Attribute	Description
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 DRG Classification System expands the basic DRG structure by adding four subclasses to each DRG. The addition of the four subclasses addresses patient differences relating to severity of illness and risk of mortality. Severity of illness and risk of mortality relate to distinct patient attributes. For example, a patient with acute cholelithiasis (acute gallstone attack) as the highest secondary diagnosis may be considered a major severity of illness but only a minor risk of mortality. The severity of illness is major since there is significant organ system dysfunction associated with acute cholelithiasis. However, it is unlikely that the acute episode alone will result in patient mortality and thus, the risk of mortality for this patient is minor. If

additional, more serious diagnoses are also present, patient severity of illness and risk of mortality may increase. For example, if peritonitis is present along with the acute choledocholithiasis, the patient may be 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 DRG 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. For example, severity subclass 4 congestive heart failure patients are not comparable to severity subclass 4 patients with a fractured leg. Thus, it is not meaningful 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), 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 usually characterized by multiple serious diseases or illnesses. 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 represent difficult-to-treat patients who tend to have poor outcomes.

## The development process

The process used in the development of the APR DRG Classification System 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 base APR DRGs. Once the clinical model for severity of illness and risk of mortality was developed for each base APR DRG, it was evaluated with historical data in order to review the clinical hypotheses. If there was a discrepancy between clinical expectations and the data results, the clinical content of the

diagnosis and procedure codes was closely examined to determine if ambiguities in the definition or content of the codes could explain the discrepancy. Any discrepancies between clinical expectations and data results were always resolved by using clinical expectations as the basis for the APR DRGs. Thus, the APR DRGs are a clinical model that has been extensively tested with historical data.

## Development of the base APR DRGs

The process of forming the base APR DRGs begins by dividing all possible principal diagnoses into 25 mutually exclusive principal diagnosis categories referred to as Major Diagnostic Categories (MDCs).

The MDCs were formed by physician panels as the first step toward ensuring that the DRGs would be clinically coherent. The diagnoses in each MDC correspond to a single organ system or etiology and in general, are associated with a particular medical specialty. Thus, in order to maintain the requirement of clinical coherence, no final DRG could contain patients in different MDCs. In general, each MDC was constructed to correspond to a major organ system (e.g., Respiratory System, Circulatory System, Digestive System) rather than etiology (e.g., malignancies, infectious diseases). This approach was used since clinical care is generally organized in accordance with the organ system affected, rather than the etiology. Diseases involving both a particular organ system and a particular etiology (e.g., malignant neoplasm of the kidney) were assigned to the MDC corresponding to the organ system involved. However, not all diseases or disorders could be assigned to an organ system-based MDC and a number of residual MDCs were created (e.g., Systemic Infectious Diseases, Myeloproliferative Diseases, and Poorly Differentiated Neoplasms). For example, the infectious diseases such as food poisoning and Shigella dysentery are assigned to the Digestive System MDC, while pulmonary tuberculosis is assigned to the Respiratory System MDC. On the other hand, infectious diseases such as miliary tuberculosis and septicemia, which usually involve the entire body, are assigned to the Systemic Infectious Disease MDC.

Once the MDCs were defined, each MDC was evaluated to identify those additional patient characteristics which would have a consistent effect on the consumption of hospital resources. Since the presence of a surgical procedure which required the use of the operating room would have a significant effect on the type of hospital resources (e.g., operating room, recovery room, anesthesia) used by a patient, most MDCs were initially divided into medical and surgical groups. The medical-surgical distinction is also useful in further defining the clinical specialty involved.

Patients were considered surgical if they had a procedure performed which would require the use of the operating room. Since the patient data generally available does not precisely indicate whether a patient was taken to the operating room, surgical patients were identified based on the procedures which were performed. Physician panels classified every possible procedure code based on whether the procedure would normally be performed in the operating room. Thus, closed heart valvotomies, cerebral meninges biopsies and total cholecystectomies would be expected to require the operating room, while thoracentesis, bronchoscopy and skin sutures would not. If a patient had any procedure performed which was expected to require the operating room, that patient would be classified as a surgical patient.

Once each MDC was divided into medical and surgical groups, the surgical patients were usually further defined based on the precise surgical procedure performed, while the medical patients were further defined based on the precise principal diagnosis for which they were admitted to the hospital. The general structure of a typical MDC is shown in the following diagram. In general, specific groups of surgical procedures were defined to distinguish surgical patients according to the extent of the surgical procedure performed. For example, the procedure groups defined for the Endocrine, Nutritional and Metabolic MDC are amputations, adrenal and pituitary procedures, procedures for obesity, parathyroid procedures, thyroid procedures, thyroglossal procedures, and other procedures relating to Endocrine, Nutritional, or Metabolic diseases.

Since a patient can have multiple procedures related to their principal diagnosis during a particular hospital stay, and a patient can be assigned to only one surgical group, the surgical groups in each MDC were defined in a hierarchical order. Patients with multiple procedures would be assigned to the surgical group highest in the hierarchy.

Thus, if a patient received both a D&C and a hysterectomy, the patient would be assigned to the hysterectomy surgical group. It should be noted that as a result of the surgical hierarchy, the ordering of the surgical procedures on the patient abstract has no influence on the assignment of the surgical group and DRG.

In general, specific groups of principal diagnoses were defined for medical patients. Usually the medical groups in each MDC would include a group for neoplasms, symptoms and specific conditions relating to the organ system involved. For example, the medical groups for the Respiratory System MDC are pulmonary embolism, infections, neoplasms, chest trauma, pleural effusion, pulmonary edema and respiratory failure, chronic obstructive pulmonary disease, simple pneumonia, RSV pneumonia and whooping cough, interstitial lung disease, pneumothorax, asthma, respiratory symptoms and other respiratory diagnoses.



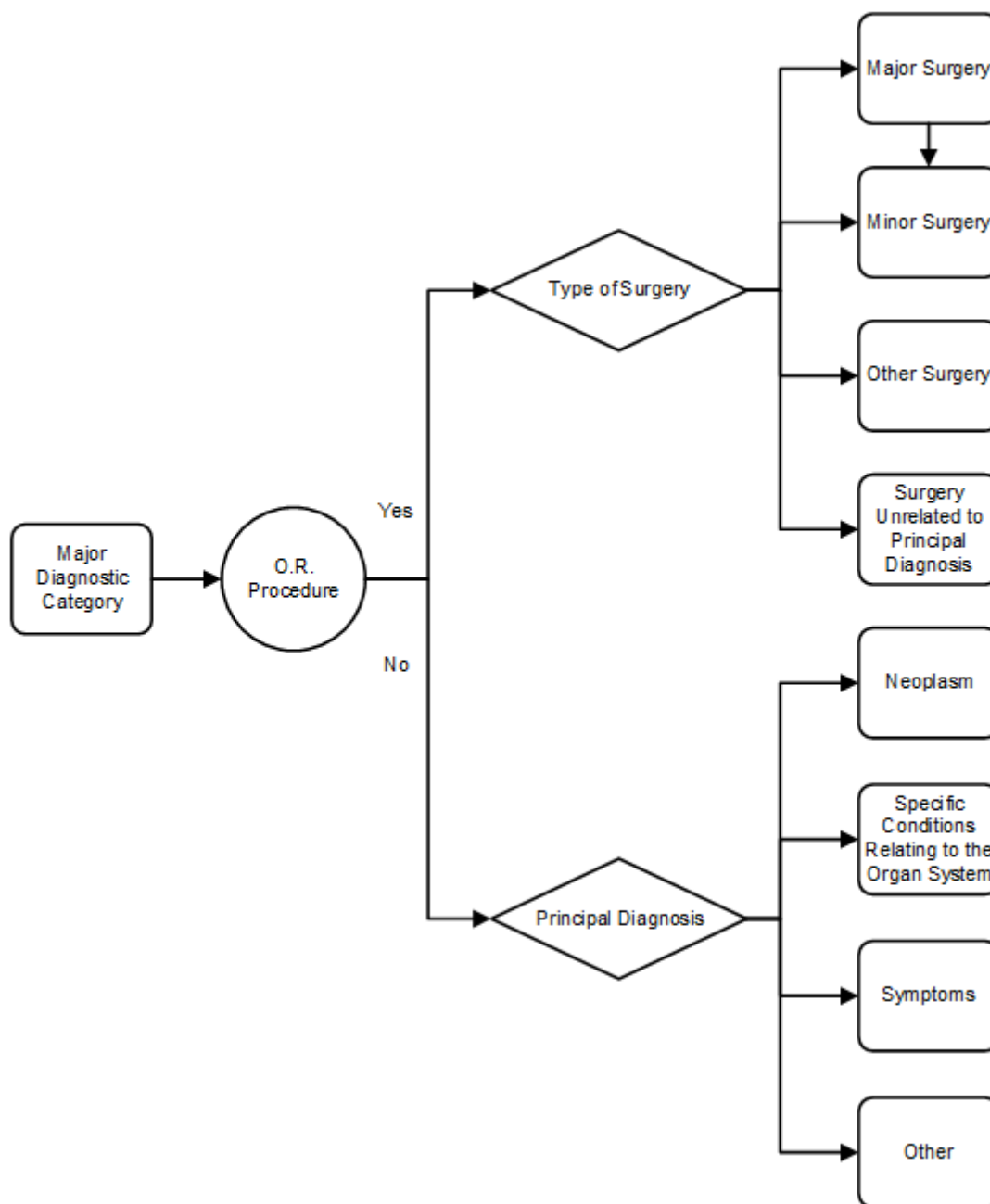


Figure 1: Typical DRG structure for a Major Diagnostic Category

In each MDC there is usually a medical and a surgical group referred to as "other medical diseases" and "other surgical procedures," respectively. The "other" medical and surgical groups are not as precisely defined from a clinical perspective. The other groups would include diagnoses or procedures which were infrequently encountered or not well-defined clinically. For example, the "other" medical group for the Respiratory System MDC would contain the diagnoses psychogenic respiratory disease and respiratory anomalies not otherwise specified,

while the "other" surgical group for the female reproductive MDC would contain surgical procedures such as liver biopsy and exploratory laparotomy.

The "other" surgical group contains surgical procedures which, while infrequent, could still reasonably be expected to be performed for a patient in the particular MDC. However, there are also patients who receive surgical procedures which are completely unrelated to the MDC to which the patient was assigned. An example would be a patient with a principal diagnosis of pneumonia whose only surgical procedure is a transurethral prostatectomy. Such patients are assigned to surgical groups referred to as "unrelated operating room procedures."

The process of defining the surgical and medical groups in an MDC required that each surgical or medical group be based on some organizing principle. Examples of organizing principles would be anatomy, surgical approach, diagnostic approach, pathology, etiology or treatment process. In order for a diagnosis or surgical procedure to be assigned to a particular group, it would be required to correspond to the particular organizing principle for that group. For example, in MDC 11 (Diseases and disorders of the kidney and urinary tract), a surgical group was formed for all patients with a procedure on the urethra (i.e., organizing principle based on anatomy).

The actual process of forming the base APR DRGs was highly iterative, involving a combination of statistical results from test data with clinical judgment. At any point during the definition of the DRGs there would often be several patient characteristics which appeared important for understanding the impact on hospital resources. The selection of the patient characteristics to be used and the order in which they would be used was a complex task with many factors examined and weighed simultaneously.

There are several base APR DRGs which contain patients whose medical record abstracts contain clinically inconsistent or invalid information. For example, there are DRGs for patients for whom all their operating room procedures performed are unrelated to the major diagnostic category of the patient's principal diagnosis. Typically, these are patients admitted for a particular diagnosis requiring no surgery, who develop a complication unrelated to the principal diagnosis and have an operating room procedure performed for the complication or have a diagnostic procedure performed for another concurrent diagnosis. The unrelated operating room procedures have been divided into three groups based on hospital resource use: extensive, prostatic and non-extensive. For example, a patient with a principal diagnosis of congestive heart failure who develops acute cholecystitis and whose only procedure is a cholecystectomy will be assigned to the extensive unrelated procedure DRG since a cholecystectomy is considered an extensive procedure. However, if a patient has a principal diagnosis of arrhythmia and has a biopsy performed for a breast mass discovered while in the hospital, the patient will be assigned to the non-extensive unrelated DRG since the biopsy is considered a non-extensive procedure. Finally, a patient with benign prostatic hypertrophy who develops prostatic obstruction while hospitalized for a medical problem such as pneumonia, will be assigned to the prostatic unrelated procedure DRG if a transurethral prostatectomy is performed.

When a valid ICD-10-CM principle diagnosis is coded, but that code is not precise enough to allow the patient to be assigned to a clinically coherent DRG, the patient is assigned to the DRG for diagnosis invalid as principal diagnosis. For example, ICD-10-CM code O09211 is supervision of a pregnancy with a history of pre-term labor, first trimester. Supervision of a patient as the reason for admission into the hospital is not valid and therefore O09211 must be assigned to the DRG for diagnosis invalid as principal diagnosis.

It should be noted that patients with a principal diagnosis not typically considered a reason for hospitalization such as Z413 (ear piercing) are not assigned to the diagnosis invalid as principal diagnosis DRG but are assigned a DRG in the MDC most related to the diagnosis.

Patients are assigned to an ungroupable DRG if certain types of medical records errors which may affect DRG assignment are present. Patients with an invalid or non-existent ICD-10-CM code as principal diagnosis will be assigned to the ungroupable DRG. Patients will also be assigned to the ungroupable DRG if their sex, or discharge status is both invalid and necessary for DRG assignment. For example, if a patient has a non-numeric discharge status and has a principal diagnosis of an acute myocardial infarction, the patient will be assigned to the ungroupable DRG since patients with acute myocardial infarction will be assigned to different DRGs depending on whether their discharge status is alive or died. On the other hand, if the same patient had a principal diagnosis of hypertension, the assignment would not be to the ungroupable DRG since discharge status is not used in the determination of the DRG for hypertensive patients.

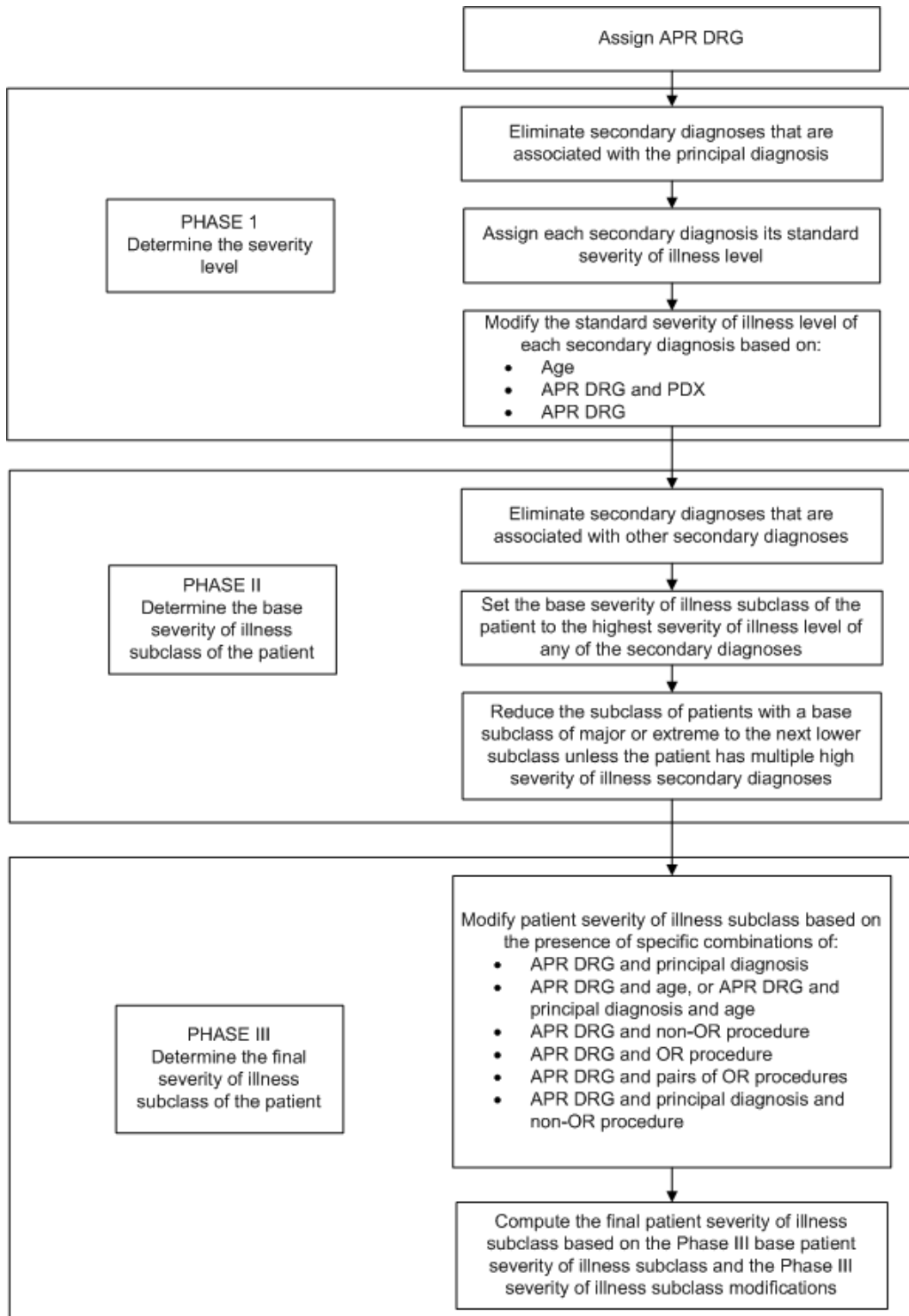
## Overview of APR DRG subclass assignment

Once the base APR DRGs are formed, 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. 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 (operating room) procedures and non-OR procedures.

