# Design and development of the Diagnosis Related Group (DRG)

Prospective payment rates based on Diagnosis Related Groups (DRGs) have been established as the basis of Medicare's hospital reimbursement system. The 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. 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 represents 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 being that the patients treated were "sicker." Although there has been 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, prognosis, treatment difficulty, need for intervention and resource intensity. Each of these concepts has very precise meaning which describes a particular aspect of a hospital's case mix.

- **Severity of illness.** Refers to the relative levels of loss of function and mortality that may be experienced by patients with a particular disease.

- **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 health care 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 mean that the patients treated have a greater severity of illness, present greater treatment difficulty, have poorer prognoses and have 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.

In the past, there has sometimes been confusion regarding the use and interpretation of the 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 patients having a greater severity of illness, a greater treatment difficulty, a poorer prognosis or a greater need for intervention.

# Patient classification

Given that the purpose of the 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 classes. Moreover, if these patient classes 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 classes of patients who were similar 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 classes were investigated. Initially, a normative approach was used which involved having clinicians define the DRGs using the patient characteristics which they felt were important for determining resource intensity. There was a tendency for their 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, it would ultimately lead to 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 scheme

Given the limitations of previous patient classification schemes and the experience of attempting to develop DRGs with physician panels and statistical analysis, it was concluded that in order for the DRG patient classification scheme to be practical and meaningful it should have the following characteristics:

1. The patient characteristics used in the definition of the DRGs should be limited to information routinely collected on hospital abstract systems.
2. There should be a manageable number of DRGs which encompass all patients seen on an in-patient basis.
3. Each DRG should contain patients with a similar pattern of resource intensity.
4. Each DRG should contain patients who are similar from a clinical perspective (i.e., each class 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. Currently, the patient information routinely collected includes age, principal diagnosis, secondary diagnoses and the surgical

procedures performed. Creating DRGs based on information that is only collected in a few settings or on information which is difficult to collect or measure would have resulted in a patient classification scheme which could not be applied uniformly across hospitals. That 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 might result in improvements in the ability to classify patients.

Limiting the number of DRGs to manageable numbers (i.e., hundreds of patient classes, 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 as a means of 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 is a necessary but not sufficient requirement 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, a DRG should not be based on patient characteristics which 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 classes, since the presence of peritonitis would be expected to consistently increase the resource intensity of the 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. If, on the other hand, 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 classes to be formed than would be necessary for explaining resource intensity alone.

# Formation of the DRGs

The process of forming the DRGs was begun by dividing all possible principal diagnoses into 23 mutually exclusive principal diagnosis areas referred to as Major Diagnostic Categories (MDC). Two new MDCs were created in the eighth version of the DRGs. The 25 MDCs are listed in table 1.

The MDCs were formed by physician panels as the first step toward insuring 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, and not the etiology. Thus, 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 food poisoning and Shigella dysenteriae 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 in most hospitals be performed in the operating room.

**Table 1. Major Diagnostic Categories**

| MDC | Description |
|---|---|
| 1 | Diseases and Disorders of the Nervous System |
| 2 | Diseases and Disorders of the Eye |
| 3 | Diseases and Disorders of the Ear, Nose, Mouth and Throat |
| 4 | Diseases and Disorders of the Respiratory System |
| 5 | Diseases and Disorders of the Circulatory System |
| 6 | Diseases and Disorders of the Digestive System |
| 7 | Diseases and Disorders of the Hepatobiliary System and Pancreas |
| 8 | Diseases and Disorders of the Musculoskeletal System and Connective Tissue |
| 9 | Diseases and Disorders of the Skin, Subcutaneous Tissue and Breast |
| 10 | Endocrine, Nutritional and Metabolic Diseases and Disorders |
| 11 | Diseases and Disorders of the Kidney and Urinary Tract |
| 12 | Diseases and Disorders of the Male Reproductive System |
| 13 | Diseases and Disorders of the Female Reproductive System |
| 14 | Pregnancy, Childbirth and the Puerperium |
| 15 | Newborns and Other Neonates with Conditions Originating in the Perinatal Period |
| 16 | Diseases and Disorders of Blood, Blood Forming Organs and Immunologic Disorders |
| 17 | Myeloproliferative Diseases and Disorders, and Poorly Differentiated Neoplasms |
| 18 | Infectious and Parasitic Diseases, Systemic or Unspecified Sites |
| 19 | Mental Diseases and Disorders |
| 20 | Alcohol or drug use or induced organic mental disorders |
| 21 | Injuries, Poisonings and Toxic Effects of Drugs |
| 22 | Burns |
| 23 | Factors Influencing Health Status and Other Contacts with Health Services |
| 24 | Multiple Significant Trauma |
| 25 | Human Immunodeficiency Virus Infections |

