Medstat Disease Staging™ Software

Version 5.21

Reference Guide

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November 2003

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> A disease can be effectively treated only when I as a doctor understand its causes in that particular patient, its site of origin, the internal havoc it creates, and the course which the process is likely to take whether treated or not. With that knowledge, I can make a diagnosis, prescribe a program of treatment, and predict an outcome.[1]

Where? Why? How serious? These are the basic questions that a clinician must attempt to answer when a patient presents with a medical problem. The same questions must be answered to make appropriate comparisons in studies of outcomes, quality, or costs of care. The "where" is the specific organ or system of the body; the "why" is the etiology of the problem; and the "how serious" is the pathophysiologic changes that have occurred and the ranking of the disease's complications.

Physicians use information from a patient's history, physical examination, laboratory findings, and other diagnostic tests to answer these questions in order to diagnose a disease, to estimate the patient's prognosis, and to prescribe appropriate treatment. Ideally, answers should be available before therapeutic intervention. Even in those cases when definitive answers may not be available and treatment must be given, it should be based on the presumptive answers to these questions.

Disease Staging is a classification system that uses diagnostic findings to produce clusters of patients who require similar treatment and have similar expected outcomes. It can serve as the basis for clustering of clinically homogeneous patients to assess quality of care, analyze clinical outcomes, review utilization of resources, assess efficacy of alternative treatments, and assign credentials for hospital privileges.

Ideally, a diagnostic label should have explicit data about the location of the health problem, the cause of the problem, and the severity of the problem. The majority of diagnostic labels identify the site of the disease (e.g., appendicitis, cholecystitis, diverticulitis, and peptic ulcer). Some provide information about the system involved and cause of the problem (e.g., pneumococcal pneumonia and urinary tract infection caused by E. coli). Other diagnostic labels are manifestations of problems (e.g., hypertension and anemia). A few, because of the body system involved, also convey a degree of severity (e.g., myocardial infarction or bacterial meningitis). And some may even be distinguished by the time of onset (e.g., congenital toxoplasmosis).

Only in the discipline of cancer has the medical profession developed a diagnostic classification that includes severity based on the understanding of the need to measure the efficacy of various treatments for similar clusters of patients. Now that society is challenging the medical profession to document quality of

care in a more objective manner, similar measurement instruments are needed for all medical problems.

DISEASE STAGING CRITERIA

The Disease Staging criteria define levels of biological severity for specific medical diseases, where severity is defined as the risk of organ failure or death. The classification is based on the severity of the pathophysiologic manifestations of the disease:

Stage 1	A disease with no complications
Stage 2	The disease has local complications
Stage 3	The disease involves multiple sites, or has systemic complications
Stage 4	Death

Subdivisions of these stage levels have been defined to allow more precise classification. The challenge is to include enough detail to allow for a rich description of each disease and yet not be so overwhelmingly complete that the staging is cumbersome.

In the definition of the Staging criteria, most of the diseases begin at Stage 1 and continue through Stage 4. There are several exceptions to this rule. Some self-limiting diseases, such as cataracts, do not include a Stage 3 or 4. Other criteria begin at either Stage 2 or 3 since they are often complications of other diseases (e.g., bacterial meningitis, which can be a complication of sinusitis, otitis media, or bacterial pneumonia). Stage 0 has also been included in the classification of diseases for patients with a history of a significant predisposing risk factor for the disease, but for whom there is currently no pathology (e.g., history of carcinoma or a newborn baby born to a mother suspected of having an infection at the time of delivery).

The Stage levels are ordinal in nature for each medical problem. Stage 1 of one disease may have different implications for resource use, treatment, and prognosis than a similar stage of another disease. For example, hyperglycemia (Stage 1 diabetes mellitus) is different than positive serological evidence of AIDS (Stage 1). Even when major pathophysiologic damage exists such as coma, which in all diseases is a Stage 3 complication, the prognosis may be different for each disease since for some there is treatment which may reverse the complication. Treatment, whether medical or surgical, has not, however, been introduced into the staging classification; staging is driven by the natural history of the disease. Nor has quality of life been taken into consideration in Disease Staging. Controlling for other factors (e.g., choice of treatment, age, and presence of co-morbid disease), risk of death is a function of etiology and stage of disease. While this risk generally increases with each higher Stage level, it may vary dramatically by Stage from one disease to another.

