All-Payer Severity-Adjusted Diagnosis-Related Groups: A Uniform Method To Severity-Adjust Discharge Data

Measuring severity of illness within diagnosis-related groups (DRGs) has become increasingly important because of the growing need to compare outcomes across providers. In response to these needs, the Health Care Financing Administration (HCFA) has developed a DRG-based severity system as a refinement to its current Medicare DRG structure. As a result of this recent HCFA research, all-payer severity-adjusted DRGs (APS-DRGs) have been developed to provide a uniform approach for severity classification that is also applicable to the all-payer population. Key words: *diagnosis-related groups, relative weights, severity*

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DIAGNOSIS-RELATED Groups (DRGs), or variations thereof, are used internationally to categorize inpatient hospitalizations into classes of cases that are similar in cost and clinical meaning.[1] Since being implemented as the basis for Medicare prospective payment in 1983, the DRGs have been modified and expanded in a number of ways by both the Health Care Financing Administration (HCFA) and other public and private groups. DRG enhancements have included the development of new DRGs as well as the modification of existing DRGs to improve within-DRG homogeneity and to reflect changing practice patterns and technology. Examples of such DRG modifications include the addition of new groups for laparoscopic surgeries, human immunodeficiency virus (HIV) infection, and multiple significant trauma. Other enhancements have been driven by the need to adjust for a basic limitation in the current HCFA DRGs: an inability to account adequately for differences in sever-

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ity of illness. Finally, groups other than the HCFA have extended the DRGs to apply to a non-Medicare, all-payer (under age 65) population.

In addition to ensuring equitable payments to hospitals, measuring severity of illness within DRGs has become increasingly important because of the growing need to compare outcomes across providers. In response to these needs, the HCFA has developed a DRG-based severity system as a refinement to its current DRG structure.[2] These severity-adjusted DRGs (S-DRGs) offer the potential of serving as a nationally recognized and nationally utilized severity-adjustment methodology. The S-DRGs, however, like the current HCFA DRGs, are targeted to the over 65-year-old population and largely ignore the pediatric and neonatal populations. In addition, because S-DRGs were designed to be used for hospital reimbursement, decisions were made that limit the number of S-DRGs, resulting in a severity system that has an inconsistent severity structure across DRGs.

HSS, Inc. developed all-payer severity-adjusted DRGs (APS-DRGs) in response to these limitations with the intent of creating an all-payer generalization of the S-DRG structure. This article highlights the issues involved in severity-adjusting DRGs, describes the APS-DRG structure, and provides an illustration of how APS-DRG relative weights can be used to compare performance across providers.

MEASURING SEVERITY OF HOSPITAL INPATIENT CASES

Severity of illness measures in the inpatient arena have been defined as "systems that quantify risks of the short-term outcome for hospitalized patients."[3(p.11)] Such outcomes can be measured in terms of resource use, such as increased charges/costs or length of stay. Few argue that it is unimportant to adjust for patient differences when comparing outcomes of care. The difficulty lies in identifying a single approach that is appropriate for diverse patients, reasonable to implement, and easily understood by users.

Depending on the outcome being studied, severity adjustment can be modeled quite differently. Developers of severity-adjustment systems must always balance the need to improve statistical predictability with the requirement that the system be clinically coherent. Using a strictly statistical approach yields the best predictive performance, often focusing on maximizing explained variance in total charges. In contrast, a purely clinical approach yields the most medically meaningful system and thus a high degree of clinician acceptance. Combining these two approaches (statistical and clinical) produces a system that is statistically sound and can be accepted and endorsed by clinicians.

One of the fundamental differences in current severity-adjustment systems is the data required to drive the system. Some methodologies rely solely on data elements routinely collected and stored via the computerized discharge abstract (i.e., administrative data). Others require the reabstracting of medical records to collect additional clinical findings. Although the additional clinical data may add to the clinical meaningfulness of the severity measures, each condition may require unique data elements, making data collection costly and the method difficult to explain. Recent work by Iezzoni and colleagues has shown that systems relying solely on administrative data perform quite well across many applications compared with systems that involve additional record abstracting.[4]

Hospital discharge abstract data represent one of the most consistent and available sources of health data. Medicare's reliance on hospital discharge data (collected via the uniform bill) for prospective payment has led to increasing standardization and quality. Coding of diagnoses and

procedures is accomplished through the *International Classification of Diseases*, 9th revision, clinical modification (ICD-9-CM), a well-accepted and internationally used nomenclature. Although the clinical data are limited, the number of diagnoses and procedures fields has been expanded in recent years to facilitate collection of additional clinical data. Despite other limitations, discharge data are a rich data source that is increasingly used for outcome studies.[5]