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. A complete list of all the procedures expected to require the operating room is contained in Appendix E.

Once each MDC was divided into medical and surgical categories, then, in general, the surgical patients were 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 by the tree diagram found at the end of this chapter (figure 1). 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 classes defined for the Endocrine, Nutritional and Metabolic MDC are amputations, procedures for obesity, skin grafts and wound debridements, adrenal and pituitary procedures, 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 class, the surgical classes in each MDC were defined in a hierarchical order. Patients with multiple procedures would be assigned to the surgical class highest in the hierarchy.

Thus, if a patient received both an extraction of endometrium (D&C in ICD-9-CM) and a resection of uterus (hysterectomy in ICD-9-CM), the patient would be assigned to the hysterectomy surgical class. 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 class and DRG. Appendix D lists the surgical hierarchy for each MDC.

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

In each MDC there is usually a medical and a surgical class referred to as “other medical diseases” and “other surgical procedures,” respectively. The “other” medical and surgical classes are not as precisely defined from a clinical perspective. The other classes would include diagnoses or procedures which were infrequently encountered or not well defined clinically. For example, the “other” medical class for the Respiratory System MDC would contain the diagnoses “other somatoform disorders” and “congenital malformation of the respiratory system,” while the “other” surgical class for the female reproductive MDC would contain the surgical procedures “excision of liver” (liver biopsy in ICD-9-CM) and “inspection of peritoneal cavity" (exploratory laparotomy in ICD-9-CM).

The “other” surgical category contains surgical procedures which, while infrequent, could still reasonably be expected to be performed for a patient in the particular MDC. There are,

however, also patients who receive surgical procedures which are completely unrelated to the MDC to which the patient was assigned. An example of such a patient would be a patient with a principal diagnosis of pneumonia whose only surgical procedure is a destruction of prostate (transurethral prostatectomy in ICD-9-CM). Such patients are assigned to a surgical class referred to as "unrelated operating room procedures." These patients are ultimately never assigned to a well-defined DRG.

The process of defining the surgical and medical classes in an MDC required that each surgical or medical class 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 class, it would be required to correspond to the particular organizing principle for that class. For example, in the Urinary System MDC a surgical group was formed for all patients with a procedure on the urethra (i.e., organizing principle based on anatomy). This surgical group was then further divided based on whether the procedure performed was transurethral (i.e., organizing principle based on surgical approach).