The process of determining the severity of illness or risk of mortality subclass of a patient consists of three phases. In Phase I, the level of each secondary diagnosis is determined. Once the level of each individual secondary diagnosis is established, then Phase II determines a base subclass for the patient based on all of 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 procedure, non-OR procedures, multiple OR procedures, and combinations of categories of secondary diagnoses. A detailed description of the determination of the severity of illness subclass and the risk of mortality subclass will be presented separately.

The following flowchart summarizes the three-phase process of determining the severity of illness subclass. There are six steps to Phase I, three steps to Phase II, and nine steps to Phase III for a total of 18 steps.



## Phase I - Determining the severity of illness level of each secondary diagnosis

### Step 1: Eliminate secondary diagnoses associated with the principal diagnosis

If a secondary diagnosis is closely related to the principal diagnosis and does not add any distinguishing information, 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 prostate hypertrophy because the urinary retention is caused by the benign prostate hypertrophy and will usually be present for patients hospitalized for benign prostate hypertrophy. For version 20.0 APR DRGs, the secondary diagnosis and principal diagnosis exclusion list was comprehensively reviewed and extensively modified. Since that time, the list has only updated.

### Step 2: 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. 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 age of the patient, the APR DRG and principal diagnosis, the APR DRG, and the presence of certain non-operating room procedures. These potential modifiers are evaluated and applied sequentially through Phase I.

### Step 3: Modify the standard severity of illness level of a secondary diagnosis based on age

In v37.0 the age criteria for this step changed to include only ages from 0 days to 17 years. The age of the patient will modify the standard severity of illness level assignment for some secondary diagnoses. For pediatric patients there are some secondary diagnoses that are modified to a higher level throughout all childhood years. For example, Hypertensive heart disease with heart failure is modified from minor to major and really represents a different disease in children than adults. There are other secondary diagnoses that are modified only for certain childhood ages, most often early childhood. For example, many congenital anomalies and syndromes have their most difficult presentation in the neonatal time period and the first year of life, and are modified to a higher level for these ages. For example, Acute systolic (congestive) heart failure and combined immune deficiency are both modified from major to

extreme for children less than one year of age. There are also some secondary diagnoses that are modified to a lower level for pediatric patients. For example, thrush is modified from moderate to minor for children less than one year of age.

#### **Step 4: Modify the standard severity of illness level of a secondary diagnosis for APR DRG 190 and principal diagnosis**

The standard severity of illness level for some secondary diagnoses may be modified depending on the APR DRG and principal diagnosis of the patient. This logic is applied only to APR DRG 190 Acute myocardial infarction. In general, secondary diagnoses that are closely related to the principal diagnosis are excluded from the determination of the severity of illness subclass. However, for a patient admitted for an acute anterior wall myocardial infarction, an acute anterolateral myocardial infarction represents an extension of the acute anterior wall myocardial infarction. Therefore, the acute anterolateral myocardial infarction is not excluded and is assigned a severity of illness level of moderate.

#### **Step 5: Modify the standard severity of illness level of a secondary diagnosis based on the APR DRG**

The standard severity of illness level for many secondary diagnoses may be modified depending on the APR DRG to which the patient is assigned. The APR DRG specific modifications to the severity of illness level of individual secondary diagnoses reflects the disease-specific nature of the determination of severity of illness.

The following table shows some examples of APR DRG modifications. 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. Other fluid overload is an integral part of the disease and is reduced to a minor severity of illness level for the APR DRG for Congestive heart failure. 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.

<b>Secondary Diagnosis</b>	<b>Standard Severity of Illness Level</b>	<b>APR DRG</b>	<b>Modified Severity of Illness Level</b>
Chronic renal failure	Moderate	Diabetes	Major
Other fluid overload	Moderate	Congestive heart failure	Minor
Uncomplicated diabetes	Minor	Vaginal delivery	Moderate

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.

## **Step 6: 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 severity and clinical impact on patients. The presence of certain non-OR (operating room) procedures can indicate a more extensive disease process. This type of modification is applied to only nine sets of non-OR procedure codes and to only a limited number of secondary diagnoses. The most important of these are the procedure codes for mechanical ventilation. Mechanical ventilation  $\leq$ 96 hours is used to increase the standard severity level of a secondary diagnosis by an increment of one up to major; e.g., asthma with status asthmaticus would increase from level moderate to major if the patient had mechanical ventilation  $<$ 96 hours. Mechanical ventilation 96+ hours is used to increase the standard severity level of illness of a secondary diagnosis by an increment of two up to extreme; e.g., adult respiratory distress syndrome increases the standard severity of illness level from moderate to extreme and a diagnosis such as pneumonia NOS which is already a level of major increases to extreme if the patient had mechanical ventilation 96+ hours. In each of these instances, the need for mechanical ventilation is indicative of a patient with more severe pulmonary illness, especially those who require ventilation for 96+ hours.

Among the other non-OR procedures that are used as part of this step, renal dialysis is used to increase the severity level of nephritis by an increment of one up to a maximum of major; total parenteral nutrition (TPN) is used to increase regional enteritis and ulcerative colitis by an increment of one up to major; and temporary pacemaker is used to increase heart block diagnoses such as trifascicular block by an increment of one up to major. Overall, non-OR procedures as part of this step in the APR DRG severity of illness logic are used more sparingly starting with version 20.0.

## **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 age, APR DRG and principal diagnosis, APR DRG, and presence of certain non-OR procedures, the Phase II base severity of illness subclass for the patient can be determined. The process of determining the base patient severity of illness subclass of the patient 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 all of the remaining secondary diagnoses. There are three steps to Phase II.

## **Step 7: Eliminate certain secondary diagnoses from the determination of the severity of illness subclass of the patient**

Certain secondary diagnoses are eliminated from the determination of the severity subclass. Closely related secondary diagnoses are grouped together with clinically similar diagnoses. If more than one secondary diagnosis from the same secondary diagnosis 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 from contributing to the patient's base subclass determination. There are 284 secondary diagnosis groups defined for this step. For example, the secondary diagnoses of cerebral embolism with infarct and precerebral occlusion are in the same secondary diagnosis group, Cerebrovascular diagnoses. Since the cerebral embolism with infarct is an extreme severity of illness level, and the precerebral occlusion is a moderate severity of illness level, the cerebral embolism with infarct will be preserved and the severity of illness level of the precerebral occlusion will be eliminated.

A subset of the 284 secondary diagnosis groups are designated as either a specific group or a general group. In step 7a all but one of the secondary diagnoses in each group are eliminated and there will be only a single secondary diagnosis code assign to a group. Each specific group has one or more general groups associated with it. The specific group represents a more specific description of the diagnoses in an associated general group. For example, the specific group for pneumonia has general groups associated with it that specify the infectious organism (e.g., pseudomonas, gram negative, etc). All diagnoses in the general group for the related organisms are eliminated by the specific pneumonia group. The one exception is if the general group creates an explicit secondary diagnosis combination in step 17, both the specific and general group are maintained. If the severity level of the diagnosis in the general group is higher than the severity level of the diagnosis in the specific group, the diagnosis in the general group is eliminated, but the severity level of the diagnosis in the specific group is increased to be equal to the severity level of the diagnosis in the general group.

It is anticipated that whenever a diagnosis in a general group is present, there will also be a diagnosis in an associated specific group present. However, in the circumstance in which there is no corresponding specific group diagnosis and there are diagnoses in multiple general groups present that would have been eliminated had the specific group been present, a hierarchy of general groups is used to eliminate all but one of the general groups. For example, if the general groups for pseudomonas, gram negative and E. Coli infections were present, the general group hierarchy would retain only the diagnosis in the general group for pseudomonas and eliminate the diagnosis in the general groups for gram negative and E. Coli infections. If any of the severity levels of the diagnoses being eliminated is higher than the severity level of the general group that is highest in the general group hierarchy, the severity level of the diagnosis that is in the general group that is highest in the hierarchy is increased to the severity level of the eliminated diagnosis with the higher severity level.

## **Step 8: 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 had their severity levels reduced to minor, 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.

### **Step 9: 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 usually characterized by the presence of multiple high severity of illness secondary diagnoses. Patients with a base severity of illness subclass of extreme 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 subclass is reduced to major. Patients with a base severity of illness subclass of major 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 subclass 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., congestive heart failure 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, the patient severity of illness subclass may be increased or decreased based on specific values of the following patient attributes:

- Combinations of APR DRG and principal diagnosis
- Combinations of APR DRG and age, or APR DRG and principal diagnosis and age
- Combinations of APR DRG and non-OR (operating room) procedures
- Combinations of APR DRG and OR procedures
- Combinations of APR DRG and pairs of OR procedures
- Combinations of APR DRG and principal diagnoses and non-OR procedures
- Combinations of categories of secondary diagnoses

Phase III examines these eight patient attributes, seven of which are APR DRG specific, and then as its ninth step, computes the patient's final severity of illness subclass assignment.

In Phase I, 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 have an impact that is specific to the patient's APR DRG or to a specific principal diagnosis within the APR DRG. Thus, the impact of age and non-OR procedures is reassessed in Phase III 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 modifications to the base severity of illness subclass made in Phase III.

## **Step 10: Modify severity of illness subclass for the patient based on combinations of APR DRG and principal diagnosis**

This step is used extensively in Phase III to modify a patient's severity of illness subclass.

Within specific All Patient Refined Diagnosis Related Groups (APR DRGs) there are also some principal diagnoses that 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 224 Peritoneal adhesiolysis with a principal diagnosis of other peritonitis is increased by one up to a maximum subclass of moderate. Relative to the other principal diagnoses associated with the procedures in APR DRG 224 other peritonitis represents a more severely ill patient. A medical example is hemophilia factor VIII that is increased by two up to major in APR DRG 661 Coagulation and platelet disorders.

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, within APR DRG 404 Thyroid, parathyroid and thyroglossal procedures, patients with a principal diagnosis of nontoxic single thyroid nodule will have their severity of illness subclass decreased by one if their severity of illness subclass up to this point in the process were major or moderate. Relative to the other principal diagnoses associated with the procedures in APR DRG 404 (e.g., malignant neoplasm of thyroid), nontoxic single thyroid nodule represents a less severely ill patient. A medical example is first degree burns, which is decreased from moderate to minor in APR DRG 844 Partial thickness burns without skin graft as these patients are less severely ill than second degree burn patients.

## **Step 11: Modify severity of illness subclass for the patient based combinations of APR DRG and age, or APR DRG, principal diagnosis and age**

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, septic arthritis and other musculoskeletal infections with bone infection as a principal diagnosis, the severity of illness subclass is increased by one 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. Elderly patients with certain principal diagnoses have their

severity of illness subclass increased by one to a maximum subclass of moderate. For example, patients age >69 years with certain septicemia principal diagnoses in APR DRG 720 Septicemia and disseminated infections and patients age >79 years with chronic/unspecified ulcer with hemorrhage without obstruction in APR DRG 241 Peptic ulcer and gastritis have their severity of illness subclass increased by one to a maximum of moderate.

For some APR DRGs the patient's severity of illness subclass is modified for all patients in an age range, not just for those certain principal diagnoses. This modification has been applied to just elderly patients and in just two MDC 10 (Endocrine, nutritional and metabolic diseases and disorders) APR DRGs and five MDC 19 (Mental diseases and disorders) APR DRGs. For example, patients age >79 years in APR DRG 421 Malnutrition, failure to thrive and other nutritional disorders and APR DRG 422 Hypovolemia and related electrolyte disorders will have their severity of illness subclass increased by an increment of one up to a maximum subclass of moderate.

## **Step 12: Modify the severity of illness subclass for the patient based upon combinations of APR DRG and non-OR procedures**

For some APR DRGs the presence of certain non-OR (operating room) procedures represents a complicating factor. The most important of these are the codes for mechanical ventilation. For a number of neurological, respiratory, certain cardiovascular, neonatal, burn, and trauma patients, the need for mechanical ventilation indicates a more severely ill patient and the patient's severity of illness subclass is increased most often by an increment of one to a maximum subclass of major. In the same APR DRGs, mechanical ventilation 96+ hours is often used to increase the patient's severity of illness subclass by an increment of two up to a maximum subclass of extreme. The exact amount of the increment will vary according to the APR DRG category. For example, in the instance of neonates the increment varies depending upon birthweight and medical or surgical APR DRG. In the cardiovascular APR DRGs, balloon pulsation device is used to increase the severity subclass by an increment of one to a maximum of major for most surgical categories and by an increment of two to extreme for most medical APR DRGs.

## **Step 13: Modify the severity of illness subclass for the patient based on combinations of APR DRG and OR procedure**

This step is used extensively in Phase III to modify a patient's severity of illness subclass. Within specific APR DRGs, some OR (operating room) 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 one 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 patients in APR DRGs 162 and 163 (Cardiac valve procedure with or without AMI or complex PDX) with an OR procedure of open heart valvuloplasty, is less complex than patients

receiving cardiac valve replacements, and have their severity of illness subclass decreased by one for patients with a severity of illness subclass up to this point in the process that is moderate.

### **Step 14: Modify the severity of illness subclass for the patient based on combinations of APR DRG and pairs of OR procedures**

Within specific APR DRGs some pairs of OR (operating room) procedures are indicative of higher severity of illness relative to the other patients in the APR DRG. Areas where multiple procedures are a significant determinant of severity of illness include: peripheral bypass surgery plus lower limb amputation or skin graft, cranial procedures plus face bone or jaw procedures, multiple spinal fusion procedures (anterior and posterior), and multiple procedures related to trauma such as multiple limb procedures, limb procedure plus back procedure, and limb procedure plus skin or fascia graft. For example, if a patient in APR DRG 308 Hip and femur fracture repair receives both a femur procedure (upper leg) and one of a specified set of tibia/fibula procedures (lower leg) or shoulder/arm procedures, the severity of illness subclass will be increased by one up to a maximum subclass of extreme. Relative to other femur procedure patients, those who also have a procedure for trauma to other extremities have a higher severity of illness.

### **Step 15: Modify the severity of illness subclass for the patient based upon combination of APR DRG 583 and absence of certain OR procedures**

This step is no longer applicable to severity of illness as of APR DRG v35.0.

### **Step 16: Modify the severity of illness subclass for the patient based upon combinations of APR DRG, principal diagnosis and non-OR procedure**

Specific principal diagnoses within an APR DRG in combination with certain non-OR (operating room) procedures will increase the severity of illness subclass by a specified increment up to a specified maximum severity of illness subclass. This step applies to a limited number of patients, mostly cancer patients receiving chemotherapy or radiation therapy. For example, patients with a principal diagnosis of malignancy in APR DRG 343 (Musculoskeletal malignancy and pathological fracture due to musculoskeletal malignancy) are increased by one level up to a maximum subclass of major if radiation therapy or chemotherapy is performed.