DRG-BASED SEVERITY-ADJUSTMENT EFFORTS

The HCFA DRGs use principal diagnosis, secondary diagnoses, procedures, age, gender, and discharge status for initial patient classification. More severely ill patients are identified primarily through the use of secondary diagnosis codes, which are considered substantial complications or comorbidities (CCs). The HCFA has designated approximately 3,000 diagnosis codes as CCs. These diagnoses cover a broad spectrum of disease conditions, ranging from major acute illnesses (e.g., heart attack and stroke) to minor illnesses (e.g., otitis media and urinary tract infections). Diagnoses designated as CCs are expected to increase length of stay for 75 percent of the patients by at least 1 day. Although the HCFA has continued to maintain and enhance its list of CCs, there has been no attempt to develop a hierarchy within CCs, where some CCs would be designated as more complex or severe than others. These and other limitations have been addressed by many public and private groups, as discussed below. Table 1 summarizes these efforts.

Refined DRGs

Senior staff at HSS participated in the initial research and field testing of the refined DRGs (R-DRGs). The R-DRGs were originally developed by the Health Systems Management Group at Yale University in cooperation with the HCFA.[6] R-DRGs are closely related to the HCFA DRGs, using the same approach to initial patient classification. As a next step, adjacent DRGs (ADRGs) are created by combining all DRGs with and without CCs. For example, DRG 10 (nervous system neoplasm with CC) is combined with DRG 11 (nervous system neoplasm without CC) to form a single new group. ADRGs are then stratified based on the presence of specific secondary diagnoses that are designated as CCs. Medical ADRGs are divided into three subclasses: minor or no substantial CCs, moderate CCs, and major CCs. Surgical ADRGs are divided into four subclasses: the three medical subclasses plus an additional catastrophic CC category. If a patient has multiple secondary diagnoses, each is evaluated independently, and a class is assigned based on the most severe. The number of secondary diagnoses has no effect on class assignment. As of January 1995, there were a total of 1,194 R-DRGs.

New York all-patient DRGs

In January 1988, New York state implemented a DRG-based prospective payment system for all non-Medicare patients. This system was based upon a modified version of the HCFA DRGs known as the all-patient DRGs (AP-DRGs). The main difference between the original AP-DRGs and the HCFA DRGs was in the area of newborns. Using research performed by the National Association of Children's Hospitals and Related Institutions, the AP-DRGs created an enhanced set of newborn or neonatal DRGs based on birthweight, procedure, and combinations of secondary diagnoses. Over the years, the AP-DRGs have been further modified and refined, specifically in areas affecting the pediatric and under-65 population, including the addition and revision of DRGs for substance abuse, eating disorders, lead poisoning, and high-risk obstetrical conditions.

Table 1. Development of DRG-based severity measures

DRG-based severity measures	Year started	Approaches to severity adjustment and inclusion of all-payer populations	Number of groups (1/1/95)
HCFA DRGs	1983 (version 2.0)	3,000 diagnoses designated as substantial CCs Class assignment based on presence or absence of CC as secondary diagnosis Enhancements made to account for non-Medicare populations include creation of new DRGs (transplant, tracheostomy) and new MDCs (trauma and HIV)	492
R-DRGs	1985	Collapse ADRGs (with and without CCs and with age splits) ADRGs are split into categories of CCs with three medical classes and four surgical classes Neonatal model created with HCFA DRGs split into subgroups based on birthweight	1,194
AP-DRGs	1988	Specifically designed to account for cost variance for all ages and all types of patients Enhancements include creation of major CCs as subset of HCFA CCs 56 new DRGs created based on presence of major CC Procedure, secondary diagnoses, and age utilized to assign complex cases to a DRG before MDC assignment (e.g., tracheostomy, age < 29 days, HIV infection)	641
APR-DRGs	1993	Based on AP-DRG classification and R-DRG refinements Class assignment further adjusted for coexisting comorbidities through the assessment of non–operating room procedure, combinations of secondary diagnoses, age, and principal diagnosis Results in four medical and four surgical levels	1,437
S-DRGs	1994	Uses ADRGs and combines DRGs based on clinical judgment, resulting in CDRGs Class assignment based on CCs and major CCs, with three possible classes within surgical and medical CDRGs Classes are recollapsed when statistical criteria are not met Results in one, two, or three levels in both surgery and medicine	652