Figure 1 displays the basic structure of the DRG. Until the eighth version, the first step in the determination of the DRG had been the assignment of the appropriate MDC based on the principal diagnosis. The eighth version of the DRGs contained the first departure from the use of principal diagnosis as the initial variable in DRG assignment, when the initial step in DRG assignment was based on procedure (PRE MDC). If a patient has a heart transplant or implant of heart assist system, ECMO or tracheostomy, liver transplant and/or intestinal transplant, bone marrow transplant, lung transplant simultaneous pancreas/kidney transplant, or pancreas transplant, then the patient is assigned to these DRGs independent of the MDC of the principal diagnosis. Heart, intestinal, liver, bone marrow, lung, pancreas/kidney and pancreas transplants are very resource intensive and can be performed for diagnoses in many different MDCs. Tracheostomies are performed primarily for patients on long term ventilator support and therefore such patients are very resource intensive. The eighth version also created two new MDCs for patients with multiple trauma (MDC 24) and patients with an HIV infection (MDC 25). Assignment to MDC 24 and 25 is based on both principal and secondary diagnoses. An assignment to MDC 24 is based on the presence of two or more significant traumas in different body systems (e.g. a fractured skull and a fractured femur). Assignment to MDC 25 is based on a principal diagnosis of an HIV infection or a principal diagnosis of an HIV related complication combined with a secondary diagnosis of an HIV infection (e.g. principal diagnosis of pneumocystosis and a secondary diagnosis of an HIV infection).

Once the medical and surgical classes for an MDC were formed, each class of patients was evaluated to determine if complications, comorbidities, the patient's age or discharge status consistently affected the consumption of hospital resources. Physician panels classified each diagnosis code based on whether the diagnosis, when present as a secondary condition, would be considered a substantial complication or comorbidity. A substantial complication or comorbidity was defined as a condition, that because of its presence with a specific principal diagnosis would cause an increase in length of stay by at least one day in at least 75 percent of the patients. For example, sarcoidosis of lung, chronic obstructive pulmonary disease and pneumococcal pneumonia are considered substantial complications or comorbidities for certain diseases, while nontoxic diffuse goiter and essential hypertension are not. Each medical and surgical class within an MDC was tested to determine if the presence of any substantial comorbidities or complications would consistently affect the consumption of hospital resources.

For example, the presence of complications or comorbidities was not significant for patients receiving a median nerve release (carpal tunnel release in ICD-9-CM) but was very significant for patients with arrhythmia and conduction disorders. The same basic list of complications and comorbidities are used across most DRGs. However, depending on the principal diagnosis of the patient, some diagnoses in the basic list of complications and comorbidities may be excluded if they are closely related to the principal diagnosis. For example, urinary retention is a complication or comorbidity for a patient admitted for congestive heart failure but not for a patient admitted for enlarged prostate. In addition, in some cases such as newborns or acute myocardial infarction patients, special complications and comorbidity definitions were used in defining the DRGs.

The final variable used in the definition of the DRGs was the patient discharge status. Separate DRGs were formed for newborns if the patients were transferred to another acute care facility. In addition, separate DRGs were formed for patients with alcoholism or drug abuse who left against medical advice and for acute myocardial infarction patients and newborns who died.

For versions 2-24 of the DRGs, the further subdivisions of some medical and surgical DRGs was primarily based on the presence or absence of a CC or pediatric age (0-17). For example, in DRG version 24 there were 115 pairs of DRGs subdivided based on the presence or absence of a CC and 43 pediatric DRGs (age 0-17). Beginning with version 25 the use of CCs and patient age was completely revised. The revisions were so extensive that the version 25 DRGs were renamed to be the Medicare Severity DRGs (MS-DRGs).

Except for new diagnosis codes that were added to ICD-9-CM after FY1984 (e.g., HIV), the CC list of diagnoses used in the DRGs remained virtually identical to the original CC list used in FY1984. As a result of the changes that occurred in hospitals during the first 22 years of PPS, the CC list had lost much of its power to discriminate hospital resource use. Better coding of secondary diagnoses, stricter criteria for extended hospital stays, increased availability of post acute care services and the shift to outpatient care resulted in most patients (nearly 80 percent) admitted to hospitals having a CC. Therefore, in version 25 (MS-DRGs) the diagnoses comprising the CC list were completely redefined. The revised CC list is primarily comprised of significant acute disease, acute exacerbations of significant chronic diseases, advanced or end stage chronic diseases and chronic diseases associated with extensive debility. In general, most chronic diseases were not included on the revised CC list. For a patient with a chronic disease, a significant acute manifestation of the chronic disease was required to be present and coded for the patient to be assigned a CC. The revision of the CC list reduced the number of Medicare patients with a CC from approximately 80 percent to 40 percent.