### **Step 17: Establish a minimum severity of illness subclass for the patient based on the presence of specific combinations of categories of secondary diagnoses**

The presence of certain combinations of secondary diagnoses has great clinical significance. The interaction of specific combinations of secondary diagnoses makes treatment more difficult and typically indicates a more extensive disease process. Therefore, a minimum patient severity of

illness subclass greater than minor 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 interact with each other causing patient severity of illness to be increased. All of the diagnosis codes were classified into either one of the 81 core secondary diagnosis categories applicable to all patients except Major Diagnostic Category (MDC) 15 (Newborns and other neonates with conditions originating in the perinatal period) or to one of the 21 secondary diagnosis categories applicable to a subset of MDC 15. The following table shows the 81 core secondary diagnosis categories. Each of these categories represents a disease process and is further subdivided by severity of illness level. The full numbering of the categories includes the two digits shown in the table plus a third digit for the severity of illness level of the secondary diagnoses in the category. To illustrate, secondary diagnosis category 15 Cerebrovascular diagnoses includes diagnoses that span all four severity levels so the full numbering and titling is: 151 Cerebrovascular diagnoses (1), e.g., cerebral atherosclerosis; 152 Cerebrovascular diagnoses (2), e.g., occlusion and stenosis of pre-cerebral artery without cerebral infarction; 153 Cerebrovascular diagnoses (3), e.g., occlusion and stenosis of pre-cerebral artery with cerebral infarction; and 154 Cerebrovascular diagnoses (4), e.g., cerebral thrombosis with cerebral infarction. Not all secondary diagnosis categories contain four severity levels. Some describe a disease process that has only three severity levels (e.g., Ear, Nose & Throat; Eye) or only two severity levels (e.g., Asthma; Hypertension). Others describe a more singular disease process that has only one severity level (e.g., Coronary bypass graft status, Acute myocardial Infarct, Hypovolemia). Altogether, the secondary diagnosis categories together with severity level breakouts contain 229 categories.

Category number	Category description
02	Abdominal trauma
03	Abortion
04	Acute myocardial infarct
05	Alcohol and drug abuse
06	Arteries, veins and other vascular DX
07	Asthma
08	Atrial fibrillation
09	Bacterial infections
10	Benign neoplasm and CA in situ
11	Brain malignancy
12	Burn
13	CABG status
14	Congestive heart failure
15	Cerebrovascular diagnoses
16	Cardiac diagnoses

<b>Category number</b>	<b>Category description</b>
17	Cardiac and respiratory arrest
18	Chest and respiratory trauma
19	Cardiovascular device malfunction
20	Hypertension
21	Child and adult abuse
22	Chronic renal failure
23	Cirrhosis
24	Head trauma with coma
25	Chromosomal anomaly/other specified syndromes
26	Decubitus ulcer
27	Delirium tremens
28	Dental and oral diagnoses
29	Dermatologic diagnoses
30	Diabetes
31	Dialysis status
32	Dysrhythmia
33	Ear, nose and throat diagnoses
34	Electrolyte diagnoses except hypovolemia
35	Endocrine, nutritional and metabolic diagnoses
38	Eye diagnoses
39	Gastrointestinal diagnoses
40	Genitourinary diagnoses
41	Gynecological diagnoses
42	HIV
43	Head and neck trauma without coma
44	Hematological and immunological diagnoses
45	Hematological malignancy
46	Hemiplegia
47	Hemorrhoids
48	History of major organ surgery

<b>Category number</b>	<b>Category description</b>
49	History of malignancy
50	Hypotension
51	Hypovolemia
52	Incidental signs, symptoms and findings
53	Incidental diagnosis codes
54	Fx (limb), open wounds and other injuries
55	Iron deficiency anemia
56	Kaposi's sarcoma
57	Lung malignancy
58	Digestive malignancy
59	Malnutrition
60	Mental health
61	Multiple birth
62	Musculoskeletal diagnoses
63	Neonatal diagnoses
64	Neurological diagnoses
65	Obstetrics
67	Osteoarthritis
68	Ostomy status - GI and GU
69	Other complications
70	Other malignancy
72	Pleural effusion
73	Poisoning
74	TB, fungal, parasitic infections
75	Pulmonary diagnoses
76	Acute renal failure
77	Respirator dependence
78	Secondary malignancy
79	Shock
80	Sickle cell anemia

Category number	Category description
81	Spinal cord and vertebral injuries
82	Surgical and device complications
83	Thrombophlebitis
84	Transplant status
86	Urinary tract infection
87	Viral infections

The next table shows the secondary diagnosis categories for MDC 15. These are intended for use with just two groups of MDC 15 patients: APR DRG 626 Neonate birthweight 2000 – 2499g, normal newborn or neonate with other problem and APR DRG 640 Neonate birthweight >2499g, normal newborn or neonate with other problem. The secondary diagnoses on this list are nearly all diagnoses with a severity of illness level of minor, so no further differentiation based on severity level is necessary. It is their purpose to distinguish newborns with multiple minor or other problems from those who are normal newborns or have a single minor problem. This is an important distinction because there is a very large case volume of these newborn patients.

Category number	Category description
900	Craniofacial anomalies
901	Musculoskeletal anomalies
902	Maternal infections and other maternal effects except noxious substances
903	Chromosomal anomaly NOS
904	Perinatal jaundice from prematurity/other specified causes
905	Circulatory disorder diagnoses
906	Gastrointestinal disorder diagnoses
907	Newborn peripheral nerve injury
908	Fetal malnutrition
909	Newborn meconium aspiration
910	Other newborn respiratory problem/other asphyxia
911	Newborn feeding problem diagnoses
912	Hypo-hypertonia/other newborn problem diagnoses
913	Noxious influences affecting fetus through placenta/breast milk
914	Infant of diabetic mother



Category number	Category description
915	Hemolytic disease due to isoimmunization
916	Other hematologic disorders except isoimmunization
917	Dehydration
918	Hypoglycemia
919	Fever
920	Transient tachypnea

The next table shows there are nine different types of combinations of secondary diagnosis categories that will result in a minimum severity of illness subclass for a patient. For combination types 1 through 5, four significant secondary diagnoses are required in order to increase the severity of illness subclass of a patient. Two of the four secondary diagnoses must constitute one of the secondary diagnosis category combinations and must not have had their standard severity of illness level decreased as part of the Phase I severity level modifications. The addition of the third and fourth secondary diagnoses increases the likelihood that the specific combination of secondary diagnosis categories represents a more extensive and severe disease process.

Combination Type	Combination of Categories	Additional Secondary Diagnoses Required	Minimum Severity of Illness
01	Specified combinations of two major categories	At least two additional secondary diagnoses of major or higher	Extreme (4)
02	Specified combinations of a major and moderate category	At least two additional secondary diagnoses of major or higher	Extreme (4)
03	Specified combinations of two moderate categories	At least two additional secondary diagnoses of moderate or higher	Major (3)
04	Specified combinations of a moderate and minor category	At least two additional secondary diagnoses of moderate or higher	Major (3)
05	Specified combinations of two minor categories	At least two additional secondary diagnoses of minor or higher	Moderate (2)
06	Specified combinations of two moderate categories	None	Major (3)
11	Specified combinations of two major categories	At least one additional secondary diagnosis of major or higher	Extreme (4)
13	Specified combinations of two moderate categories	At least one additional secondary diagnosis of moderate or higher	Major (3)

Combination Type	Combination of Categories	Additional Secondary Diagnoses Required	Minimum Severity of Illness
15	Specified combinations of two minor categories	At least one additional secondary diagnosis of minor or higher	Moderate (2)

Combination types 11, 13, and 15 only require a total of three significant secondary diagnoses, the two that make up the secondary diagnosis category combination and one additional secondary diagnosis. This reflects that the secondary diagnosis category combination is sufficiently significant that only one additional secondary diagnosis is required. Combination types 11, 13, and 15 are new starting with APR DRG Classification System v20.0. Previous versions contained only types 1 through 6.

A type 1 combination consists of two secondary diagnosis 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 is a major bacterial infection (category 9) with a major hematological/immunological diagnosis (category 44). 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. An example of a type 2 combination is a major bacterial infection (category 9) and brain malignancy (category 11). 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 is a moderate alcohol and drug abuse diagnosis (category 5) and a moderate electrolyte disorder except hypovolemia (category 34).

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 is a moderate hematological/immunological diagnosis (category 44) and hypovolemia (category 51). 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 minimum patient severity of illness subclass is moderate. An example of a type 5 combination would be diabetes without mention of complication (category 30) and minor bacterial infection (category 9).

Combination type 6 is a special combination type for APR DRGs 626 and 640 to distinguish neonates with multiple "other problems," i.e., problems that are generally viewed as minor severity of illness but distinguish a neonate from being a normal newborn. An example is a neonate with transient tachypnea (category 920) and newborn feeding problem (category 911). These diagnoses have a minor severity of illness level, but are each increased to moderate for APR DRGs 626 and 640 per an earlier Phase I step, and together, as part of this step, result in the patient's severity subclass being increased to major for APR DRGs 626 and 640.

Combination types 11, 13, and 15 are new to version 20.0 and pertain mostly to multiple trauma patients and a handful of other patients such as transplant status patients. A type 11 combination consists of two secondary diagnosis categories that contain major severity of illness diagnoses, plus any third secondary diagnosis that is at least a major severity of illness. An example is a major severity of illness transplant status diagnosis (category 84) and a major TB, fungal or parasitic infection (category 74). A type 13 combination consists of two secondary diagnosis categories that contain moderate severity of illness level diagnoses, plus any third secondary diagnosis that is at least a moderate severity of illness level. An example is a moderate cardiothoracic trauma diagnosis (category 18) and a moderate head and neck trauma with coma diagnosis (category 24). A type 15 combination consists of two secondary diagnosis categories that contain minor severity of illness level diagnoses, plus any third secondary diagnosis that is at least a minor severity of illness level. An example is a minor severity of illness level head and neck trauma without coma diagnosis (category 43) and a minor severity of illness level pulmonary diagnosis (category 75).

## Step 18: 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. The modified severity subclasses from Phase III can be equal to, greater than or less than the Phase II base severity of illness subclass (step 9). In order to determine the final patient severity of illness subclass, the Phase III modified severity of illness subclasses are evaluated in a hierarchical order. In general, the Phase III severity subclass hierarchy is structured in the following order:

- OR (operating room) Procedures
- Non-OR procedures or combinations or secondary diagnoses
- Principal diagnosis
- Age

Most of the Phase III severity modifications are in the form of specified increment up to a specified maximum severity subclass (e.g., increase severity subclass by 1 up to a maximum severity subclass of 3) or a specified decrement from specified severity subclasses (e.g., decrease severity subclass by 1 if the Phase II base severity subclass is 3 or 4). Thus, depending on the value of the Phase II base severity subclass, some Phase III severity modifications may be tried but not actually performed (e.g., if the Phase II base severity subclass is 3, a Phase III severity modification that specifies an increase of one up to a severity subclass of 3 is tried but is not actually performed because the Phase II base severity subclass is already a 3). In specifying the Phase III severity modification hierarchy, a differentiation will be made between Phase III severity modifications that are tried but not performed versus Phase III severity modifications that are actually performed. The following table contains the Phase III severity subclass modification hierarchy. The hierarchy is applied from top to bottom. Each row specifies the results from a Phase III step or combination of Phase III steps and contains the corresponding determination of the final severity subclass. In the table, base severity subclass refers to the subclass from step 9. The maximum Phase III decrease means the maximum decrease of any Phase III step that decrease the severity subclass. The maximum Phase III increase means the maximum increase of any Phase III step that increase the severity subclass.

Phase II Severity Modification		Phase III Severity Modification		Final Severity Subclass
Step	Result	Step	Result	
13	Actual or Tried Increase			Base severity subclass plus maximum Phase III severity increase
13	Actual Decrease	12,14,16,17	Actual Increase	Base severity subclass minus maximum Phase III decrease plus one
13	Actual or Tried Decrease			Base severity subclass minus maximum Phase III decrease
10, 12, 14, 16, 17	Actual or Tried Increase			Base severity subclass plus maximum Phase III increase
10	Actual Decrease			Base severity subclass minus maximum Phase III decrease
10	Actual Decrease	11A, 11B	Actual Increase	Base severity subclass minus maximum Phase III decreases plus one
10	Tried Decrease			Base severity subclass minus maximum Phase III decrease
10	Tried Decrease	11A, 11B	Actual Increase	Base severity subclass plus one
11A, 11B	Actual Increase			Base severity subclass plus maximum of phase III increases
11A, 11B	Actual Decrease			Base severity subclass minus maximum of phase III decreases

The Phase III step highest in the hierarchy is step 13 which relates to OR procedures. If there is a step 13 actual or tried increase the final severity subclass is the base severity subclass plus the maximum Phase III severity increase. If step 13 results in an actual severity subclass decrease and any one of steps 12, 14, 16 or 17 result in severity subclass increase, the final severity subclass is the base severity subclass minus the maximum Phase III severity decrease plus one. The plus one is partial recognition that the OR procedure severity decrease in step 13 takes priority, but the severity increase from step 12, 14, 16, or 17 should contribute to the final severity subclass. However, if the step 13 decrease is tried but not actually done and there is an

actual step 12, 14, 16 or 17 increase the final severity subclass is the base severity subclass minus the maximum Phase III severity decrease and a plus one is not added to the final severity subclass. In this situation step 13 tried to lower the severity subclass further but could not and therefore recognition of the step 12, 14, 16 or 17 increase is not applied. Next in the hierarchy, if any of steps 10, 12, 14, 16 or 17 results in a tried or actual severity subclass increase the final severity subclass is the base severity subclass plus the maximum Phase III severity subclass increase. Since steps 12, 14, 16 and 17 can only increase the severity subclass, the hierarchy does not have to address a severity subclass decrease for these steps. The application of the Phase III severity subclass modification hierarchy continues as describe above until all steps have been evaluated. If no Phase III steps result in an increase or decrease in the severity subclass, the final severity subclass is the base severity subclass from step 9. The combination of the All Patient Refined Diagnosis Related Group (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**

Step 1: Eliminate secondary diagnoses that are associated with the principal diagnosis.

Step 2: Assign each secondary diagnosis its standard severity of illness level.

Step 3: Modify the standard severity of illness level of each secondary diagnosis based on the age of the patient.

Step 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 (applicable only to APR DRG 190 Acute myocardial infarction).

Step 5: Modify the standard severity of illness level of each secondary diagnosis based on the APR DRG to which the patient is assigned.

Step 6: Modify the standard severity of illness level of each secondary diagnosis based on the presence of certain non-OR (operating room) procedures.

### **Phase II: Determine the base severity of illness subclass of the patient**

Step 7: Eliminate all secondary diagnoses that are in the same secondary diagnosis group except the secondary diagnosis with the highest severity of illness level.

Step 8: Compute the base patient severity of illness subclass as the maximum of all the secondary diagnosis severity of illness levels.

Step 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**

Step 10: Modify the patient severity of illness subclass based on the APR DRG and principal diagnosis.

Step 11: Modify the patient severity of illness subclass based on the APR DRG and age of the patient.

Step 12: Modify the patient severity of illness subclass based on a combination of the APR DRG and the presence of certain non-OR procedures.

Step 13: Modify the patient severity of illness subclass based on the APR DRG and OR procedure.

Step 14: Modify the patient severity of illness subclass based on combinations of APR DRGs and pairs of OR procedures.

Step 15: This step is no longer applicable for severity of illness as of APR DRG v35.0.