It is important to distinguish the etiology of a disease whenever possible. For example, "pneumonia" does not specify etiology. Designating that the pneumonia was bacterial in origin would be an improvement, (e.g., "bacterial pneumonia"), but optimally a physician should document the specific bacteria causing the pneumonia (e.g., pneumococcal pneumonia).

Health problems, such as congestive heart failure, and laboratory findings, such as anemia, that may result from a variety of causes, are not diagnoses. When such problems are recorded as the only evidence and stated as the patient's "diagnosis," the implication is that the physician did not know, or did not document, the disease process that produced the problem. Unfortunately, many users of medical information fail to distinguish between non-specific health problems (e.g., symptoms and laboratory findings) and diagnoses of specific diseases. As a result, patients may be inappropriately classified for the purposes of reimbursement, for the analysis of resource utilization, and for the assessment of quality of care.

For each Staging criteria set included in this volume, the most likely etiology is specified. Some diseases may have multiple etiologies (e.g., bacterial pneumonia). While the Staging classification is essentially the same for pneumonia due to Pneumococcus as it is for that due to Staphylococcus or Pseudomonas, each type of bacterial pneumonia should be analyzed separately when evaluating quality of care, clinical trials, and utilization of resources because of the varying prognosis associated with each.

There are a number of complications (for example, sepsis and congestive heart failure) that may result from many diseases. Generally, these complications have been assigned the same integer stage level across the different diseases, although not necessarily the same substage level. Different integer stage levels have been used when the complication may indicate different levels of severity depending upon the underlying disease. For example, pneumonia is classified as a Stage 2 complication when it occurs secondary to other problems. There are a few diseases, such as botulism, where aspiration pneumonia or bacterial pneumonia is a reflection of the systemic nature of the problem rather than just the involvement of the respiratory system. For these diseases, pneumonia is classified as a Stage 3 complication.

DIAGNOSTIC FINDINGS

In addition to the stages of the disease, each criteria set includes a specification of “diagnostic findings” that can be used to validate the presence of the disease and stage level. The diagnostic findings include physical findings, radiological and laboratory results, and pathological and operative reports.2

The present edition has addressed the validation issue more comprehensively than previous editions. Only the information that specifically documents a complication is included, with the understanding that physicians should first gather data from the history and physical examination to state a hypothesis (presumptive diagnosis) and use the laboratory judiciously to validate the diagnosis. Which laboratory data are collected will depend on available facilities and cost-benefits for the patients. For some diagnoses, both the patient and physician can accept uncertainty. However, if major treatment decisions are to be made, validation using objective data is essential. For instance, patients should not be treated for cancer on a presumptive diagnosis.

For some diagnostic testing (e.g., the use of the glucose tolerance test or fasting blood sugar for the diagnosis of diabetes mellitus), criteria have been recommended that are accepted by the medical community. Many laboratory tests, however, do not have nationally accepted values to delineate normal and abnormal results. In these situations, laboratory results have been defined as abnormal when they exceed three standard deviations from the mean value.3, 4

In summary, the physician's clinical judgment based on the history and physical examination should be used along with laboratory data to confirm or rule out the presence of a particular problem. In addition, laboratory values may need to be adjusted based on the calibration of the laboratory performing the test.

APPLICATIONS OF DISEASE STAGING

Disease Staging is a valuable tool in many clinical, research, management, and educational studies. Examples of how Disease Staging has been used to classify patients for a number of applications are highlighted below.

TIMING OF HOSPITALIZATION 5-8

Disease Staging may be used to document potential quality of care problems in ambulatory settings by providing data relating to patients' severity of illness at the time of hospitalization. Patients admitted to the hospital with advanced stages of illness represent possible failures of outpatient care. For example, an admission for cellulitis secondary to diabetes mellitus might have been preventable if the disease progression could have been averted with appropriate outpatient care.

For some diseases, such as appendicitis, hospitalization is clearly appropriate at the earliest stage of the disease. Other diseases, such as essential hypertension, rarely require hospitalization at the early stages; hospitalization is only required if the disease progresses to more advanced stages.

Because admitting patients to an acute care hospital involves incurring significant cost and potential risk, patients should be admitted to the hospital only if the expected benefits outweigh the costs and risks of the admission. Questions to address include:

Is inpatient diagnostic testing required? Do the symptoms suggest a serious illness which, if confirmed, may require immediate treatment? Does the patient require treatment that is most appropriately provided as an inpatient? Does the patient require the types of monitoring and nursing care available only in an acute care hospital?