In addition, to the revision of the CC list, each CC was also categorized as a major CC or a CC (i.e., non major CC) based on relative resource use. Approximately, 12 percent of all diagnoses codes were classified as a major CC, 24 percent as a CC and 64 percent as a non CC. Diagnoses closely associated with mortality (ventricular fibrillation, cardiac arrest, shock and respiratory arrest) were assigned as a major CC if the patient lived but as a non CC if the patient died.

The major CC, CC and non CC categorization was used to subdivide the surgical and medical DRGs into up to three levels with a patient being assigned to the most extreme level (e.g., a patient with an MCC and a CC is assigned to the MCC level). Before subdividing the medical and surgical DRGs into CC levels all the pediatric age distinctions were removed from the DRGs. To create the MS-DRGs, individual DRGs were subdivided into three, two or one level depending on the CC impact on resources used for that patient. The two way subdivision either created a

separate level for just the major CC patients or a separate level for the non CC patients. The CC levels relate to the relative severity of illness of the patient. In the MS-DRG version 25, 152 DRGs had 3 CC levels, 107 DRGs had two CC levels and 76 DRGs had no CC levels resulting in 745 MS-DRGs which is a net increase of 207 DRGs over the 538 in version 24. The following table provides the MS-DRG version 39.1 subdivisions:

**Table 2. MS-DRG v39.1 subdivisions**

| Base MS-DRGs | Split Type | Total MS-DRGs |
|---|---|---|
| 161 | 3-way | 483 |
| 39 | 2-way MCC/CC and no CC | 78 |
| 68 | 2-way MCC and CC/no CC | 136 |
| 70 | No split | 70 |
| 338 Total Base | [blank] | 767 Total MS-DRGs |

In MS-DRG version 39.1 there are 72,750 diagnoses and 78,227 procedures.

The Deficit Reduction Act of 2005 (P.L.109-171) requires CMS to eliminate any increase in payment due to the occurrence of selected post admission complications, known as Hospital Acquired Conditions (HACs). HACs are harmful events (e.g. accidental laceration during a procedure) or negative outcomes (e.g. decubitus ulcer) that result from the processes of care and treatment rather than from a natural progression of underlying illness. Under the Medicare inpatient prospective payment system, the occurrence of an HAC can result in a higher payment because the presence of the HAC diagnosis may cause the patient to be assigned to a higher-paying MS-DRG, in effect financially rewarding poor quality care.

When IPPS was implemented the standard claim form did not contain a specification of whether a secondary diagnosis was present on admission (POA). The Deficit Reduction Act requires hospitals to report a POA indicator for all diagnoses beginning in fiscal year 2008. The reporting of the POA indicator allows complications that occur post admission to be identified. The Deficit Reduction Act requires that the post admission complications selected as HACs be (1) high cost, high volume, or both; (2) be a CC or Major CC in MS-DRGs and (3) be reasonably preventable through the application of evidence-based guidelines. For Fiscal Year 2009, CMS designated 12 conditions as HACs:

1. Foreign object retained after surgery
2. Air embolism
3. Blood incompatibility
4. Stage III and IV pressure ulcers
5. Falls and trauma
6. Catheter-associated urinary tract infection (UTI)
7. Vascular catheter-associated infection

8. Surgical site infection – Mediastinitis following Coronary Artery Bypass Surgery (CABG)

9. Manifestations of poor glycemic control

10. Deep vein thrombosis (DVT) /pulmonary embolism (PE) following total knee replacement or hip replacement

11. Surgical site infection following bariatric surgery

12. Surgical site infection following certain orthopedic procedures of spine, shoulder or elbow

For Fiscal Year 2013, two additional HACs were added:

13. Surgical site infection following cardiac device procedures

14. Iatrogenic pneumothorax with venous catheterization.

If an HAC diagnosis is present at admission, it will continue to be classified as a CC or major CC and allowed to affect the MS-DRG assignment. However, if the HAC diagnosis is not present at admission, it will no longer be classified as a CC or major CC and will not affect MS-DRG assignment. The exclusion of an HAC diagnosis from MS-DRG assignment does not necessarily mean the MS-DRG will change. Some MS-DRGs are not differentiated by the presence of a CC or Major CC. For such MS-DRGs the exclusion of an HAC diagnosis will have no impact on MS-DRG assignment. Further, if in addition to an HAC diagnosis there are non-HAC diagnoses present that are a CC or major CC, the exclusion of the HAC diagnosis may not change the MS-DRG. Beginning in Fiscal Year 2009, HAC diagnoses are excluded from MS-DRG assignment.

The actual process of forming the 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. A complete list of the MS-DRGs is contained in Appendix A in the MS-DRG definitions manual.

There are several MS-DRGs which contain patients whose medical record abstracts contain clinically inconsistent or invalid information. For example, there are MS-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 two groups based on hospital resource use: extensive 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 resection of gallbladder (cholecystectomy in ICD-9-CM) will be assigned to the extensive unrelated procedure MS-DRG since a cholecystectomy is considered an extensive procedure. However, if a patient has a principal diagnosis of arrhythmia and has a diagnostic excision of breast (breast biopsy in ICD-9-CM) discovered while in the hospital, the patient will be assigned to the non- extensive unrelated MS-DRG since the biopsy is considered a non-extensive procedure. The complete definition of unrelated operating room procedures is contained in Appendix F.

When a principal diagnosis is coded which, although it is a valid ICD-10-CM code, is not precise enough to allow the patient to be assigned to a clinically coherent MS-DRG the patient is assigned to a diagnosis invalid as principal diagnosis MS-DRG. For example, ICD-10-CM code O0930 is an unspecified complication of pregnancy with the episode of care unspecified. Thus, this diagnosis code does not indicate the type of complication nor whether the episode of care was antepartum, postpartum or for delivery. Since the MS-DRG definitions assign patients to different sets of MS-DRGs depending on whether the episode of care was antepartum, postpartum or for delivery, a patient with a principal diagnosis of O0930 must be assigned to the diagnosis invalid as principal diagnosis MS-DRG.

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 MS-DRG but are assigned a MS-DRG in the MDC most related to the diagnosis.

Patients are assigned to an ungroupable MS-DRG if certain types of medical records errors which may affect MS-DRG assignment are present. Patients with an invalid or non-existent ICD-10-CM code as principal diagnosis will be assigned to the ungroupable MS-DRG. Patients will also be assigned to the ungroupable MS-DRG if their sex, or discharge status is both invalid and necessary for MS-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 MS-DRG since patients with acute myocardial infarction will be assigned to different MS-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 MS-DRG since discharge status is not used in the determination of the MS-DRG for hypertensive patients.

The DRGs were originally developed at the Yale University School of Organization and Management during the 1970's under contract to the Centers for Medicare and Medicaid Services (formerly Health Care Financing Administration). The second version and all subsequent versions of the DRG definitions have been updated by 3M Health Information Systems under contract with CMS. All versions of the DRGs, since the inception of the Medicare Prospective Payment System, are summarized in the following table.