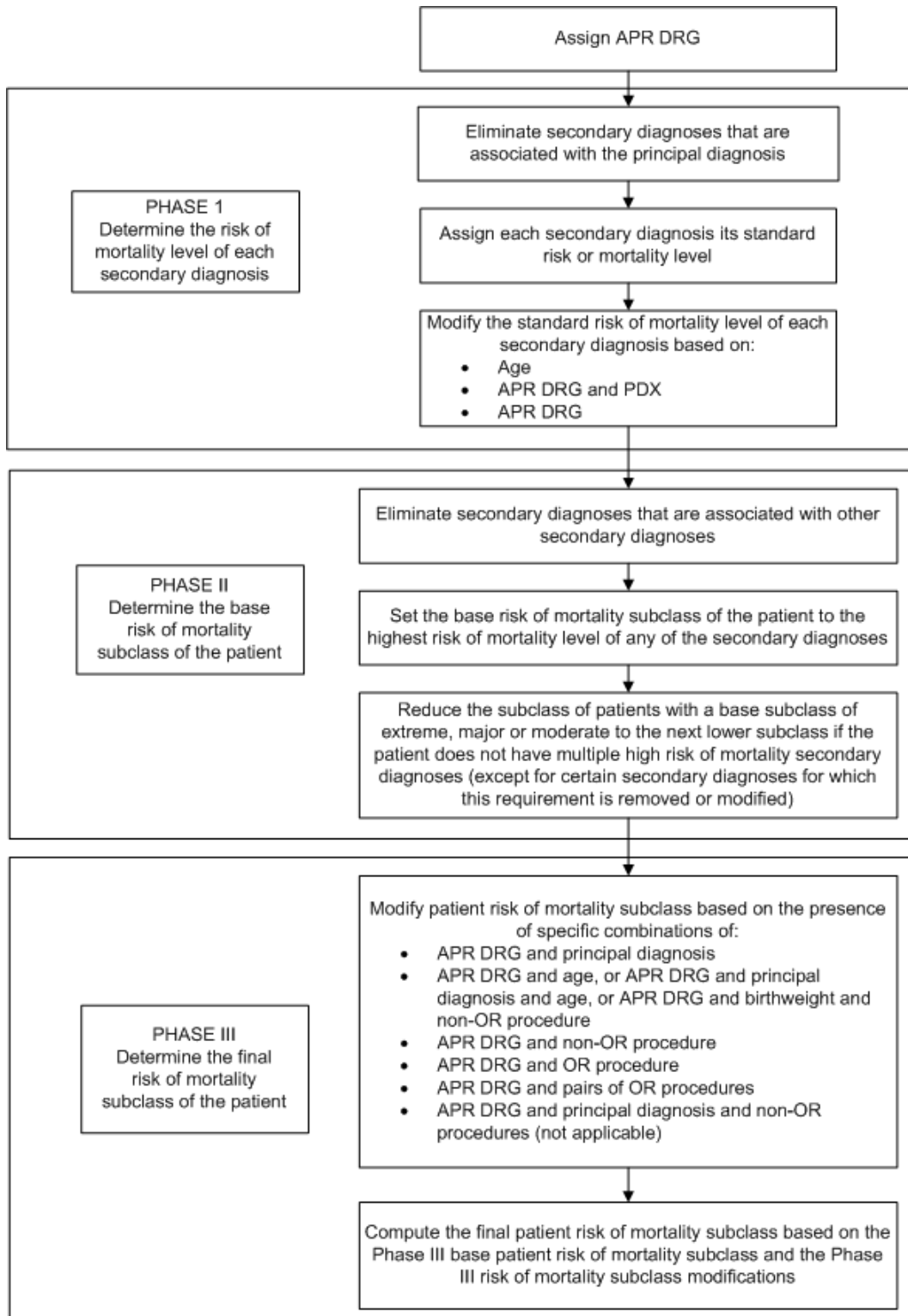
Step 16: Modify the patient severity of illness subclass based on the combination of APR DRG and principal diagnosis and the presence of certain non-OR procedures.

Step 17: Establish a minimum severity of illness subclass for the patient based on the presence of specific combinations of categories of secondary diagnoses.

Step 18: 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 10–17.

## **Determination of the risk of mortality subclass**

The following flowchart summarizes the three-phase process of determining the risk of mortality subclass. This three-phase process parallels the three phases in the determination of the severity of illness subclass. In Phase I, the risk of mortality of each secondary diagnosis is determined. Once the risk of mortality level of each individual secondary diagnosis is established, then Phase II determines a base risk of mortality subclass for the patient based on all of 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 (operating room) procedures, certain non-OR procedures, multiple OR procedures, and combinations of categories of secondary diagnoses.



## Phase I - Determining the risk of mortality level of each secondary diagnosis

### Step 1: 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. If a secondary diagnosis is closely related to the principal diagnosis and does not add any distinguishing information, then the secondary diagnosis is completely excluded from the 18-step process to determine the patient's risk of mortality subclass.

### Step 2: 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 diseases 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, acute myocardial infarct, and acute renal failure.

### Step 3: Modify the standard risk of mortality level of a secondary diagnosis based on age

In v37.0 the age criteria for this step changed to include only ages from 0 days to 17 years. The standard risk of mortality for certain secondary diagnoses may be modified depending upon the age of the patient. This age modification is applied much more extensively for risk of mortality, than for severity of illness. For pediatric patients, the standard risk of mortality level of secondary diagnoses is often decreased. For example, the risk of mortality level for diabetes with ketoacidosis is lowered from moderate to minor for pediatric patients. It is also lowered for many other secondary diagnoses including infectious illnesses and traumatic injuries. However, for some pediatric diagnoses, mostly congenital anomalies, the risk of mortality level is increased during the neonatal time period and sometimes the first year of life. For example, the risk of mortality level for hypoplastic left heart syndrome is increased from major to extreme during the neonatal period; renal dysphasia is increased from moderate to major during the neonatal period; and congenital tricuspid atresia/stenosis is increased from moderate to major during the first year of life.



## **Step 5: Modify the standard risk of mortality of a secondary diagnosis based on the APR DRG**

The standard risk of mortality level for many secondary diagnoses is modified depending upon the APR DRG to which the patient is assigned. As with severity of illness, the APR DRG specific modifications to the risk of mortality level of individual secondary diagnoses reflects the disease-specific nature of the determination of risk of mortality.

For example, the risk of mortality level for secondary diagnoses is increased from minor to moderate for the following combinations of secondary diagnoses and APR DRGs: right bundle branch block and APR DRG for acute myocardial infarct; chronic obstructive lung disease and major chest and major cardiovascular surgery; hypovolemia and APR DRGs for cancer, cardiovascular disease, and respiratory failure. The risk of mortality level for secondary diagnoses is increased from moderate to major for the following combinations of secondary diagnoses and APR DRGs: acidosis and APR DRGs for acute myocardial infarct, congestive heart failure, and septicemia; hypotension and APR DRGs for respiratory failure, acute myocardial infarct, and liver and pancreas disorders.

There are also many APR DRGs where the standard risk of mortality level for some secondary diagnoses is decreased, such as for secondary diagnoses that are closely related to the definition of the APR DRG. For example, the risk of mortality level is decreased from moderate to minor for secondary diagnosis of obstructive hydrocephalus in the APR DRG for ventricular shunt procedures, since the hydrocephalus is the underlying reason for performing the procedure. The risk of mortality level is decreased from extreme to major for secondary diagnosis of cerebral edema in a number of nervous system APR DRGs including craniotomy, cerebrovascular disease, and malignancy. If there is essentially complete overlap between the secondary diagnosis and the APR DRG, the risk of mortality level for the secondary diagnosis may be decreased from extreme or major to minor. For example, acute respiratory failure is decreased from extreme to minor for APR DRGs for respiratory system diagnosis with mechanical ventilation 96+ hours and tracheostomy with mechanical ventilation 96+ hours. There are many secondary diagnoses for which the standard risk of mortality level is lowered to minor for a patient in one of eleven elective, non-extensive surgical APR DRGs. For example, in these APR DRGs, secondary diagnoses of malignant neoplasm are reduced from major or moderate to minor, since the patient would likely not have these surgical procedures performed if the malignancy was at a stage that represented a significant risk of mortality.

## **Step 6: Modify the standard risk of mortality level of a secondary diagnosis based on non-OR procedure**

Certain non-OR (operating room) procedures will sometimes be used to modify the standard risk of mortality level of some secondary diagnoses. For risk of mortality, this step is just used with one non-OR procedure, pulsation balloon implant. For example, subendocardial infarction has a standard risk of mortality level of moderate but is increased by an increment of two up to extreme if the patient had a pulsation balloon implanted. The need for the pulsation balloon is an indicator of the extent 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 patient's age, All Patient Refined Diagnosis Related Group (APR DRG) and principal diagnosis, APR DRG, and certain non-OR (operating room) procedure, the Phase II 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 all of the remaining secondary diagnoses. There are three steps to Phase II for risk of mortality. The first two are the same as for severity of illness. The third step is similar to severity of illness but has some additional exceptions logic.

### **Step 7: 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. Secondary diagnoses that are related to other secondary diagnoses have their risk of mortality level reduced to minor.

### **Step 8: 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 their risk of mortality level reduced to minor, the base patient risk of mortality subclass is set equal to the maximum risk of mortality level across all of the remaining secondary diagnoses. This is done the same way as for severity of illness. 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.

### **Step 9: Reduce the base risk of mortality subclass if the patient does not have multiple secondary diagnoses with a significant risk of mortality, except for certain secondary diagnoses for which this requirement is removed or modified**

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. If this multiple criteria is not met, the patient's base risk of mortality subclass is

lowered to either major or moderate. If the multiple criteria is not met, but in addition to a single extreme risk of mortality secondary diagnosis there is at least one other major or moderate secondary diagnosis, then the patient's risk of mortality subclass is lowered to major. If there is not at least one other major or moderate secondary diagnosis in addition to an extreme risk of mortality secondary diagnosis, then the patient's base risk of mortality subclass is lowered to moderate. There are, however, two exceptions to these criteria. There is one set of secondary diagnoses that have such an inherent high risk of mortality that no other secondary diagnoses are required for the patient's base risk of mortality subclass to be extreme. Examples include: pulmonary anthrax, ruptured aortic aneurism, hepatorenal syndrome, head trauma with deep coma, and 60-90% body burn/50-59% third degree. There is a second set of secondary diagnoses that also have an inherently high risk of mortality and for which only one other major secondary diagnosis is required for the patient's base risk of mortality to be extreme. Examples included: defibrination syndrome, acute myocardial infarct, intracranial hemorrhage, cerebral thrombosis with infarct, dissection of aortic aneurism, acute respiratory failure, acute renal failure, and shock.

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 is at least one additional major risk of mortality secondary diagnosis or two more additional secondary diagnoses with a moderate risk of mortality. If this multiple criteria is not met then the patient's base risk of mortality subclass is lowered to moderate. There are, however, two exceptions to these criteria. There is one set of secondary diagnoses that have a sufficiently high inherent risk of mortality that no other secondary diagnoses are required for the patient's base risk of mortality subclass to be set at major. Examples include: flail chest, major liver laceration, 40-49% body burns/10-19% third degree. There is a second set of secondary diagnoses that have a significant inherent risk of mortality so that only one moderate secondary diagnoses is required for the patient's base risk of mortality subclass to be set at major. Examples include: food/vomit pneumonia, acute lung edema, and perforation of intestine.

Patients with a base risk of mortality subclass of moderate are reduced to minor unless there are at least two moderate risk of mortality secondary diagnoses present. There is, however, one exception to this criteria. These moderate risk of mortality secondary diagnoses do not require any other secondary diagnoses to be present. Examples include: malignant neoplasm diagnoses that are moderate risk of mortality level diagnoses, acidosis, bacterial pneumonia, congestive heart failure, chronic renal failure, Alzheimer's disease, and decubitus ulcer.

## 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 in Phase III based on specific values of certain patient attributes. In Phase III, the risk of mortality algorithm examines six of the eight patient attributes utilized in Phase III of the severity of illness logic. The two that are not used by risk of mortality are only used to a very limited extent in the severity of illness logic. The patient attributes are:

- Combinations of APR DRG and principal diagnosis

- Combinations of APR DRG and age, or APR DRG and principal diagnosis and age, or APR DRG and birthweight and absence of certain non-OR (operating room) procedures
- Combinations of APR DRG and non-OR procedures
- Combinations of APR DRG and OR procedures
- Combinations of APR DRG and pairs of OR procedures
- Combinations of APR DRG and principal diagnoses and non-OR procedures (not applicable for risk of mortality)
- Combinations of categories of secondary diagnoses

In Phase I, 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 have an impact that is specific to the patient's APR DRG or a specific principal diagnosis within an APR DRG. 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 are 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 modifications to the base risk of mortality subclass made in Phase III.

## **Step 10: Modify the risk of mortality subclass for the patient based on the APR DRG and principal diagnosis**

Within specific APR DRGs some principal diagnoses are indicative of higher or lower risk of mortality relative to the other principal diagnoses in the APR DRGs. This is one of the most important and extensively used modifications to the patient's base risk of mortality subclass that occurs as part of the Phase III risk of mortality logic. The majority of the modifications are increases to the patient risk of mortality subclass, but there are also some decreases to the patient risk of mortality subclass. Some of the increases are an increment of one up to a maximum subclass of moderate, while others pertain to more dramatic clinical situations and provide greater increases to the patient risk of mortality subclass. Most of the decreases reduce the patient risk of mortality subclass by one from major or moderate. Following are examples:

- APR DRG 309 Other significant hip and femur surgery and principal diagnosis of secondary malignancy of bone: increase patient risk of mortality subclass by one up to a maximum of moderate.
- APR DRG 135 Major chest and respiratory trauma and principal diagnosis of flail chest: increase patient risk of mortality subclass by one up to a maximum of major.
- APR DRG 169 Major abdominal vascular procedures and principal diagnosis of ruptured abdominal aortic aneurism: increase patient risk of mortality subclass by three up to extreme.
- APR DRG 44 Intracranial hemorrhage and principal diagnosis of subdural hemorrhage: decrease patient risk of mortality subclass by one from moderate.

- APR DRG 52 Alteration in consciousness and principal diagnosis of transient alteration of awareness: decrease patient risk of mortality subclass by one from extreme, major, or moderate.

## **Step 11: Modify the risk of mortality subclass for the patient based on combinations of the APR DRG and principal diagnosis and age, or APR DRG and age, or APR DRG and birthweight and presence/absence of certain non-OR procedures**

For some principal diagnoses in specific APR DRGs, the patient's age essentially represents a complicating factor. For specific principal diagnosis 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, elderly patients age >79 years in APR DRG 137 Major respiratory infections and inflammations with a principal diagnosis of staphylococcal pneumonia and elderly patients age >79 years in APR DRG 710 Infections and parasitic diseases including HIV with OR procedure with most of the septicemia principal diagnoses, have their risk of mortality subclass increased by one up to a maximum subclass of moderate. Elderly patients age >69 years in APR DRG 44 Intracranial hemorrhage with a principal diagnosis of intracerebral hemorrhage have their risk of mortality subclass increased by one up to a maximum subclass of moderate. The increase indicates that intracranial hemorrhage in an elderly patient represents a higher risk of mortality.

This step is also sometimes implemented for all patients in a specified age range in an APR DRG rather than just for patients with a particular principal diagnosis. This approach is used for elderly patients age >84 years for 19 APR DRGs involving major surgery. For example, patients age >84 years in APR DRG 120 Major chest and respiratory procedures have their risk of mortality subclass increased by one to a maximum subclass of moderate.

The last part of this step examines the relationship between APR DRG and birthweight and presence/absence of certain non-OR procedures for extremely low birthweight neonates in MDC 15. Many of the neonates at an extremely low birthweight (<750 grams or 1.6 pounds) are non-viable and receive comfort-only care. Nearly all of these newborns die and most of the time this is within a few days of being born. There are no ICD-10-CM diagnosis codes for non-viability due to extreme prematurity, which, if such codes existed, would allow a risk of mortality subclass of extreme to be assigned. In its place, the APR DRG Classification System has developed logic to identify these cases. Since newborns <750 grams will virtually always receive some therapeutic interventions if the goal is to maintain life (e.g., respiratory therapy, tube feedings), the absence of any of these non-OR procedures can be used to infer the newborn is receiving comfort-only measures and their risk of mortality subclass is increased to extreme for APR DRGs 589 and 591. Without this logic, most of these newborns would be a risk of mortality subclass minor or moderate because of the lack of codes for identifying non-viability.

## **Step 12: Modify the risk of mortality subclass for the patient based on combinations of APR DRG and non-OR procedure**

For some APR DRGs the presence of certain non-OR (operating room) procedures is indicative of a more extensive disease process with a higher risk of mortality. In these instances, the risk of mortality subclass is increased by a specific increment up to a specified maximum. There are three non-OR procedures used for this step: mechanical ventilation 96+ hours, mechanical ventilation =<96 hours, and balloon pulsation device. For example, for patients in APR DRG 194 Heart failure the risk of mortality subclass is increased by two up to a maximum subclass of extreme if mechanical ventilation 96+ hours is performed and is increased by one up to a maximum subclass of major if mechanical ventilation =<96 hours is performed.

## **Step 13: Modify the risk of mortality subclass for the patient based on combinations of APR DRG and OR procedure**

Within specific APR DRGs, some OR (operating room) 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 two 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.

Within specific APR DRGs, there are also some OR procedures that are indicative of lower risk of mortality relative to other patients in the same APR DRG. For example, a patient in APR DRG 220 Major stomach esophageal and duodenal procedures who receives a procedure to create esophogastric sphincteric competence has a lower risk of mortality than other surgical patients in APR DRG 220 (e.g., esophagectomy, gastrectomy), and if up to this point in the process their risk of mortality subclass is moderate, it is decreased by 1 to minor.

## **Step 14: Modify the risk of mortality subclass for the patient based on combinations of APR DRG and pairs of OR procedures**

Within specific APR DRGs the presence of certain pairs of OR (operating room) procedures is indicative of a more extensive disease process and a higher risk of mortality relative to other patients in the same APR DRG. For risk of mortality, this logic is applicable primarily for patients who receive both a peripheral bypass procedure and a lower limb amputation. For example, a patient in APR DRG 305 Amputation of lower limb except toes who receives both a peripheral bypass procedure and a lower leg amputation has their risk of mortality subclass increased by an increment of one up to a maximum subclass of major.