Table 1 continues

Table 1. *(continued)*

DRG-based severity measures	Year started	Approaches to severity adjustment and inclusion of all-payer populations	Number of groups (1/1/95)
APS-DRGs	1995	Uses CDRG classification from S-DRGs Class assignment based on CCs and major CCs but retains three classes within each CDRG Neonatal model uses birthweight, diagnoses and discharge status to create 21 neonatal classes Extends exclusion of certain secondary diagnoses as CCs or major CCs because their effect on severity is accounted for by assignment to MDC or DRG	1,076

In 1990, the AP-DRGs were further expanded to adjust for severity through the use of a new category of CCs known as major CCs. Major CCs are based on the Yale R-DRG secondary diagnoses that were designated as catastrophic for surgery and those designated as major for medical. These revisions resulted in 54 new groups based on major CC assignment.

A unique aspect of the AP-DRGs is the assignment of complex cases to a major DRG category based on the major diagnostic category (MDC) rather than by the creation of separate splits by DRG. This occurred when the presence of a Major CC in a surgical or medical case within an MDC was a better indicator of resource use than the type of surgery performed or the principal diagnosis. The resulting structure used to define the Major CC DRGs (i.e., the number and definition of medical and surgical categories) is not uniform and varies across MDCs. For example, MDC 2 (Eye) has one medical and one surgical Major CC DRG, while MDC 5 (Circulatory System) has two medical and six surgical Major CC classifications. This assignment of severity at the MDC level has been seen as combining groups of severely ill patients which require substantially more resources with those that require much less.[7] As of January 1995, there were a total of 641 AP-DRGs.

All-patient refined DRGs

The all-patient refined DRGs (APR-DRGs) are a proprietary patient severity classification system developed by 3M/Health Information Systems. The APR-DRGs are similar in many respects to the R-DRGs and AP-DRGs discussed above, in that they apply diagnosis-based severity class adjustments to an underlying structure of the ADRGs. The APR-DRGs utilize the AP-DRGs as their underlying base patient classification scheme and assign four patient subclasses to both medical and surgical patients: minor or no substantial CCs, moderate CCs, major CCs, and extreme or catastrophic CCs.

Unlike the systems discussed previously, the APR-DRGs adjust this initial diagnosis-based severity class using factors such as the presence of a specific nonoperating procedure, combinations of multiple secondary diagnoses, principal diagnosis, and age. For example, chronic renal failure is most often a severity class 2. If the diagnostic codes indicate that the patient was also

a diabetic, however, chronic renal failure is promoted to severity class 3. As of 1 January 1993, there were 348 basic APR-DRGs, each with four subclasses. These combined with the 45 neonatal APR-DRGs, resulting in 1,437 APR-DRGs.[7]

HCFA S-DRGs

The HCFA has recently developed an alternative DRG-based severity system to serve as the basis for Medicare prospective payment[7]: the S-DRGs. Under the HCFA's S-DRG structure, all paired DRG groupings (DRGs with and without CCs) are consolidated in a process similar to that used to create the ADRGs in the R-DRG system. Additional HCFA DRGs are combined because they contain patients with similar clinical patterns and resource use. Each consolidated DRG (CDRG) is then evaluated to determine whether it should be split based upon the presence of a major CC, a CC, both, or neither.

In S-DRGs, a list of specific secondary diagnoses designated as major CCs is used to differentiate more severely ill patients, much like the R-DRGs and the New York AP-DRGs previously discussed. Unlike the situation with the AP-DRGs, major CC categories in the S-DRG system are created at a DRG-like level, rather than an MDC level. Major CC categories are not automatically created for every DRG, but only for those DRGs that meet certain criteria, described below.