Classification of severity of illness at the time of hospitalization is important for analysis of both inpatient and outpatient care. Comparisons of inpatient care outcomes can be accomplished only if one adjusts for patient risk at time of admission.

For patients admitted at earlier stages of illness, one may question whether an acceptable level of care could have been provided in an outpatient setting. A number of factors could make such an earlier stage admission appropriate. For example, a patient with acute symptoms (e.g., chest pain), but without a confirmed diagnosis, may be appropriately admitted to the hospital until a diagnosis and a decision can be made as to whether further inpatient care is necessary. A patient may have other co-morbid conditions (for example, poorly controlled diabetes mellitus) that make the admission advisable, or a patient may choose to undergo an elective surgical procedure that must be performed as an inpatient. A patient with osteoarthritis of the hip who decides to have a total hip replacement would clearly require hospitalization.

For patients hospitalized at more advanced stages, the issue is whether the patient has complications that could have been preventable with earlier inpatient care. For example, a patient admitted with acute cholecystitis and gangrene of

the gallbladder has a serious complication that may have been prevented with earlier hospitalization and treatment.

Timeliness of admission is, in part, a function of whether hospitalization is the first or subsequent admission for a particular complication of episode of care. For example, a first admission at advanced-stage cancer should raise questions about whether earlier detection was feasible. Subsequent scheduled admissions for the same patient to undergo chemotherapy would not, of course, raise the same question.

It is important to differentiate the concept of a timely admission from a preventable admission. For example, an admission at Stage 1 appendicitis is timely and, given current medical knowledge, not preventable. Such an admission does not raise issues of appropriateness of care. On the other hand, while an admission for Stage 2.5 diabetes mellitus and cellulitis is also timely, it may have been a preventable admission if the disease progression could have been averted with appropriate outpatient care.

CASE-MIX CLASSIFICATION FOR ANALYSIS OF RESOURCE UTILIZATION AND REIMBURSEMENT [9-19]

Disease Staging should be an integral part of systems designed to analyze resource utilization. Differences in length of stay and cost may result from differences in patient populations treated, as well as from differences in efficiency. Etiology and stage of disease are directly related to the use of resources and must be considered in these types of analyses, whether the focus is at the level of an individual physician, a hospital product line, or an entire institution.

In addition to the stage of the principal disease, other variables to be included in analysis of utilization include: presence of co-morbid, or co-existing, medical problems (e.g., presence of diabetes mellitus in a patient hospitalized for appendicitis – both the diabetes mellitus and appendicitis should be staged); reason for admission (e.g., for diagnostic purposes, therapeutic purposes, both diagnosis and therapy, chemotherapy, or observation); and the use of surgical procedures or special units (e.g., ICU, CCU), if such use is justified by the needs of the patient.

Use of resources depends on the clinical status of the patient, the reason for admission, and whether the latter is the first or one of many re-admissions. For instance, a woman with Stage 3 cancer of the breast will consume more resources during the first hospitalization, when more diagnostic and therapeutic interventions will be used, than on her third hospitalization, when for the same problem she may likely receive only chemotherapy or radiation therapy. In addition, the social support needs of the patient should be considered, although this variable would have a greater impact on timing of hospitalization and length of stay than on the diagnostic or therapeutic intervention.

By using Disease Staging, variations in resource use resulting from patient differences can be controlled, thereby allowing the manager or researcher to appropriately focus on the analysis of differences resulting from variation in physician and institutional practices. For similar reasons, reimbursement systems should be modified to account for differences in severity of illness.

Quality of Care Assessment [5, 20-30]

Whether the goal is assessment and improvement of the process of care or evaluation of clinical outcomes, there is a need for clinical specificity. The Centers for Medicare and Medicaid Services (CMS) and several statewide data organizations publish institution-specific, and in some cases physician-specific, information on outcome measures such as mortality. Without appropriate ways to account for differences in the severity of the patient mix treated, the relevance of these types of analyses is questionable. For example, analysis of data from the National Hospital Discharge Survey demonstrated a 5.6% mortality rate for patients hospitalized with Stage 1 bacterial pneumonia, 9.5% for those with Stage 2, and a 33.1% mortality rate for Stage 3.29 These estimates were further refined by considering the specific etiology (organism) of the pneumonia.

As a part of a quality improvement program, these types of advanced-stage admissions should be reviewed to evaluate whether they resulted from physician-related problems (e.g., delayed or incorrect diagnosis or treatment), patient-related problems (e.g., failure to seek timely care or comply with prescribed treatment), system problems (e.g., lack of access to care), or were not preventable (e.g., resulting from rapid disease progression in a particular patient).