### **Step 15: Modify the risk of mortality subclass for the patient based upon combination of the APR DRG for ECMO and presence/absence of certain OR procedures**

This step is not applicable to risk of mortality.

### **Step 16: Modify the patient risk of mortality subclass based on the APR DRG and principal diagnosis and certain non-OR procedures**

This step is not applicable to risk of mortality.

### **Step 17: Establish a minimum risk of mortality subclass for the patient based on combinations of categories of secondary diagnoses**

The presence of certain combinations of secondary diagnoses has great clinical significance. The interaction of specific combinations of secondary diagnoses increases the risk of mortality. Therefore, a minimum patient risk of mortality subclass greater than subclass minor 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.

The categories of secondary diagnoses used for this step in risk of mortality are the same 81 core secondary diagnosis categories that are used for severity of illness (page [28](#)). The only difference is that these 81 secondary diagnosis categories are then subdivided by risk of mortality level, not severity of illness level. The additional 21 secondary diagnosis categories developed for use with neonatal APR DRGs 626 and 640 are not used for risk of mortality. These additional 21 secondary diagnosis categories are intended to differentiate neonates with multiple minor or other problems from those who are normal newborns or who have a single minor problem, which is significant for severity of illness but is not applicable for risk of mortality since these diagnoses do not increase the risk of dying.

The next table shows there are six different types of combinations of secondary diagnosis categories that will result in a minimum risk of mortality subclass for a patient. For combination types 1 through 5, four significant secondary diagnoses are required in order to increase the risk of mortality subclass of a patient. Two of the four secondary diagnoses must constitute one of the secondary diagnosis category combinations and must not have had their standard risk of mortality level decreased as part of the Phase I risk level modifications. The addition of the third and fourth secondary diagnoses increases the likelihood that the specific combination of secondary diagnosis categories represents a more extensive and severe disease process.

Combination Type	Combination of Categories	Additional Secondary Diagnoses Required	Minimum Risk of Mortality
01	Specified combinations of two major categories	At least two additional secondary diagnoses of major or higher	Extreme (4)
02	Specified combinations of a major and moderate category	At least two additional secondary diagnoses of major or higher	Extreme (4)
03	Specified combinations of two moderate categories	At least two additional secondary diagnoses of moderate or higher	Major (3)
04	Specified combinations of a moderate and minor category	At least two additional secondary diagnoses of moderate or higher	Major (3)
05	Specified combinations of two minor categories	At least two additional secondary diagnoses of minor or higher	Moderate (2)
13	Specified combinations of two moderate categories	At least one additional secondary diagnosis of moderate or higher	Major (3)

A type 1 combination consists of two categories that contain major risk of mortality 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 75) such as acute pulmonary edema and a major neurological diagnosis (category 64) such as cerebral thrombosis without infarct combined with any other two major secondary diagnoses. A type 2 combination is the same as type 1 except that the two categories consist of a major risk of mortality category and a moderate risk of mortality category. For a type 2 combination, the minimum patient risk of mortality subclass is extreme. An example of a type 2 combination is a major bacterial infection (category 9) such as peritonitis and a moderate level secondary malignancy (category 78) 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. For a type 3 combination, the minimum patient risk of mortality is major. An example of a type 3 combination is a moderate bacterial infection (category 9) such as staphylococcal enteritis with chronic renal failure (category 20) combined with any other two moderate secondary diagnoses. A type 4 combination consists of a moderate risk of mortality category and a minor risk of mortality category, plus any two additional secondary diagnoses that are at least moderate. For a type 4 combination, the minimum patient risk of mortality subclass is major. An example of a type 4 combination is a decubitus ulcer (category 26) and hypovolemia (category 51) combined with two other secondary diagnoses that are at least moderate.

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. For a type 5 combination, the minimum patient risk of mortality is moderate. An example of a type 5 combination is atrial fibrillation (category 8) and hypovolemia (category 51) combined with any other two minor secondary diagnoses.

A type 13 combination consists of two secondary diagnosis categories that contain moderate risk of mortality diagnoses, plus any third secondary diagnosis that is at least a moderate risk of mortality diagnosis. For a type 13 combination, the minimum patient risk of mortality subclass is major. An example of a type 13 combination is cirrhosis (category 23) and hypotension (category 50) combined with any other moderate secondary diagnosis.

## Step 18: Compute the final risk of mortality subclass

The final patient risk of mortality (ROM) subclass is computed based on the Phase II base patient ROM subclass and the Phase III modified patient risk of mortality subclasses. The modified ROM subclasses from Phase III can be equal to, greater than or less than the Phase II base ROM subclass (step 9). In order to determine the final patient ROM subclass, the Phase III modified ROM subclasses are evaluated in a hierarchical order. In general, the Phase III ROM subclass hierarchy is structured in the following order:

- OR (operating room) Procedures
- Non-OR procedures or combinations or secondary diagnoses
- Principal diagnosis
- Age

Most of the Phase III ROM modifications are in the form of specified increment up to a specified maximum ROM subclass (e.g., increase ROM subclass by 1 up to a maximum ROM subclass of 3) or a specified decrement from specified ROM subclasses (e.g., decrease ROM subclass by 1 if the Phase II base ROM subclass is 3 or 4). Thus, depending on the value of the Phase II base ROM subclass, some Phase III ROM modifications may be tried but not actually performed (e.g., if the Phase II base ROM subclass is 3, a Phase III ROM modification that specifies an increase of one up to a ROM subclass of 3 is tried but is not actually performed because the Phase II base ROM subclass is already a 3). In specifying the Phase III ROM modification hierarchy, a differentiation will be made between Phase III ROM modifications that are tried but not performed versus Phase III ROM modifications that are actually performed. The following table contains the Phase III ROM subclass modification hierarchy. The hierarchy is applied from top to bottom. Each row specifies the results from a Phase III step or combination of Phase III steps and contains the corresponding determination of the final ROM subclass. In the table, base ROM subclass refers to the subclass from step 9. The maximum Phase III decrease means the maximum decrease of any Phase III step that decrease the ROM subclass. The maximum Phase III increase means the maximum increase of any Phase III step that increase the ROM subclass.

Phase III ROM Modification		Phase III ROM Modification		Final ROM Subclass
Step	Result	Step	Result	
13	Actual or Tried Increase			Base ROM subclass plus maximum Phase III ROM increase
13	Actual Decrease	12,14,17	Actual Increase	Base ROM subclass minus maximum Phase III decrease plus one
13	Actual or Tried Decrease			Base ROM subclass minus maximum Phase III decrease
10, 12, 14, 16, 17	Actual or Tried Increase			Base ROM subclass plus maximum Phase III increase
10	Actual Decrease			Base ROM subclass minus maximum Phase III decrease
10	Actual Decrease	11A, 11B	Actual Increase	Base ROM subclass minus maximum Phase III decrease plus one
10	Tried Decrease			Base ROM subclass minus maximum Phase III decrease
10	Tried Decrease	11A, 11B	Actual Increase	Base ROM plus one
11A, 11B	Actual Increase			Base ROM subclass plus maximum of phase III increase
11A, 11B	Actual Decrease			Base ROM subclass minus maximum of phase III decrease

The Phase III step highest in the hierarchy is step 13 which relates to OR procedures. If there is a step 13 actual or tried increase the final ROM subclass is the base ROM subclass plus the maximum Phase III ROM increases. If step 13 results in an actual ROM subclass decrease and any one of steps 12, 14, or 17 result in ROM subclass increase, the final ROM subclass is the base ROM subclass minus the maximum Phase III ROM decrease plus one. The plus one is partial recognition that the OR procedure ROM decrease in step 13 takes priority, but the ROM increase from step 12, 14, or 17 should contribute to the final ROM subclass. However, if the step 13 decrease is tried but not actually done and there is an actual step 12, 14, or 17 increase the final ROM subclass is the base ROM subclass minus the maximum Phase III ROM decrease and a plus

one is not added to the final ROM subclass. In this situation step 13 tried to lower the ROM subclass further but could not and therefore recognition of the step 12, 14, or 17 increase is not applied. Next in the hierarchy, if any of steps 10, 12, 14, or 17 results in a tried or actual ROM subclass increase the final ROM subclass is the base ROM subclass plus the maximum Phase III ROM subclass increase. Since steps 12, 14, and 17 can only increase the ROM subclass, the hierarchy does not have to address a ROM subclass decrease for these steps. The application of the Phase III ROM subclass modification hierarchy continues as describe above until all steps have been evaluated. If no Phase III steps result in an increase or decrease in the ROM subclass, the final ROM subclass is the base ROM subclass from step 9. 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**

Step 1: Eliminate all secondary diagnoses that are associated with the principal diagnosis of the patient.

Step 2: Assign each secondary diagnosis its standard risk of mortality.

Step 3: Modify the standard risk of mortality level of each secondary diagnosis based on the age of the patient.

Step 4: Modify the standard risk of mortality level of each secondary diagnosis based on the APR DRG and principal diagnosis (applicable only to APR DRG 190 Acute myocardial infarction).

Step 5: Modify the standard risk of mortality level of each secondary diagnosis based on the APR DRG to which the patient is assigned.

Step 6: Modify the standard risk of mortality level of each secondary diagnosis based on the presence of certain non-OR (operating room) procedures.

### **Phase II: Determine the base risk of mortality subclass of the patient**

Step 7: Eliminate all secondary diagnoses that are in the same secondary diagnosis group except the secondary diagnosis with the highest risk of mortality level.

Step 8: Compute the base patient risk of mortality subclass as the maximum of all the secondary diagnosis risk of mortality levels.

Step 9: Reduce the base patient risk of mortality subclass if the patient does not have multiple secondary diagnoses at a significant risk of mortality, except for certain secondary diagnoses for which this requirement is removed or modified.

### **Phase III: Determine the final risk of mortality subclass of the patient**

Step 10: Modify the patient risk of mortality subclass based on the APR DRG and principal diagnosis.

Step 11: Modify the patient risk of mortality subclass based on the APR DRG and age, or APR DRG and principal diagnosis and age, or APR DRG and birthweight and absence of certain non-OR procedures.

Step 12: Modify the patient risk of mortality subclass based on a combination of the APR DRG and certain non-OR procedures.

Step 13: Modify the patient risk of mortality subclass based on the APR DRG and OR procedure.

Step 14: Modify the patient risk of mortality subclass based on the APR DRG and certain pairs of OR procedures.

Step 15: This step is not applicable for risk of mortality.

Step 16: Modify the patient risk of mortality subclass based upon the APR DRG and principal diagnosis and certain non-OR procedures (this step applicable only to severity of illness, not to risk of mortality).

Step 17: Establish a minimum risk of mortality subclass for the patient based on the presence of specific combinations of categories of secondary diagnoses.

Step 18: Compute the final patient risk of mortality subclass based on the Phase II base patient risk of mortality subclass from Step 9 and the modifications of the patient risk of mortality subclass from Steps 10–17.

## **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-10 coding scheme changes or as medical technology or practice changes, the APR DRG definitions will continue to be updated to reflect these changes.

# Chapter 3: Determination of Admission All Patient Refined Diagnosis Related Groups (APR DRGs)

Hospitals report discharge diagnoses on the Medicare claim form that include diagnoses that were present on admission as well as diagnoses that develop post admission. As a result, the base APR DRG, severity of illness subclass and risk of mortality subclass represent the patient's condition at the time of discharge and include the impact of conditions that developed during the hospital stay. The Deficit Reduction Omnibus Reconciliation Act of 2005 requires that hospital report a "present on admission" (POA) indicator for each diagnosis that specifies whether the diagnosis was present at the time of admission on all Medicare claims beginning in FY 2008. The states of New York and California have required a POA indicator be reported for all hospital discharges since the mid 1990's and numerous other states have begun mandating the reporting of the POA indicator for all hospital discharges. With the availability of the POA indicator an admission base APR DRG, severity of illness subclass and risk of mortality subclass can be assigned in addition to the discharge base APR DRG, severity of illness subclass and risk of mortality subclass. For some applications such as comparing inpatient complication rates, the use of the admission APR DRG is preferable to discharge APR DRG.

The assignment of the discharge APR DRG uses the diagnosis, procedures, age, sex and discharge status fields on the standard claim form. In addition to these variables, the assignment of the admission APR DRG requires the POA indicator for each diagnosis and the date each procedure is performed (or instead of the date the number of days after admissions that the procedure is performed).

The assignment of the admission base APR DRG, severity of illness subclass and risk of mortality subclass is accomplished through a seven-step process that essentially eliminates certain diagnoses and procedures from consideration in the assignment of the APR DRG. The logic for assigning the base APR DRG, severity of illness subclass and risk of mortality subclass is identical for both the discharge and admission APR DRG. The one difference is that a reduced set of diagnoses and procedures are used to assign the admission APR DRG. The seven steps in admission APR DRG assignment essentially represent a preprocessing that limits the diagnoses and procedures passed to the standard APR DRG assignment logic. We have taken a strict approach to the determination of the secondary diagnoses that are passed to the admission APR DRG. Certain procedures are included in the admission APR DRG assignment only if they occur within a specified number of days after admission. We have taken a conservative approach to the determination of the procedures that are passed to the admission APR DRG. Unless the date of the procedure explicitly specifies that it did not occur within the specified number of days after admission, it will be included in the admission APR DRG.

The following seven steps determine the subset of diagnoses and procedures that will be used to assign the admission APR DRG.

## 1. Identify diagnoses present on admission

Using the POA (present on admission) indicator secondary diagnoses present on admission are identified. All secondary diagnoses present on admission are included in the assignment of the admission APR DRG.

## 2. Identify diagnoses always considered present on admission

Chronic disease (e.g., multiple sclerosis), malignancies and infections with long incubation periods (e.g., Lyme disease) are always considered present on admission. If the POA (present on admission) indicator identifies such secondary diagnoses as not present on admission, the POA indicator is presumed to be reported in error and such secondary diagnoses are included in the assignment of the admission APR DRG.

## 3. Substitute underlying chronic disease for acute exacerbation of a chronic disease not present on admission

Coding rules for reporting the POA (present on admission) status of an acute exacerbation of a chronic disease (e.g., diabetic ketoacidosis) specify that the POA status is determined relative to the acute exacerbation (e.g., whether the ketoacidosis was present on admission) and not the underlying chronic disease. In ICD-10-CM the acute exacerbation and the underlying chronic disease are sometimes included in a single code. When a single ICD-10-CM code representing an acute exacerbation of an underlying chronic disease is reported as not POA, an ICD-10-CM code representing the chronic disease without an acute exacerbation (e.g., diabetes) is substituted for the acute exacerbation code. The substituted chronic disease code is included in the assignment of the admission APR DRG. The substitution of the chronic disease code allows the chronic disease to be taken into account in the assignment of the APR DRG while excluding the post admission acute exacerbation from the APR DRG assignment.

## 4. Include complication of care codes\* when present on admission

In the discharge APR DRG assignment ICD-10-CM codes for complications of care (e.g., instrument left in after a procedure) were assigned a default severity of illness and risk of mortality level of 1. With the incorporation of the POA (present on admission) indicator in version 26.1 of the APR DRG Classification System, a subset of the complication of care codes were assigned a default severity of illness and risk of mortality level greater than 1 (e.g., Foreign

body left during procedure). If the complication of care code is present on admission, it is included in both the discharge and admission APR DRG assignment. If the complication of care code is not present on admission it is excluded from both the discharge and admission APR DRG assignment.

\* There are codes associated with extremely high mortality rates that will be treated within the logic in the same way as complication of care codes. Meaning, they are only included when calculating admission and discharge DRGs, and they are flagged as present on admission.

## 5. Use procedures to identify diagnoses present on admission

The occurrence of certain non OR (operating room) procedures early in a patient's stay indicate that the diagnosis associated with the non OR procedure must have been present on admission or an extension of the patient's condition at the time of admission. For example, if acute renal failure is specified as not present on admission but dialysis was initiated within the first four days of stay, the acute renal failure is presumed to have been present on admission and is included in the assignment of the admission APR DRG.

## 6. Use length of stay to identify diagnoses present on admission

Certain diagnoses require an extended period of time to develop. For example, a patient must be hospitalized an extended period of time for a post admission decubitus ulcer to develop. For short length of stay patients diagnoses with long development periods will be considered present on admission. For example, for patients with a length of stay of four days or less, a decubitus ulcer specified as not present on admission is presumed to be in error and the decubitus ulcer is included in the assignment of the admission APR DRG.