CC splits (including splits into levels of CCs) are only made when statistically significant differences are identified. To warrant creation of either a major CC or a CC subgroup within a CDRG, the subgroup has to meet the following criteria based on a 10 percent sample of the Medicare Provider Analysis and Review files:

- reduce variance in charges by at least 3 percent
- contain at least 5 percent of the patients in the CDRG
- contain at least 50 cases
- demonstrate at least a 20 percent difference in average charges with other subgroups
- have at least a $2,000 difference in average charges between subgroups

More than 100 CDRGs were not subdivided because they did not meet these criteria. Because CC or major CC groups are only made when these statistical criteria are met, the resulting model lacks a uniform clinical structure and is difficult for users to understand. It also presents problems when data are analyzed as a result of the inconsistent number of categories across CDRGs. For the CDRGs that are split, three different severity-adjustment scenarios are possible, as represented in Figure 1. Another concern with this statistically driven approach is that small groups of patients who are important clinically may be consolidated into a larger, clinically dissimilar category of patients. Moreover, a group that may be considered too small in the Medicare population to warrant a separate category may meet the subsample size criteria in the all-payer population.

The current severity model developed by the HCFA contains a total of 652 S-DRGs, 160 more than the HCFA DRG model. This nominal increase is the result of the HCFA's desire to limit S-DRG development to less than 1,000 final groups, a response to the historical criticism that too many groups leads to instability in DRG relative weights from year to year. By limiting the number of groups, the HCFA also ensured that its new classification system would maintain a three-digit final group number, the same size as the current DRG number. It should also be noted

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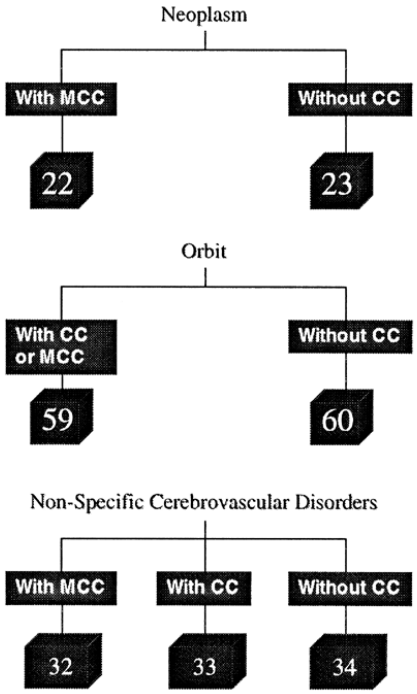

Figure 1. Possible S-DRG severity-adjustment scenarios. MCC, major CC.

that the S-DRGs are assigned sequential numbers. Therefore, there is no link between the S-DRGs and the underlying severity classification system.

APS-DRGs

Building upon the HCFA's S-DRG research and its own experience in constructing and updating DRG and R-DRG algorithms, HSS developed the APS-DRGs. They are an expansion of the S-DRGs and are designed to be applicable to all hospitalized patients, regardless of age, type of illness, or payer category. Like the previously discussed systems, the APS-DRGs use both principal and secondary diagnoses as well as the occurrence and degree of surgery as discriminating variables in patient classification and severity evaluation. In a few instances, the patient's age, discharge status, or birthweight may be taken into account.

The basic process of assigning nonneonatal APS-DRGs is reflected in the box. First, the HCFA DRG and MDC are assigned. Second, the CDRGs are assigned using the same underlying structure as the HCFA S-DRG model. Third, each secondary diagnosis is evaluated to determine whether it meets criteria for designation as a CC or a major CC. Fourth, each CDRG is split into three resource-based severity levels: no CCs, with a CC, or with a major CC. Unlike the HCFA S-DRGs, no aggregation of severity classes is performed. Last, the final severity class and APS-DRG are assigned using a consistent nomenclature. Thus the APS-DRGs begin with a nationally recognized and clinically acceptable model and apply a uniform structure that can be easily represented. Unlike S-DRGs, the APS-DRG numeric representation indicates the linkages back to the underlying severity classification system.

Figure 2 illustrates the basic differences in structure for the HCFA DRGs, S-DRGs, and APS-DRGs for the CDRG of degenerative disorder in MDC 1. As can be seen, in the HCFA DRGs there is a single DRG (DRG 12) for degenerative disorder. In this example, the DRG and CDRG are the same. In the S-DRG system, this CDRG is split into two S-DRGs: one with a major CC and the other without a major CC. Note that the "without major CC" category includes cases both with and without CCs. In the APS-DRG system, the CDRG is split into the full three distinct classes: with a major CC, with a CC, and without a CC or major CC.