Disease Staging can also be used as a direct measure of patient outcomes by studying changes in disease stage over time. For instance, severity at hospital admission can be compared with severity at discharge. Patient-based longitudinal data can be used in conjunction with Disease Staging to assess changes in severity of illness for defined populations and specific episodes of care.

Another valuable use of Disease Staging is the evaluation of processes as well as outcomes of medical care. A great deal of activity is currently being devoted to the development of clinical guidelines designed to reduce uncertainty and help guide the process of care. One of the difficulties faced in guidelines development is that the appropriateness of a specific diagnostic test or prescribed treatment varies by stage of disease. By defining stage-specific criteria, it is possible to improve the specificity of clinical guidelines and process review criteria and to make them more useful and acceptable to clinicians.

Clinical Trials 29

The primary objective of clinical trials is to test the efficacy of therapeutic interventions under highly controlled conditions. By using Disease Staging to help specify the study population, comparability of the treatment and control groups can be assessed. Staging allows the investigator to stratify patients more accurately, both for their principal diagnoses or problems and for any co-morbid conditions that they may have. Depending on the goals of the trial, it can be restricted to samples defined using specific stages of disease or designed to allow the assessment of efficacy across different levels of severity.

Professional Staffing and Facility Planning in Health Care Institutions [9-11, 31]

Severity of illness, as documented by Disease Staging, may be used to evaluate the appropriateness of current or planned staffing levels within hospitals or managed care institutions in relationship to patients' health care needs. Staging can provide severity-level data for specific patient groups that may justify

establishing or expanding special care units or securing special diagnostic equipment or other facilities.

SPECIALTY BOARD CERTIFICATION AND CLINICAL PRIVILEGES [32-34]

A major responsibility of medical specialty boards is the development and administration of procedures and examinations for board certification and recertification. Disease Staging has been used to classify the content of test items from the board certification/recertification examinations administered by the American Board of Family Practice32 and to analyze medical licensing examinations in Japan.33 Each item on the examination is classified by organ system, etiology, and stage of illness, along with other dimensions such as age group affected and whether the item focuses on diagnosis or management.

Use of this type of classification enables the specialty board to assess the current mix of items and begin to develop a "blueprint" to guide development of future examinations. For example, by using Disease Staging, one can refine the assessment of the physician's knowledge of diabetes mellitus management to assure that there is an appropriate mixture of items relevant to the early stages, as well as prevention and management of specific advanced-stage complications.

Disease Staging can be used in the assignment of hospital clinical privileges.34 Currently, the delineation of clinical privileges is primarily procedure-oriented, even in the medically-oriented specialties. For example, a general internist may be credentialed to perform procedures such as arterial puncture, thoracentesis, and lumbar puncture. However, the skills necessary to successfully perform an arterial puncture say very little about the physician's ability to diagnose or manage the complex patient with advanced-stage medical problems.

Disease Staging can be used to delineate disease-specific privileges that more appropriately reflect the clinical challenges of patient management. For example, a board certified general internist may have the appropriate education and experience to manage early stage diabetes mellitus, but not to manage a patient admitted for hyperosmolar coma. Potentially, the volume and outcomes of stage-specific experience could also be monitored, as is increasingly done for surgical volume and outcomes, to reassess the privileges assignment.

MEDICAL EDUCATION [35, 36, 37]

A significant part of both undergraduate and graduate medical education involves increasing levels of patient care responsibility as the experience of the student/physician increases. Disease Staging can be used as a part of systems designed to document these clinical experiences. For example, what is the mix of severity of illness of patients with diabetes mellitus seen by medical students? Does the student have adequate experience managing a patient with this disease to avoid, as well as in treating complications which may occur? Does this vary depending on the site where the students perform their clerkship? Is there significant variation from student to student?

Similarly, Disease Staging concepts can be used to evaluate the content of the curriculum. To what extent does the medical curriculum address Stage 1 illness and to what extent does it address Stage 3 illness? To what extent is attention devoted to problems associated with particular body organ systems or to problems of a particular etiological nature?

Use of Disease Staging can also help the student and resident become more effective diagnosticians. By understanding the evolution of a disease, the physician will use the laboratory more effectively and avoid delay in arriving at an accurate diagnosis.