## 7. Exclude certain OR and non OR procedures from the admission APR DRG assignment unless performed early in the stay

In general, OR (operating room) and non OR are included in the assignment of the APR DRG. However, some OR and non OR procedures will not be included in the assignment of the APR DRG unless they are performed early in the hospital stay. In several of the steps in the APR DRG assignment logic, the performance of certain non OR procedures (e.g., mechanical ventilation) is used to increase the patients severity of illness or risk of mortality subclass. For assignment of the admission APR DRG these non OR procedures are only used if they are performed early in the patient's stay. For example, mechanical ventilation is only used in the assignment of the

admission APR DRG if it is performed during the first two days of stay. Similarly, the OR procedures for repair of an obstetrical laceration are only used to assign the APR DRG if they are performed in the first two days of the hospital stay.



# Chapter 4: Background and Explanation of Approach for Rerouting Logic in All Patient Refined Diagnosis Related Groups (APR DRGs)

The basic organizing approach to classification in the 3M™ All Patient Refined Diagnosis Related Groups (APR DRG) Classification System is to first assign a patient to a Major Diagnostic Group (MDC), based upon principal diagnosis, and then to a specific APR DRG category based upon principal diagnosis (if medical) or operating room procedure (if surgical). This works well in the vast majority of cases to categorize the patient into an MDC and APR DRG that most aptly describes the reason for the hospitalization.

There are several different kinds of situations, however, where the principal diagnosis (PDX) based approach, as the starting point for establishing the MDC and APR DRG, needs to be supplemented by additional information and logic to yield the most useful classification. One situation is where there is an overwhelming consideration that should take priority. This is handled by a Pre-MDC Assignment Logic. The Pre-MDC Assignment Logic handles assignment to the major organ transplant APR DRGs, the neonatal MDC (based on age), the two tracheostomy APR DRGs, the Multiple Significant Trauma MDC, and the HIV MDC.

The other situation where the PDX-based starting point for APR DRG classification needs to be supplemented by additional information and logic, is where the PDX is overly broad or the sequencing of PDX and secondary diagnosis (SDX) is unclear, or in some instances the OR (operating room) procedure is unclear. These are handled through what is referred to as APR DRG "rerouting logic." This is the logic that considers secondary diagnoses, procedures and sometimes age, most often in conjunction with the PDX, to clarify the reason for the hospitalization. The rerouting logic either reassigns the patient to a new APR DRG within the same MDC (Within MDC Rerouting) or to a new MDC and APR DRG (Across MDC Rerouting).

These situations are not unique to the APR DRG Classification System. They represent ambiguities that confront any DRG classification system. What is unique to the APR DRG Classification System is the rerouting logic developed to assign these patients to the most appropriate and useful category.

Following is a description of the need for APR DRG rerouting logic, an explanation of the methodology for the APR DRG reroutings, and a set of detailed examples of Within MDC Reroutings and Across MDC Reroutings. Also included is a table summarizing all of the APR DRG reroutings.

## Methodology for APR DRG Rerouting Logic

As identified earlier, the assignment of patients to a Major Diagnostic Category (MDC) is usually very straightforward based upon the principal diagnosis (PDX). Likewise, the assignment to an APR DRG is usually straightforward based upon the PDX for medical patients and OR (operating room) procedure for surgical patients. Occasionally, the surgical APR DRGs split into separate categories based upon PDX or non-OR procedure.

There are situations however, where it is necessary to consider several different factors together to assign the patient to the most appropriate and useful MDC and APR DRG. There are five different factors considered for this: PDX, secondary diagnosis (SDX), OR procedure, non-OR procedure, and age. The entire logic and specifications for the APR DRG reroutings contain three elements:

1. Whether the rerouting applies within MDC or across MDCs;
2. The combination of factors that define the rerouting;
3. Whether there is any special handling of SDXs, specifically, any resequencing of SDX and PDX for grouping purposes.

There are ten specific combinations of factors introduced in the rerouting logic. Some are very similar to each other, but are technically different. The most frequently used combination of factors is #1, PDX or SDX and Medical. This means a diagnosis, whether recorded as PDX or SDX, determines the APR DRG category assignment for medical patients.

- 0 – PDX or SDX and Medical
- 1 – PDX and Age and Medical
- 2 – PDX and Non-OR Procedure and Medical
- 3 – PDX and OR Procedure (and other OR procedures allowed if lower in MDC surgical hierarchy)
- 4 – PDX and Only OR Procedure Except Related OR Procedures
- 5 – SDX and OR Procedure (and any other OR procedures are allowed)
- 6 – DX and SDX and Medical
- 7 – DX and SDX and Either Surgical/Medical
- 8 – PDX and SDX and Only OR Procedure Except Related OR Procedures
- 9 – PDX and SDX and Only OR Procedure

There are fundamentally two ways that SDXs are used as part of the rerouting logic. One way is for the SDX to clarify the PDX. The APR DRG grouper uses the clarifying information of the SDX to reassign the patient to a new APR DRG, but does not, for grouping purposes, alter the sequence of PDX and SDX. This can be done within or across MDCs. An example of a Within MDC Rerouting is PDX liver disease and SDX alcoholic liver disease, clarifying that the patient should be assigned

to APR DRG 280 Alcoholic liver disease. An example of an Across MDC Rerouting is PDX complication of other vascular device (includes both peripheral vascular devices and renal dialysis shunt) and SDX renal failure (without heart failure) clarifying that the patient should be reassigned to MDC 11 (Diseases and disorders of the kidney and urinary tract), APR DRG 466 Malfunction, reaction, complication of genitourinary device or procedure.

The second way the SDXs are used as part of the rerouting logic is to function as the PDX for APR DRG grouping purposes. There are two ways that the APR DRG Classification System implements this: one way for Within MDC Reroutings and another way for Across MDC Reroutings. These are technically different approaches but accomplish the same end result.

In the instance of Within MDC Reroutings, the technical approach is for the APR DRG grouper to reassign the patient to a new APR DRG and then resequence the SDX as PDX for severity of illness (SOI) and risk of mortality (ROM) purposes. For example, a patient with a PDX of chest pain and an SDX of angina pectoris is reassigned from DRG 203 Chest pain to DRG 198 Angina pectoris and coronary atherosclerosis, and since the SDX of angina pectoris drove the APR DRG assignment, it is resequenced as the PDX for the subsequent steps of assigning SOI and ROM levels. This prevents angina pectoris from contributing as a redundant SDX to the SOI and ROM levels.

In the instance of Across MDC Reroutings, the technical approach is for the APR DRG grouper to resequence the PDX and SDX as its first action step and then proceed through all of its regular steps—MDC assignment, APR DRG assignment, and SOI and ROM level assignment. For example, if a patient has a PDX of hypovolemia (dehydration) and an SDX of gastroenteritis, the APR DRG grouper resequences the PDX and SDX so that gastroenteritis becomes the PDX and the patient is assigned to MDC 6 (Diseases and disorders of the digestive system) and to the appropriate APR DRG per the logic and specifications of MDC 6. Since gastroenteritis is already resequenced as the PDX, it will not contribute as a redundant SDX to the SOI and ROM levels. Hypovolemia, which is resequenced as the SDX, would contribute to the SOI and ROM levels if judged to be a significant comorbidity or complication by the APR DRG Classification System (which, in this case it is not).

Note, the sequencing of PDX and SDX on the patient discharge record is not altered by any of these resequencing processes. Rather, the APR DRG grouper is redesignating PDX and SDX for specified steps that are part of its logic. In the example of PDX hypovolemia and SDX gastroenteritis, the APR DRG grouper resequences PDX and SDX for grouping purposes, but when users examine their own discharge records, hypovolemia will still be the principal diagnosis. This also means that when users examine their patients in MDC 6 (Diseases and disorders of the digestive system) and especially APR DRG 249 Other gastroenteritis, nausea and vomiting, some of the patients will have a PDX of hypovolemia, which is ordinarily assigned to MDC 10 (Endocrine, nutritional and metabolic diseases and disorders).

Following is a list that summarizes the different types of logic used for the APR DRG reroutings. There are three characters to the APR DRG rerouting type number. Each character captures the following aspects of the rerouting logic:

- The first character refers to whether the rerouting occurs within or across MDCs.
  - W = Within MDC Rerouting

- A = Across MDC Rerouting
- The second character refers to the combination of diagnostic, procedure and demographic factors used in rerouting (values 0–9 described earlier).
- The third character refers to special handling of SDXs, if any.
  - P = Resequence SDX as PDX for new APR DRG assignment and SOI/ROM purposes.
  - S= Resequence SDX as PDX for SOI/ROM purposes (after assignment to new APR DRG).
  - X = SDX clarifies PDX; no special handling of SDX needed. Type C also includes where Age or Procedure clarify the APR DRG assignment.

Type	Within or Across MDC	Combination of Factors	Special Handling of SDXs
W0S	Within MDC	PDX or SDX and Medical	Resequence SDX as PDX for SOI/ROM.
W1X	Within MDC	PDX and Age and Medical	
W3X	Within MDC	PDX and OR Procedure (and other OR procedures lower in MDC surgical hierarchy are allowed)	
W6S	Within MDC	PDX and SDX and Medical	Resequence SDX as PDX for SOI/ROM.
W6X	Within MDC	PDX and SDX and Medical	SDX clarifies PDX; no special handling needed.
A2X	Across MDC	PDX and Non-OR Procedure	
A3X	Across MDC	PDX and OR Procedure (and other OR procedures lower in MDC surgical hierarchy are allowed)	
A4X	Across MDC	PDX and Only OR Procedure Except Related OR Procedures	
A5X	Across MDC	SDX and OR Procedure (and any other OR procedures are allowed)	
A6P	Across MDC	PDX and SDX and Medical	Resequence SDX as PDX.
A6X	Across MDC	PDX and SDX and Medical	SDX clarifies PDX; no special handling needed.
A7P	Across MDC	PDX and SDX and Surg/Med	Resequence SDX as PDX.
A8P	Across MDC	PDX and SDX and Only OR Procedure Except Related OR Procedures	Resequence SDX as PDX.
A9P	Across MDC	PDX and SDX and Only OR Procedure	Resequence SDX as PDX.

## Detailed Examples of Within MDC Reroutings:

### WOS

PDX (principal diagnosis) or SDX (secondary diagnosis) and Medical --> Occurrence of specified diagnosis as either PDX or SDX determines APR DRG assignment within same Major Diagnostic Category (MDC) in accordance with medical APR DRG hierarchies for that MDC; since the specified diagnosis defines the APR DRG, it is resequenced as the PDX for severity of illness (SOI)/risk of mortality (ROM) purposes regardless of whether it is recorded as PDX or SDX.

This is the most frequently used rerouting logic and existed in version 15.0 of the APR DRGs. It affects the following types of patients: MDC 4 cystic fibrosis patients and bronchopulmonary dysplasia patients; many MDC 15 medical neonatal APR DRGs; all MDC 20 alcohol and substance abuse APR DRGs; and all MDC 24 HIV APR DRGs. Examples are provided for each of these areas.

- If medical patient in MDC 4 (Diseases and disorders of the respiratory system) other than those with mechanical ventilation 96+ hours has a PDX or SDX of cystic fibrosis, then assign patient to APR DRG 131 Cystic fibrosis and rescreens cystic fibrosis as the PDX for SOI/ROM purposes unless the patient has another PDX or SDX that is higher in the MDC 4 medical hierarchy. (Note, APR DRG 132 BPD and other chronic respiratory diseases arising in perinatal period is the only other MDC 4 APR DRG defined this way and it is lower in the MDC 4 medical hierarchy).
- If medical patient in MDC 15 (Newborns and other neonates with conditions originating in the perinatal period) is > 2,499 grams and has a PDX or SDX from a list of congenital/perinatal infections, then assign patient to APR DRG 636 Neonate birth weight > 2499g with congenital/perinatal infection and resequence the congenital/perinatal infection diagnosis as the PDX for SOI/ROM purposes unless the patient has a PDX or SDX that is higher in the MDC 15 medical hierarchy (e.g., major anomaly, respiratory distress syndrome).
- If medical patient in MDC 20 (Alcohol/drug use and alcohol/drug induced organic mental disorders) has a PDX or SDX from a list of cocaine abuse diagnoses, then assign patient to APR DRG 774 Cocaine abuse and dependence and resequence the cocaine abuse diagnosis as the PDX for SOI/ROM purposes unless there is a PDX or SDX higher in the MDC 20 medical hierarchy (e.g., opioid abuse). MDC 20 patients are often admitted for multiple alcohol and drug abuse problems and so patients are assigned to a specific APR DRG based upon a pre-existing medical hierarchy that examines all principal and secondary diagnoses.
- If medical patient in MDC 24 (Human immunodeficiency virus infections) has a PDX of major HIV related condition and SDX of HIV Infection, then assign patient to APR DRG 892 HIV with major HIV related condition and resequence HIV Infection as the PDX for SOI/ROM purposes. The sequencing of PDX and SDX for HIV patients is somewhat ambiguous and so this approach assures consistency in assignment to APR DRG category and SOI/ROM levels.

Note, if there exists more than one secondary diagnosis from the specified diagnosis list for this type of rerouting logic, then the APR DRG system provides additional selection logic for designation of the PDX for SOI/ROM purposes. The selection logic is specific to each APR DRG. In most instances, the logic selects the diagnosis with the highest severity level to capture the PDX that most fully describes the reason for hospitalization, e.g., intermediate coronary syndrome (unstable angina) would be selected over coronary atherosclerosis NOS. The main exception to this approach is MDC 15 (Newborns and other neonates with conditions originating in the perinatal period) APR DRGs. These APR DRGs tend to be defined more broadly and can include patients with multiple problems at birth. In order to ensure that neonates with multiple problems have their most serious problems considered in the SOI/ROM algorithms, the diagnosis with the lowest severity is selected as the designated PDX (e.g., neonate with multiple anomalies).

## W1X

PDX (principal diagnosis) and Age and Medical --> Age clarifies PDX and assignment to new APR DRG within same Major Diagnostic Category (MDC).

- If medical patient in MDC 23 (Rehabilitation, aftercare, other factors influencing health status and other health service contacts) has PDX Aftercare NEC and Age < 90 days, then assign patient to APR DRG 863 Neonatal aftercare instead of APR DRG 862 Other aftercare and convalescence.

## W3X

PDX (principal diagnosis) and OR (operating room) Procedure --> PDX and OR Procedure together clarify APR DRG assignment within same Major Diagnostic Category (MDC) in accordance with the MDC's surgical hierarchy.

- If surgical patient in MDC 8 (Diseases and disorders of the musculoskeletal system and connective tissue) has a PDX of back/neck disorder and one of a designated set of musculoskeletal procedures not elsewhere classified (which includes back procedures), then reassign patient to APR DRG 310 Vertebral and intervertebral spinal procedures including disc procedures unless the patient has another OR procedure that is higher in the MDC 8 surgical hierarchy.

## W6S

PDX (principal diagnosis) and SDX (secondary diagnosis) and Medical --> Occurrence of PDX-SDX determines APR DRG assignment within same Major Diagnostic Category (MDC); since the SDX is primarily responsible for the APR DRG assignment, it is resequenced as the PDX for severity of illness (SOI)/risk of mortality (ROM) purposes.

- If a medical patient in MDC 1 (Diseases and disorders of the nervous system) has a PDX of head trauma and an SDX of head trauma with coma >1 hour or hemorrhage, then assign

- patient to APR DRG 55 Head trauma with coma >1 hour or hemorrhage and resequence the SDX of head trauma with coma >1 hour or hemorrhage as the PDX for SOI/ROM purposes.
- If medical patient in MDC 5 (Diseases and disorders of the circulatory system) has a PDX of angina pectoris, coronary atherosclerosis or chest pain, and an SDX of acute myocardial infarction, then assign to APR DRG 190 Acute myocardial infarction instead of APR DRG 198 Angina pectoris and coronary atherosclerosis or APR DRG 203 Chest pain, and resequence the acute myocardial infarction as the PDX for SOI/ROM purposes.
  - If medical patient in MDC 5 (Diseases and disorders of the circulatory system) has a PDX of chest pain and an SDX of angina pectoris or coronary atherosclerosis, then assign patient to APR DRG 198 Angina pectoris and coronary atherosclerosis instead of APR DRG 203 Chest pain and resequence the diagnosis of angina pectoris or coronary atherosclerosis as the PDX for SOI/ROM purposes.
  - If medical patient in MDC 23 (Rehabilitation, aftercare, other factors influencing health status and other health service contacts) has a PDX of Aftercare NEC and an SDX of Prematurity, then assign patient to APR DRG 863 Neonatal aftercare instead of APR DRG 862 Other aftercare and convalescence, and resequence the diagnosis of prematurity as the PDX for SOI/ROM purposes.