**Table 3. Grouper versions**

| Grouper version | Effective time period |
|---|---|
| MS-DRG 39.1 | 04/01/2022 - 09/30/2022 |
| MS-DRG 39.0 | 10/01/2021 - 03/31/2022 |
| MS-DRG 38.1 | 01/01/2021 - 09/30/2021 |
| MS-DRG 38.0 | 10/01/2020 - 12/31/2020 |
| MS-DRG 37.2 | 08/01/2020 - 09/30/2020 |
| MS-DRG 37.1 | 04/01/2020 - 07/31/2020 |
| MS-DRG 37.0 | 10/01/2019 - 03/31/2020 |
| MS-DRG 36.0 | 10/01/2018 - 09/30/2019 |

| Grouper version | Effective time period |
|---|---|
| MS-DRG 35.0 | 10/01/2017 - 09/30/2018 |
| MS-DRG 34.0 | 10/01/2016 - 09/30/2017 |
| MS-DRG 33.0 | 10/01/2015 - 09/30/2016 |
| MS-DRG 32.0 | 10/01/2014 - 09/30/2015 |
| MS-DRG 31.0 | 10/01/2013 - 09/30/2014 |
| MS-DRG 30.0 | 10/01/2012 - 09/30/2013 |
| MS-DRG 29.0 | 10/01/2011 - 09/30/2012 |
| MS-DRG 28.0 | 10/01/2010 - 09/30/2011 |
| MS-DRG 27.0 | 10/01/2009 - 09/30/2010 |
| MS-DRG 26.0 | 10/01/2008 - 09/30/2009 |
| MS-DRG 25.0 | 10/01/2007 - 09/30/2008 |
| CMS 24.0 | 10/01/2006 - 09/30/2007 |
| CMS 23.0 | 10/01/2005 - 09/30/2006 |
| CMS 22.0 | 10/01/2004 - 09/30/2005 |
| CMS 21.0 | 10/01/2003 - 09/30/2004 |
| CMS 20.0 | 10/01/2002 - 09/30/2003 |
| CMS 19.0 | 10/01/2001 - 09/30/2002 |
| CMS 18.0 | 10/01/2000 - 09/30/2001 |
| CMS 17.0 | 10/01/1999 - 09/30/2000 |
| CMS 16.0 | 10/01/1998 - 09/30/1999 |
| CMS 15.0 | 10/01/1997 - 09/30/1998 |
| CMS 14.0 | 10/01/1996 - 09/30/1997 |
| CMS 13.0 | 10/01/1995 - 09/30/1996 |
| CMS 12.0 | 10/01/1994 - 09/30/1995 |
| CMS 11.0 | 10/01/1993 - 09/30/1994 |
| CMS 10.0 | 10/01/1992 - 09/30/1993 |
| CMS 9.0 | 10/01/1991 - 09/30/1992 |
| CMS 8.0 | 10/01/1990 - 09/30/1991 |
| CMS 7.0 | 10/01/1989 - 09/30/1990 |

| Grouper version | Effective time period |
|---|---|
| CMS 6.0 | 10/01/1988 - 09/30/1989 |
| CMS 5.0 | 10/01/1987 - 09/30/1988 |
| CMS 4.0 | 10/01/1986 - 09/30/1987 |
| CMS 3.0 | 05/01/1986 - 09/30/1986 |
| CMS 2.0 | 10/01/1983 - 04/30/1986 |

# Summary

The DRGs, as they are now defined, form a manageable, clinically coherent set of patient classes that relate a hospital's case mix to the resource demands and associated costs experienced by the hospital. DRGs are defined based on the principal diagnosis, secondary diagnoses, surgical procedures, age, sex and discharge status of the patients treated. Through DRGs, hospitals can gain an understanding of the patients being treated, the costs incurred and within reasonable limits, the services expected to be required. The classification of patients into DRGs is a constantly evolving process. As coding schemes change, as more comprehensive data is collected or as medical technology or practice changes, the DRG definitions will be reviewed and revised.

DRG versions 2.0–32.0 were defined using the ICD-9-CM codeset. MS-DRG v39.1 was implemented using the ICD-10-CM/PCS codeset effective April 1, 2022.