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DISEASE STAGING CODED STAGING CRITERIA

The medical criteria can be applied on a manual basis to medical records to analyze diseases of patients within an institution or within a selected disease category. While this requires only a few minutes per patient, and may be acceptable for physicians in recording diagnoses on patient charts, it is too time-consuming and costly for use in large-scale research projects and utilization reviews. A computerized version of Disease Staging is required to facilitate analyses of large numbers of hospitalized patients.

A team of medical records professionals is employed to translate each stage and substage definition into diagnostic codes. Operationally, a procedure similar to that used for the medical (clinical) criteria is used for the coding process. Each medical staging criteria set is coded independently and then reviewed by a clinical data specialist to resolve discrepancies. When necessary, physician panel members are consulted to assist in making the final decision.

Two types of problems are addressed in translating the medical criteria into coded criteria: the specificity in the coding systems themselves and the availability of certain data on a typical discharge abstract. Code specificity can be a problem because coding systems do not always allow for the precision specified by the clinical criteria within substages. For example, the medical criteria for external hernia classify “irreducible external hernia and intestinal obstruction” as Stage 2.01 and “strangulated external hernia” as Stage 2.02. However, it is not possible to differentiate between obstruction and strangulation in the ICD-9-CM coding system.

This problem is resolved via a conservative strategy to understate stage of disease. For example, a patient with the diagnostic codes of femoral or ventral hernia with obstruction is classified as Stage 2.01 since it is unknown whether the hernia resulted in obstruction or strangulation. Of course, if this patient had other complications of an external hernia, such as septicemia, then the patient would be classified at the appropriate higher stage.

Detailed refinements were also necessary when translating the criteria to ICD-9-CM and ICD-10 diagnosis codes because of a lack of data (primarily physical findings, laboratory results and diagnostic imaging) in most discharge abstract data systems. It is not possible to specify a stage (or substage) that is defined solely on laboratory results by use of discharge abstract data. For example, the stages of aplastic anemia are defined in terms of hemoglobin levels, white blood cell counts, and platelet counts. Again, the coded criteria will understate the severity of the disease if the supporting evidence is not represented by a unique diagnosis code.

THE DISEASE STAGING SOFTWARE

Once the Staging criteria are coded, a software package is developed for assigning disease categories and stages to the diagnosis codes found on medical record abstracts or hospital insurance claim records. Every diagnosis code on the patient record is assigned a disease category and is staged. The staging algorithms are designed to be exhaustive so that the input of patient diagnosis code data always results in at least one disease category being defined. If additional diagnoses are included on the record, the patient may be assigned multiple disease categories.

Once each diagnosis has been staged, a Principal Disease Category (PDXCAT) and a Principal Stage value are assigned. There is only one PDXCAT for each

admission, and it is based on the principal diagnosis that appears on the inpatient record. A secondary diagnosis may be a complication of the PDXCAT. For example, when diabetes mellitus is present as the principal diagnosis and both retinopathy and neuropathy are secondary diagnoses, the latter are considered manifestations or complications of diabetes and are used by the software logic in establishing the stage for diabetes.

All the additional DXCATs that will appear on the record use secondary diagnoses to establish the DXCAT and are unrelated to the PDXCAT and to each other. A secondary diagnosis and associated DXCAT will fall into one of the following categories:

Unrelated Comorbidity - A secondary diagnosis that is not associated with the PDXCAT or other DXCATs is an unrelated comorbidity.

Symptoms - In many cases, codes for symptoms appear in the patient record in addition to the codes for disease. This type of combination is exemplified by a secondary diagnosis code for abdominal pain for which the principal diagnosis is appendicitis.

PATIENT LEVEL SEVERITY METHODOLOGY

Disease specificity has always been a key strength of Disease Staging. However, this characteristic also makes it difficult to quantify patient-level severity of illness especially if a patient has multiple diseases. Disease Stages are expressed as ordinal levels that cannot simply be averaged across diseases to describe a patient's overall severity of illness. Consequently, The MEDSTAT Group developed a number of patient level measures, or predictive scales, that combine the information about a patient's diseases and their severity and correlate this information with outcome measures.

RESOURCE SCALES

The MEDSTAT Group has developed separate predictive scales for hospital charges (resource demand) and length of stay (LOS). The reason for this is that while charge and LOS are highly correlated, they do not correlate in a linear fashion. While the shortening of length of stay has allowed many hospitals to lower their average charges, the decrease in length of stay does not correspond to a proportional decrease in charges. Many studies have demonstrated that treatment intensity is usually highest early in the hospital stay. Total charges therefore tend to decrease at a slower rate than the average LOS. For example, for certain diseases, such as cancers, the cost of treatment may decrease with severity because of the futility of any further active intervention, while at the same time the mortality rate goes up for each stage and substage.