Note, if there exists more than one secondary diagnosis from the specified diagnosis list for this type of rerouting, then the APR DRG system provides additional selection logic for designation of the PDX for SOI/ROM purposes. The selection logic is specific to each APR DRG. It is the same kind of selection logic as that described for APR DRG rerouting type W0S.

## W6X

PDX (principal diagnosis) and SDX (secondary diagnosis) and Medical --> SDX clarifies PDX and assignment to new APR DRG within same Major Diagnostic Category (MDC); there is no need to resequence PDX and SDX.

- If medical patient in MDC 7 (Diseases and disorders of the hepatobiliary system and pancreas) has a PDX of liver disease and an SDX of alcoholic liver disease, then assign patient to APR DRG 280 Alcoholic liver disease instead of APR DRG 283 Other disorders of liver.

## Detailed Examples of Across MDC Reroutings:

### A2X

PDX (principal diagnosis) and Non-OR (operating room) Procedure and Medical --> PDX and Non-OR Procedure together clarify assignment to new Major Diagnostic Category (MDC) and APR DRG.

- If medical patient in MDC 1 (Diseases and disorders of the nervous system) has PDX brain neoplasm and non-OR procedure Stereotactic radiosurgery, then reassign patient to MDC 17 (Lymphatic, hematopoietic, other malignancies, chemotherapy and radiotherapy), APR DRG 692 Radiotherapy.
- Same logic and specifications apply to medical patients in MDC 10 with pituitary neoplasms.

### **A3X**

PDX (principal diagnosis) and OR (operating room) Procedure --> PDX and OR Procedure together clarify assignment to new Major Diagnostic Category (MDC) and APR DRG assignment is made based upon the surgical hierarchy of the new MDC.

- If surgical patient in MDC 5 (Diseases and disorders of the circulatory system) has PDX peripheral vascular disease and a lower limb amputation procedure except toe and no major cardiovascular OR procedure, then reassign patient to MDC 8 (Diseases and disorders of the musculoskeletal system and connective tissue) where APR DRG assignment will be made based upon the MDC 8 surgical hierarchy. Note, all or nearly all of these patients will be assigned to APR DRG 305 Amputation of lower limb except toe.
- If surgical patient in MDC 5 (Diseases and disorders of the circulatory system) has PDX peripheral vascular disease and a toe amputation and no other MDC 5 surgical procedures except those in APR DRG 180 Other circulatory system procedures, then reassign patient to MDC 8 (Diseases and disorders of the musculoskeletal system and connective tissue) where APR DRG assignment will be made based upon the MDC 8 surgical hierarchy. Note, most of these patients will be assigned to APR DRG 314 Foot and toe procedures.

### **A4X**

PDX (principal diagnosis) and Only OR (operating room) Procedure Except Related OR Procedures --> PDX and OR procedure together clarify Major Diagnostic Category (MDC) and APR DRG assignment is made based upon the surgical hierarchy of the new MDC.

- If surgical patient in MDC 11 (Diseases and disorders of the kidney and urinary tract) has PDX complication of genitourinary device and penile prosthesis procedure and no other OR procedure except related penile procedures, then reassign patient to MDC 12 (Diseases and disorders of the male reproductive system) where APR DRG assignment is made based upon the surgical hierarchy of MDC 12.

### **A5X**

SDX (secondary diagnosis) and OR (operating room) Procedure --> OR Procedure clarifies assignment to new Major Diagnostic Category (MDC) and APR DRG assignment is made based upon the surgical hierarchy of the new MDC.



- If surgical patient in MDC 9 (Diseases and disorders of the skin, subcutaneous tissue and breast) has SDX diabetes and lower limb amputation procedure, then reassign to MDC 8 (Diseases and disorders of the musculoskeletal system and connective tissue) where the patient will be assigned to a specific APR DRG based upon the MDC 8 surgical hierarchy. Note, most of these patients have a principal diagnosis (PDX) of chronic skin ulcer or cellulitis.

## A6P

PDX (principal diagnosis) and SDX (secondary diagnosis) and Medical --> Resequence PDX-SDX for APR DRG grouping purposes and assign patient to new Major Diagnostic Category (MDC) and APR DRG.

- If medical patient in MDC 18 (Infectious and parasitic diseases, systemic or unspecified sites) has a PDX of fever or viral infection NOS and an SDX of agranulocytosis/neutropenia, then for APR DRG grouping purposes, resequence the PDX-SDX so agranulocytosis/neutropenia is the PDX and assign patient to MDC 16 (Diseases and disorders of blood, blood forming organs and immunological disorders) and APR DRG 660 Major hematologic/immunologic diagnoses except sickle cell crisis and coagulation.

Note, if there exists more than one secondary diagnosis from the specified diagnosis list for this type of rerouting, then the APR DRG grouper provides additional selection logic to designate a PDX for grouping purposes. The approach is to select the diagnosis with the highest severity level to capture the PDX that most fully describes the reason for the hospitalization. If there are several secondary diagnoses from the diagnosis list and they have the same severity level, the APR DRG grouper selects the first one occurring in ICD-10-CM code order. This selection logic also applies to rerouting types 18A, 19A and 20A, which involve resequencing of PDX and SDX for grouping purposes.

## A6X

PDX (principal diagnosis) and SDX (secondary diagnosis) and Medical --> SDX clarifies PDX and assignment to new Major Diagnostic Category (MDC) and APR DRG; there is no need to resequence PDX and SDX.

- If medical patient in MDC 5 (Diseases and disorders of the circulatory system) has a PDX of complication of other vascular device, implant and graft and an SDX of renal failure without heart failure, then reassign the patient from MDC 5, APR DRG 206 Malfunction, reaction, complication of cardiac/vascular device or procedure to MDC 11 (Diseases and disorders of the kidney and urinary tract), APR DRG 466 Malfunction, reaction, complication of genitourinary device or procedure.

## A7P

PDX (principal diagnosis) and SDX (secondary diagnosis) and whether Surgical or Medical --> Resequence the PDX-SDX for APR DRG grouping purposes and assign patient to new Major Diagnostic Group (MDC) and appropriate surgical or medical APR DRG based upon the hierarchies and logic of the new MDC.

- If patient in MDC 10 (Endocrine, nutritional and metabolic diseases and disorders) has a PDX of diabetes manifestation not elsewhere classified and an SDX of osteomyelitis, then for APR DRG grouping purposes, resequence the PDX-SDX so that osteomyelitis is the PDX and patient is assigned to MDC 8 (Diseases and disorders of the musculoskeletal system and connective tissue) and to the appropriate surgical or medical APR DRG per MDC 8 logic.
- If patient in MDC 10 (Endocrine, nutritional and metabolic diseases and disorders) has a PDX of diabetes manifestation not elsewhere classified and an SDX of skin ulcer, then for APR DRG grouping purposes resequence the PDX-SDX so that skin ulcer is the PDX and patient is assigned to MDC 9 (Diseases and disorders of the skin, subcutaneous tissue and breast) and to the appropriate surgical or medical APR DRG per MDC 9 logic.
- If a patient in MDC 10 (Endocrine, nutritional and metabolic diseases and disorders) has a PDX of diabetes manifestation not elsewhere classified and SDXs of both osteomyelitis and skin ulcer, then regroup with osteomyelitis resequenced as the new PDX and assign patient to MDC 8 (Diseases and disorders of the musculoskeletal system and connective tissue).

## A8P

PDX (principal diagnosis) and SDX (secondary diagnosis) and Only OR (operating room) Procedure Except Related OR Procedures --> Resequence the PDX-SDX for APR DRG grouping purposes and assign patient to new Major Diagnostic Category (MDC) and APR DRG assignment is made based upon the surgical hierarchy of the new MDC.

- If surgical patient in MDC 6 (Diseases and disorders of the digestive system) has a PDX of abdominal pain and an SDX of cholecystitis and a cholecystectomy procedure and no other OR procedures except related procedures, then resequence for APR DRG grouping purposes the PDX-SDX so that cholecystitis is the PDX and reassign the patient to MDC 7 (Diseases and disorders of the hepatobiliary system and pancreas) where the patient will be assigned to a specific APR DRG based upon the MDC 7 surgical hierarchy.

## A9P

PDX (principal diagnosis) and SDX (secondary diagnosis) and Only OR (operating room) Procedure --> Resequence PDX-SDX for APR DRG grouping purposes and assign patient to new Major Diagnostic Category (MDC) and APR DRG assignment is made based upon surgical hierarchy of the new MDC.

- If surgical patient in MDC 11 (Diseases and disorders of the kidney and urinary tract) has a PDX from a select list of kidney and urinary diagnoses (e.g., retention of urine) and an SDX of

benign prostatic hypertrophy and a prostate procedure and no other OR procedure, then resequence the PDX-SDX for APR DRG grouping purposes so that benign prostatic hypertrophy is the PDX, and reassign the patient to MDC 12 (Diseases and disorders of the male reproductive system) where the patient will be assigned to a specific APR DRG based upon the MDC 12 surgical hierarchy.



# Chapter 5: List of All Patient Refined DRGs

A list of each 3M™ All Patient Refined Diagnosis Related Group (APR DRG) with a specification of the MDC (Major Diagnostic Category) and whether the APR DRG is medical or surgical. Some APR DRGs which contain patients from multiple MDCs (e.g., 006 Pancreas Transplant) do not have an MDC specified. The letter M is used to designate a medical APR DRG and the letter P is used to designate a surgical APR DRG.

MDC	Med/Surg	APR DRG	APR DRG Description
	P	1	Liver transplant and/or intestinal transplant
	P	2	Heart and/or lung transplant
	P	4	Tracheostomy w MV 96+ hours with extensive procedure
	P	5	Tracheostomy w MV 96+ hours without extensive procedure
	P	6	Pancreas transplant
	M	7	Allogeneic bone marrow transplant
	M	8	Autologous bone marrow transplant
	P	9	Extracorporeal membrane oxygenation (ECMO)
	M	11	Chimeric antigen receptor (CAR) T-cell and other immunotherapies
MDC 01	P	20	Open craniotomy for trauma
MDC 01	P	21	Open craniotomy except trauma
MDC 01	P	22	Ventricular shunt procedures
MDC 01	P	23	Spinal procedures
MDC 01	P	24	Open extracranial vascular procedures
MDC 01	P	26	Other nervous system and related procedures
MDC 01	P	27	Other open craniotomy
MDC 01	P	29	Other percutaneous intracranial procedures
MDC 01	P	30	Percutaneous intra and extracranial vascular procedures
MDC 01	M	40	Spinal disorders and injuries
MDC 01	M	41	Nervous system malignancy
MDC 01	M	42	Degenerative nervous system disorders except multiple sclerosis
MDC 01	M	43	Multiple sclerosis, other demyelinating disease and inflammatory neuropathies

<b>MDC</b>	<b>Med/Surg</b>	<b>APR DRG</b>	<b>APR DRG Description</b>
MDC 01	M	44	Intracranial hemorrhage
MDC 01	M	45	CVA and precerebral occlusion with infarct
MDC 01	M	46	Nonspecific CVA and precerebral occlusion without infarct
MDC 01	M	47	Transient ischemia
MDC 01	M	48	Peripheral, cranial and autonomic nerve disorders
MDC 01	M	49	Bacterial and tuberculous infections of nervous system
MDC 01	M	50	Non-bacterial infections of nervous system except viral meningitis
MDC 01	M	51	Viral meningitis
MDC 01	M	52	Alteration in consciousness
MDC 01	M	53	Seizure
MDC 01	M	54	Migraine and other headaches
MDC 01	M	55	Head trauma with coma > 1 hour or hemorrhage
MDC 01	M	56	Brain contusion/laceration and complicated skull fracture, coma < 1 hour or no coma
MDC 01	M	57	Concussion, closed skull fracture NOS, and uncomplicated intracranial injury, coma < 1 hour or no coma
MDC 01	M	58	Other disorders of nervous system
MDC 01	M	59	Anoxic and other severe brain damage
MDC 02	P	73	Orbit and eye procedures
MDC 02	M	82	Eye infections and other eye disorders
MDC 03	P	89	Major cranial/facial bone procedures
MDC 03	P	91	Other major head and neck procedures
MDC 03	P	92	Facial bone procedures except major cranial/facial bone procedures
MDC 03	P	95	Cleft lip and palate repair
MDC 03	P	97	Tonsil and adenoid procedures
MDC 03	P	98	Other ear, nose, mouth and throat procedures
MDC 03	M	110	Ear, nose, mouth, throat and cranial/facial malignancies
MDC 03	M	111	Vertigo and other labyrinth disorders
MDC 03	M	113	Infections of upper respiratory tract

<b>MDC</b>	<b>Med/Surg</b>	<b>APR DRG</b>	<b>APR DRG Description</b>
MDC 03	M	114	Dental diseases and disorders
MDC 03	M	115	Other ear, nose, mouth, throat and cranial/facial diagnoses
MDC 04	P	120	Major respiratory and chest procedures
MDC 04	P	121	Other respiratory and chest procedures
MDC 04	M	130	Respiratory system diagnosis with ventilator support > 96 hours
MDC 04	M	131	Cystic fibrosis - pulmonary disease
MDC 04	M	132	BPD and other chronic respiratory diseases arising in perinatal period
MDC 04	M	133	Respiratory failure
MDC 04	M	134	Pulmonary embolism
MDC 04	M	135	Major chest and respiratory trauma
MDC 04	M	136	Respiratory malignancy
MDC 04	M	137	Major respiratory infections and inflammations
MDC 04	M	138	Bronchiolitis and RSV pneumonia
MDC 04	M	139	Other pneumonia
MDC 04	M	140	Chronic obstructive pulmonary disease
MDC 04	M	141	Asthma
MDC 04	M	142	Interstitial and alveolar lung diseases
MDC 04	M	143	Other respiratory diagnoses except signs, symptoms and miscellaneous diagnoses
MDC 04	M	144	Respiratory signs, symptoms and miscellaneous diagnoses
MDC 04	M	145	Acute bronchitis and related symptoms
MDC 05	P	160	Major cardiothoracic repair of heart anomaly
MDC 05	P	161	Implantable heart assist systems
MDC 05	P	162	Cardiac valve procedures with AMI or complex PDX
MDC 05	P	163	Cardiac valve procedures without AMI or complex PDX
MDC 05	P	165	Coronary bypass with AMI or complex PDX
MDC 05	P	166	Coronary bypass without AMI or complex PDX
MDC 05	P	167	Other cardiothoracic and thoracic vascular procedures
MDC 05	P	169	Major abdominal vascular procedures

<b>MDC</b>	<b>Med/Surg</b>	<b>APR DRG</b>	<b>APR DRG Description</b>
MDC 05	P	170	Permanent cardiac pacemaker implant with AMI, heart failure or shock
MDC 05	P	171	Permanent cardiac pacemaker implant without AMI, heart failure or shock
MDC 05	P	174	Percutaneous cardiac intervention with AMI
MDC 05	P	175	Percutaneous cardiac intervention without AMI
MDC 05	P	176	Insertion, revision and replacements of pacemaker and other cardiac devices
MDC 05	P	177	Cardiac pacemaker and defibrillator revision except device replacement
MDC 05	P	178	External heart assist systems
MDC 05	P	179	Defibrillator implants
MDC 05	P	180	Other circulatory system procedures
MDC 05	P	181	Lower extremity arterial procedures
MDC 05	P	182	Other peripheral vascular and related procedures
MDC 05	P	183	Percutaneous structural cardiac procedures
MDC 05	M	190	Acute myocardial infarction
MDC 05	M	191	Cardiac catheterization for coronary artery disease
MDC 05	M	192	Cardiac catheterization for other non-coronary conditions
MDC 05	M	193	Acute and subacute endocarditis
MDC 05	M	194	Heart failure
MDC 05	M	196	Cardiac arrest and shock
MDC 05	M	197	Peripheral and other vascular disorders
MDC 05	M	198	Angina pectoris and coronary atherosclerosis
MDC 05	M	199	Hypertension
MDC 05	M	200	Cardiac structural and valvular disorders
MDC 05	M	201	Cardiac arrhythmia and conduction disorders
MDC 05	M	203	Chest pain
MDC 05	M	204	Syncope and collapse
MDC 05	M	205	Cardiomyopathy
MDC 05	M	206	Malfunction, reaction, complication of cardiac/vascular device or procedure