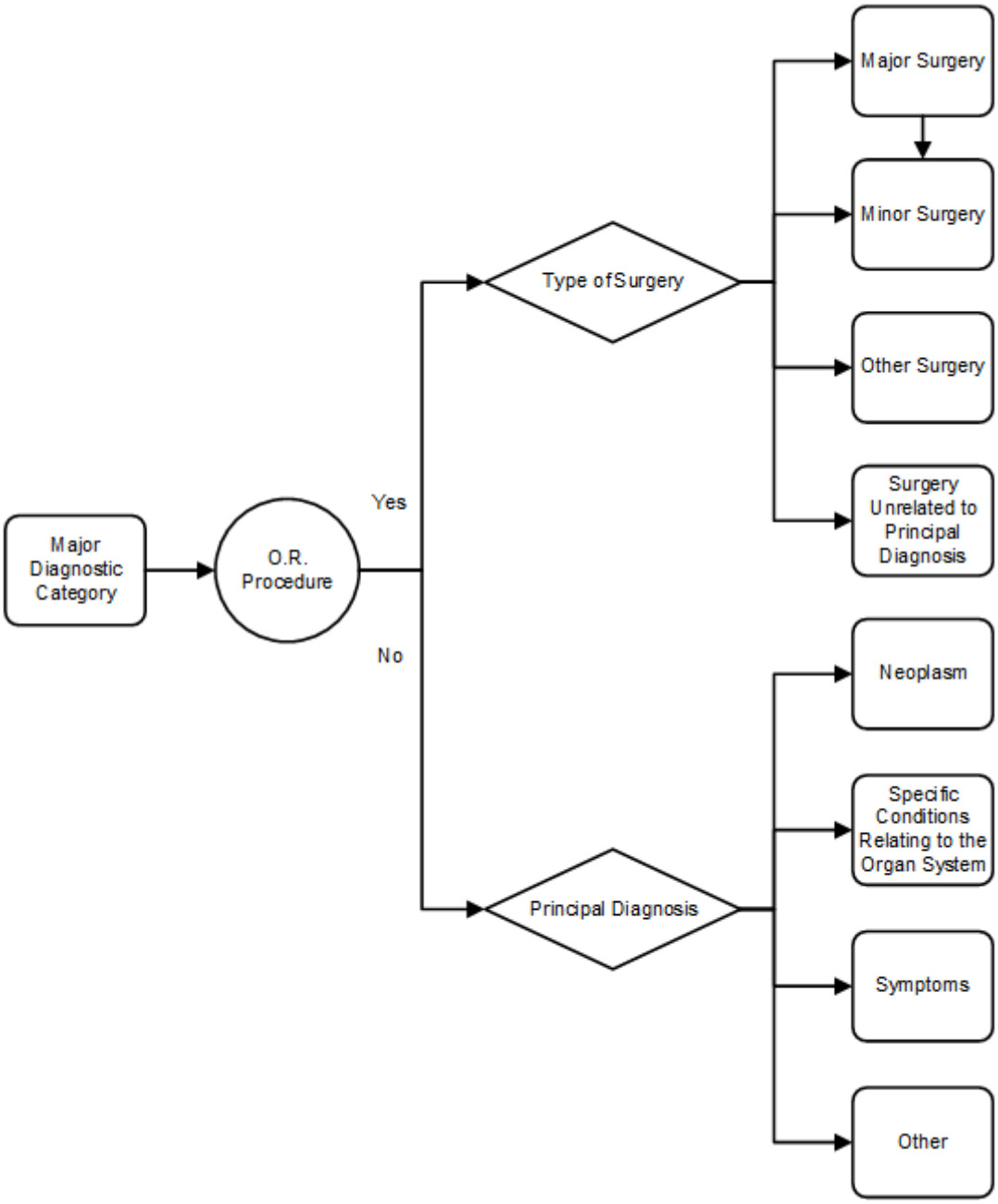


*Figure 1: Typical DRG structure for a Major Diagnostic Category*