To derive the various scales, The MEDSTAT Group conducts empirical analyses on a database containing approximately 15 million patient records. The predictions were derived from multiple regression models. An algorithm for combining multiple DXCATs to derive a single measure for the affect of comorbidities was developed and is applied.

For the Charge and LOS scales, regressions are run for each DRG and DXCAT combination separately. The independent variables consist of variables whose values tended to correlate with patient severity. Such variables include the

patient's DXCAT and stage, age, sex, comorbid conditions, and whether the patient was an emergency admission.

TOTAL RESOURCE DEMAND SCALE RDSCALE

The Overall Resource Demand Scale (RDSCALE) is a measure of resource consumption scaled to average 100 across all patients (regardless of DRG) in the development database. That is, RDSCALE is a patient's predicted charge as a percent of the average of predicted charges taken over all cases in the development database.

WITHIN DRG RESOURCE DEMAND SCALE - DRGSACLE

The DRG Resource Demand Scale (DRGSCALE) is a within-DRG measure of resource consumption scaled to average 100 in each DRG. That is, DRGSCALE is a patient's predicted charges as a percent of the average of predicted charges taken over all cases in that DRG. Thus, a DRGSCALE value of 120 indicates that a patient is expected to have a 20 percent greater average resource consumption than the average for patients in that DRG. It is important to keep in mind that an individual patient's actual resource utilization will likely vary from predicted resource utilization. As a result, DRGSCALE has greater precision as a predictor of average resource utilization for a group of patients than as a predictor for a single patient.

LENGTH OF STAY SCALE - LOSSCALE

The Length of Stay Scale (LOSSCALE) is an overall measure of likely length of stay scaled to average 100 across all patients, regardless of DRG, in the development database. Like RDSCALE, it represents a patient's predicted length of stay. It is described as a percent of the average length of stay in the development database.

LOS AND CHARGE LEVELS

A great deal of interest surrounds the predicted scales for individual patients. However, the variation in the prediction at the patient level is extremely high and for this reason drawing any conclusions at this level is extremely difficult. The reliability of the estimates improves as the predictions are aggregated into ranges.

To meet the interests of those desiring patient level statistics, LOS and RD and DRG Levels were devised and are included in the software output. The levels are explained in Table 3 below.

Table 3
Disease Staging Software
Patient Level
LOS, RD AND DRG Scale Definitions

LEVEL	PERCENTILES
+	> 95
High	75 - 95

Medium	25 - 75
Low	5 - 25
-	< 5

MORTALITY SCALE

The MEDSTAT Group's mortality scale was produced from the same development database described above. The first step in the process was accomplished by segregating surgical and medical DRGs. This is necessary as surgical procedures are an important predictor of in-hospital mortality.

The occurrence of an in-hospital death is an infrequent event. As a result reliable regression models could not be developed for all DRGs and/or DXCATs. As a result, the medical and surgical discharge groups were further divided on whether there were a sufficient number of discharges to run regressions. The data and expected mortality rates were calculated within the classes described below:

Class 1 - Medical Admissions – observed rates of death are calculated at the DXCAT and integer stage level where there were fewer than 300 discharges for a DXCAT. The observed death rates are used in the calculation of the mortality scale values for these DXCATs.

Class 2 – Medical Admissions – Prediction models analogous to the LOS and Charge models is developed where there were 300 or more discharges for a DXCAT:

Class 4 – Surgical Admissions – Observed rates are calculated at the DRG/DXCAT and integer stage level where there were fewer than 300 discharges for a DXCAT and used in the calculation of the mortality.

Class 5 – Surgical Admissions – Prediction models analogous to the LOS and Charge models are developed where there were 300 or more discharges for a DXCAT. The form of the models described for Class 2 were employed for this group of calculations with the difference being that the predictions were made at both the DRG and DXCAT level.

The Mortality Scale is calculated by dividing the predicted mortality, obtained from one of the four classes described above, by the overall rate of in-hospital mortality from the development database times 100.

MORTALITY LEVELS

Mortality levels are output for patients using the ranges and designations described for the LOS and Charge Levels (see Table 3). (Expected mortality of = .001 is considered near zero and not included in the calculation of the levels. The vast majority of the discharges in this group are normal deliveries.)

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