<b>MDC</b>	<b>Med/Surg</b>	<b>APR DRG</b>	<b>APR DRG Description</b>
MDC 05	M	207	Other circulatory system diagnoses
MDC 06	P	220	Major stomach, esophageal and duodenal procedures
MDC 06	P	222	Other stomach, esophageal and duodenal procedures
MDC 06	P	223	Other small and large bowel procedures
MDC 06	P	224	Peritoneal adhesiolysis
MDC 06	P	226	Anal and perineal procedures
MDC 06	P	227	Hernia procedures except inguinal, femoral and umbilical
MDC 06	P	228	Inguinal, femoral and umbilical hernia procedures
MDC 06	P	229	Other digestive system and abdominal procedures
MDC 06	P	230	Major small bowel procedures
MDC 06	P	231	Major large bowel procedures
MDC 06	P	232	Gastric fundoplication
MDC 06	P	233	Appendectomy with complex principal diagnosis
MDC 06	P	234	Appendectomy without complex principal diagnosis
MDC 06	M	240	Digestive malignancy
MDC 06	M	241	Peptic ulcer and gastritis
MDC 06	M	242	Major esophageal disorders
MDC 06	M	243	Other esophageal disorders
MDC 06	M	244	Diverticulitis and diverticulosis
MDC 06	M	245	Inflammatory bowel disease
MDC 06	M	246	Gastrointestinal vascular insufficiency
MDC 06	M	247	Intestinal obstruction
MDC 06	M	248	Major gastrointestinal and peritoneal infections
MDC 06	M	249	Other gastroenteritis, nausea and vomiting
MDC 06	M	251	Abdominal pain
MDC 06	M	252	Malfunction, reaction and complication of GI device or procedure
MDC 06	M	253	Other and unspecified gastrointestinal hemorrhage
MDC 06	M	254	Other digestive system diagnoses
MDC 07	P	260	Major pancreas, liver and shunt procedures

<b>MDC</b>	<b>Med/Surg</b>	<b>APR DRG</b>	<b>APR DRG Description</b>
MDC 07	P	261	Major biliary tract procedures
MDC 07	P	263	Cholecystectomy
MDC 07	P	264	Other hepatobiliary, pancreas and abdominal procedures
MDC 07	M	279	Hepatic coma and other major acute liver disorders
MDC 07	M	280	Alcoholic liver disease
MDC 07	M	281	Malignancy of hepatobiliary system and pancreas
MDC 07	M	282	Disorders of pancreas except malignancy
MDC 07	M	283	Other disorders of the liver
MDC 07	M	284	Disorders of gallbladder and biliary tract
MDC 08	P	303	Dorsal and lumbar fusion procedure for curvature of back
MDC 08	P	304	Dorsal and lumbar fusion procedure except for curvature of back
MDC 08	P	305	Amputation of lower limb except toes
MDC 08	P	308	Hip and femur fracture repair
MDC 08	P	309	Other significant hip and femur surgery
MDC 08	P	310	Vertebral and intervertebral spinal procedures including disc procedures
MDC 08	P	312	Skin graft, except hand, for musculoskeletal and connective tissue diagnoses
MDC 08	P	313	Knee and lower leg procedures except foot
MDC 08	P	314	Foot and toe procedures
MDC 08	P	315	Shoulder, upper arm and forearm procedures except joint replacement
MDC 08	P	316	Hand and wrist procedures
MDC 08	P	317	Tendon, muscle and other soft tissue procedures
MDC 08	P	320	Other musculoskeletal system and connective tissue procedures
MDC 08	P	321	Spinal fusion and other back and neck procedures except for disc procedures
MDC 08	P	322	Shoulder and elbow joint replacement
MDC 08	P	323	Non-elective or complex hip joint replacement
MDC 08	P	324	Elective hip joint replacement
MDC 08	P	325	Non-elective or complex knee joint replacement

<b>MDC</b>	<b>Med/Surg</b>	<b>APR DRG</b>	<b>APR DRG Description</b>
MDC 08	P	326	Elective knee joint replacement
MDC 08	M	340	Fracture of femur
MDC 08	M	341	Fracture of pelvis or dislocation of hip
MDC 08	M	342	Fractures and dislocations except femur, pelvis and back
MDC 08	M	343	Musculoskeletal malignancy and pathological fracture due to musculoskeletal malignancy
MDC 08	M	344	Osteomyelitis, septic arthritis and other musculoskeletal infections
MDC 08	M	346	Connective tissue disorders
MDC 08	M	347	Other back and neck disorders, fractures and injuries
MDC 08	M	349	Malfunction, reaction, complication of orthopedic device or procedure
MDC 08	M	351	Other musculoskeletal system and connective tissue diagnoses
MDC 09	P	361	Skin graft for skin and subcutaneous tissue diagnoses
MDC 09	P	362	Mastectomy procedures
MDC 09	P	363	Breast procedures except mastectomy
MDC 09	P	364	Other skin, subcutaneous tissue and related procedures
MDC 09	M	380	Skin ulcers
MDC 09	M	381	Major skin disorders
MDC 09	M	382	Malignant breast disorders
MDC 09	M	383	Cellulitis and other skin infections
MDC 09	M	384	Contusion, open wound and other trauma to skin and subcutaneous tissue
MDC 09	M	385	Other skin, subcutaneous tissue and breast disorders
MDC 10	P	401	Adrenal procedures
MDC 10	P	403	Procedures for obesity
MDC 10	P	404	Thyroid, parathyroid and thyroglossal procedures
MDC 10	P	405	Other procedures for endocrine, nutritional and metabolic disorders
MDC 10	M	420	Diabetes
MDC 10	M	421	Malnutrition, failure to thrive and other nutritional disorders
MDC 10	M	422	Hypovolemia and related electrolyte disorders

<b>MDC</b>	<b>Med/Surg</b>	<b>APR DRG</b>	<b>APR DRG Description</b>
MDC 10	M	423	Inborn errors of metabolism
MDC 10	M	424	Other endocrine disorders
MDC 10	M	425	Other non-hypovolemic electrolyte disorders
MDC 10	M	426	Non-hypovolemic sodium disorders
MDC 10	M	427	Thyroid disorders
MDC 11	P	440	Kidney transplant
MDC 11	P	441	Major bladder procedures
MDC 11	P	442	Kidney and urinary tract procedures for malignancy
MDC 11	P	443	Kidney and urinary tract procedures for non-malignancy
MDC 11	P	444	Renal dialysis access device procedures
MDC 11	P	445	Other bladder procedures
MDC 11	P	446	Urethral and transurethral procedures
MDC 11	P	447	Other kidney, urinary tract and related procedures
MDC 11	M	461	Kidney and urinary tract malignancy
MDC 11	M	462	Nephritis and nephrosis
MDC 11	M	463	Kidney and urinary tract infections
MDC 11	M	465	Urinary stones and acquired upper urinary tract obstruction
MDC 11	M	466	Malfunction, reaction, complication of genitourinary device or procedure
MDC 11	M	468	Other kidney and urinary tract diagnoses, signs and symptoms
MDC 11	M	469	Acute kidney injury
MDC 11	M	470	Chronic kidney disease
MDC 12	P	480	Major male pelvic procedures
MDC 12	P	482	Transurethral prostatectomy
MDC 12	P	483	Penis, testes and scrotal procedures
MDC 12	P	484	Other male reproductive system and related procedures
MDC 12	M	500	Malignancy, male reproductive system
MDC 12	M	501	Male reproductive system diagnoses except malignancy
MDC 13	P	510	Pelvic evisceration, radical hysterectomy and other radical gynecological procedures

<b>MDC</b>	<b>Med/Surg</b>	<b>APR DRG</b>	<b>APR DRG Description</b>
MDC 13	P	511	Uterine and adnexa procedures for ovarian and adnexal malignancy
MDC 13	P	512	Uterine and adnexa procedures for non-ovarian and non-adnexal malignancy
MDC 13	P	513	Uterine and adnexa procedures for non-malignancy except leiomyoma
MDC 13	P	514	Female reproductive system reconstructive procedures
MDC 13	P	517	Dilation and curettage for non-obstetric diagnoses
MDC 13	P	518	Other female reproductive system and related procedures
MDC 13	P	519	Uterine and adnexa procedures for leiomyoma
MDC 13	M	530	Female reproductive system malignancy
MDC 13	M	531	Female reproductive system infections
MDC 13	M	532	Menstrual and other female reproductive system disorders
MDC 14	P	539	Cesarean section with sterilization
MDC 14	P	540	Cesarean section without sterilization
MDC 14	P	541	Vaginal delivery with sterilization and/or D&C
MDC 14	P	542	Vaginal delivery with O.R. procedure except sterilization and/or D&C
MDC 14	P	543	Abortion with D&C, aspiration curettage or hysterotomy
MDC 14	P	547	Antepartum with O.R. procedure
MDC 14	P	548	Postpartum & post abortion diagnosis with O.R. procedure
MDC 14	M	560	Vaginal delivery
MDC 14	M	561	Postpartum & post abortion diagnoses without procedure
MDC 14	M	564	Abortion without D&C, aspiration curettage or hysterotomy
MDC 14	M	566	Antepartum without O.R. procedure
MDC 15	M	580	Neonate, transferred < 5 days old, not born here
MDC 15	M	581	Neonate, transferred < 5 days old, born here
MDC 15	P	583	Neonate with ECMO
MDC 15	P	588	Neonate birth weight < 1500g with major procedure
MDC 15	M	589	Neonate birth weight < 500g, or birth weight 500-999g and gestational age <24 wks, or birth weight 500-749g with major anomaly or without life sustaining intervention

<b>MDC</b>	<b>Med/Surg</b>	<b>APR DRG</b>	<b>APR DRG Description</b>
MDC 15	M	591	Neonate birth weight 500-749g without major procedure
MDC 15	M	593	Neonate birth weight 750-999g without major procedure
MDC 15	M	602	Neonate birth weight 1000-1249g with respiratory distress syndrome or other major respiratory condition or major anomaly
MDC 15	M	603	Neonate birth weight 1000-1249g with or without significant condition
MDC 15	M	607	Neonate birth weight 1250-1499g with respiratory distress syndrome or other major respiratory condition or major anomaly
MDC 15	M	608	Neonate birth weight 1250-1499g with or without significant condition
MDC 15	P	609	Neonate birth weight 1500-2499g with major procedure
MDC 15	M	611	Neonate birth weight 1500-1999g with major anomaly
MDC 15	M	612	Neonate birth weight 1500-1999g with respiratory distress syndrome or other major respiratory condition
MDC 15	M	613	Neonate birth weight 1500-1999g with congenital/perinatal infection
MDC 15	M	614	Neonate birth weight 1500-1999g with or without other significant condition
MDC 15	M	621	Neonate birth weight 2000-2499g with major anomaly
MDC 15	M	622	Neonate birth weight 2000-2499g with respiratory distress syndrome or other major respiratory condition
MDC 15	M	623	Neonate birth weight 2000-2499g with congenital/perinatal infection
MDC 15	M	625	Neonate birth weight 2000-2499g with other significant condition
MDC 15	M	626	Neonate birth weight 2000-2499g, normal newborn or neonate with other problem
MDC 15	P	630	Neonate birth weight > 2499g with major cardiovascular procedure
MDC 15	P	631	Neonate birth weight > 2499g with other major procedure
MDC 15	M	633	Neonate birth weight > 2499g with major anomaly
MDC 15	M	634	Neonate birth weight > 2499g with respiratory distress syndrome or other major respiratory condition
MDC 15	M	636	Neonate birth weight > 2499g with congenital/perinatal infection

<b>MDC</b>	<b>Med/Surg</b>	<b>APR DRG</b>	<b>APR DRG Description</b>
MDC 15	M	639	Neonate birth weight > 2499g with other significant condition
MDC 15	M	640	Neonate birth weight > 2499g, normal newborn or neonate with other problem
MDC 16	P	650	Splenic procedures
MDC 16	P	651	Other procedures of blood and blood-forming organs
MDC 16	M	660	Major hematologic/immunologic diagnoses except sickle cell crisis and coagulation
MDC 16	M	661	Coagulation and platelet disorders
MDC 16	M	662	Sickle cell anemia crisis
MDC 16	M	663	Other anemia and disorders of blood and blood-forming organs
MDC 17	P	680	Major O.R. procedures for lymphatic/hematopoietic/other neoplasms
MDC 17	P	681	Other O.R. procedures for lymphatic/hematopoietic/other neoplasms
MDC 17	M	690	Acute leukemia
MDC 17	M	691	Lymphoma, myeloma and non-acute leukemia
MDC 17	M	692	Radiotherapy
MDC 17	M	694	Lymphatic and other malignancies and neoplasms of uncertain behavior
MDC 17	M	695	Chemotherapy for acute leukemia
MDC 17	M	696	Other chemotherapy
MDC 18	P	710	Infections and parasitic diseases including HIV with O.R. procedure
MDC 18	P	711	Post-operative, post-trauma, other device infections with O.R. procedure
MDC 18	M	720	Septicemia and disseminated infections
MDC 18	M	721	Post-operative, post-traumatic, other device infections
MDC 18	M	722	Fever and inflammatory conditions
MDC 18	M	723	Viral illness
MDC 18	M	724	Other infectious and parasitic diseases
MDC 19	P	740	Mental illness diagnosis with O.R. procedure
MDC 19	M	750	Schizophrenia

<b>MDC</b>	<b>Med/Surg</b>	<b>APR DRG</b>	<b>APR DRG Description</b>
MDC 19	M	751	Major depressive disorders and other/unspecified psychoses
MDC 19	M	752	Disorders of personality and impulse control
MDC 19	M	753	Bipolar disorders
MDC 19	M	754	Depression except major depressive disorder
MDC 19	M	755	Adjustment disorders and neuroses except depressive diagnoses
MDC 19	M	756	Acute anxiety and delirium states
MDC 19	M	757	Organic mental health disturbances
MDC 19	M	758	Behavioral disorders
MDC 19	M	759	Eating disorders
MDC 19	M	760	Other mental health disorders
MDC 20	M	770	Drug and alcohol abuse or dependence, left against medical advice
MDC 20	M	772	Alcohol and drug dependence with rehab or rehab/detox therapy
MDC 20	M	773	Opioid abuse and dependence
MDC 20	M	774	Cocaine abuse and dependence
MDC 20	M	775	Alcohol abuse and dependence
MDC 20	M	776	Other drug abuse and dependence
MDC 21	P	792	Extensive O.R. procedures for other complications of treatment
MDC 21	P	793	Moderately extensive O.R. procedures for other complications of treatment
MDC 21	P	794	Non-extensive O.R. procedures for other complications of treatment
MDC 21	M	810	Hemorrhage or hematoma due to complication
MDC 21	M	811	Allergic reactions
MDC 21	M	812	Poisoning of medicinal agents
MDC 21	M	813	Other complications of treatment
MDC 21	M	815	Other injury, poisoning and toxic effect diagnoses
MDC 21	M	816	Toxic effects of non-medicinal substances
MDC 21	M	817	Intentional self-harm and attempted suicide
MDC 22	P	841	Extensive 3rd degree burns with skin graft



<b>MDC</b>	<b>Med/Surg</b>	<b>APR DRG</b>	<b>APR DRG Description</b>
MDC 22	P	842	Burns with skin graft except extensive 3rd degree burns
MDC 22	M	843	Extensive 3rd degree burns without skin graft
MDC 22	M	844	Partial thickness burns without skin graft
MDC 23	P	850	Procedure with diagnosis of rehab, aftercare or other contact with health services
MDC 23	P	851	Gender related procedures
MDC 23	M	860	Rehabilitation
MDC 23	M	861	Signs, symptoms and other factors influencing health status
MDC 23	M	862	Other aftercare and convalescence
MDC 23	M	863	Neonatal aftercare
MDC 24	M	890	HIV with multiple major HIV related conditions
MDC 24	M	892	HIV with major HIV related condition
MDC 24	M	893	HIV with multiple significant HIV related conditions
MDC 24	M	894	HIV with one significant HIV condition or without significant related conditions
MDC 25	P	910	Craniotomy for multiple significant trauma
MDC 25	P	911	Extensive abdominal/thoracic procedures for multiple significant trauma
MDC 25	P	912	Musculoskeletal and other procedures for multiple significant trauma
MDC 25	M	930	Multiple significant trauma without O.R. procedure
	P	950	Extensive procedure unrelated to principal diagnosis
	P	951	Moderately extensive procedure unrelated to principal diagnosis
	P	952	Non-extensive O.R. procedure unrelated to principal diagnosis
		955	Principal diagnosis invalid as discharge diagnosis
		956	Ungroupable