The APS-DRGs further improve upon the S-DRGs by developing a severity model for neonates, a major segment of the all-payer patient population. This neonatal model reflects the body of scientific literature that has emerged over time with regard to classifying newborns into similar resource-based categories and with regard to

Basic Process for Assigning APS-DRGs

1. *Prepare data*
- Assemble required variables:
  —ICD-9-CM diagnoses and procedure codes
  —Age
  —Discharge status
  —Length of stay
  —Birthweight (if present)
- Assign HCFA DRG and MDC

2. *Assign CDRG*
- CDRG assignment is based on the HCFA DRG and may, in a limited number of cases, be reassigned using:
  —Age
  —Procedures
  —Discharge status

3. *Assign CC severity class to each secondary diagnosis*
- Evaluate each secondary diagnosis to determine whether it is a CC, major CC, or neither
- Determine whether the CC or major CC is excluded for the principal diagnosis, MDC, or CDRG

4. *Assign final severity class and APS-DRG to discharge*

Severity class	Description	Examples
0	No CC or major CC	Heart failure and shock without CC
1	At least one nonexcluded CC	Heart failure and shock with hypertension
2	At least one nonexcluded major CC	Heart failure and shock with acute renal failure

where APS-DRG group number is equal to CDRG plus severity class XXXY; XXX is CDRG and Y is severity class.

measuring severity of illness.[8] The single most important variable in explaining survival outcomes and length of stay among neonates is birthweight. For the APS-DRGs, a combination of birthweight and diagnoses is used to define a set of initial neonatal classes. A second important risk factor is the presence of respiratory distress. The APS-DRG model recognizes this factor through evidence of respiratory assistance or the presence of respiratory distress syndrome. A third critical dimension in classifying newborns is their discharge disposition. Here, APS-DRGs take into account the fact that newborns who either die or are transferred shortly after birth are likely to be more severely ill. There are 21 neonatal APS-DRGs.

Another major improvement with APS-DRGs is their handling of CC exclusions. Both the HCFA DRGs and the S-DRGs exclude certain secondary diagnoses as CCs because they are closely related to the patient's principal diagnosis. The APS-DRGs support this same exclusion logic and extend it to major CCs as well. For example, gastritis is considered a major CC, but if the principal diagnosis is peptic ulcer, the secondary diagnosis of gastrointestinal bleed is not con-

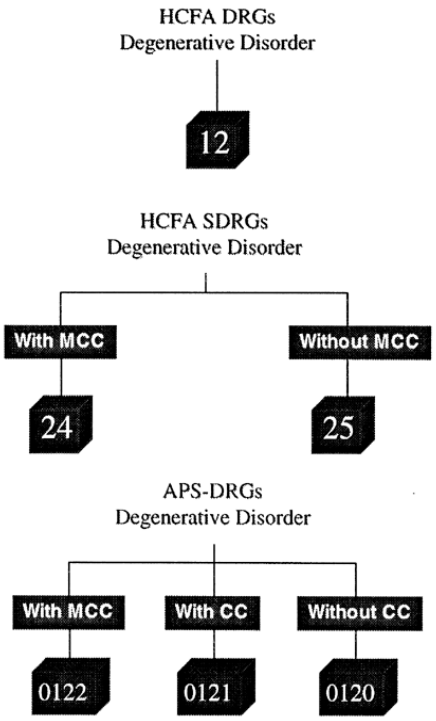

Figure 2. Comparison of structure of HCFA DRGs, S-DRGs, and APS-DRGs. MCC, major CC.

sidered a CC or a major CC. In addition, the APS-DRGs also support CC exclusions for specific MDCs and CDRGs. This occurs when the secondary diagnosis considered a CC is also used for assignment to the MDC (multiple significant trauma and HIV infection) or to the CDRG (e.g., CDRG 259, mastectomy for malignancy, or CDRG 372, vaginal delivery with complicating diagnoses). Thus the effect of these diagnoses on severity is accounted for by the assignment to the MDC or CDRG itself. The APS-DRGs have 424 more cells than the S-DRGs, resulting in 1,076 final groups. This resulted from the desire to create a uniform severity classification structure with the addition of the enhanced neonatal model required for all-payer patient populations.

VALIDATION OF APS-DRGs

APS-DRGs have been subjected to extensive testing for clinical and statistical validity. As described above, the core structure of APS-DRGs reflects an extensive body of research undertaken and supported by the HCFA. The S-DRGs have been evaluated by the developers and by other government groups, including the Prospective Payment Assessment Commission and the Office of Management and Budget.

Although HSS has relied on the work of the HCFA and other agencies to validate the core classification system used by APS-DRGs, considerable effort has been devoted to understanding and validating aspects that most clearly differentiate APS-DRGs from the S-DRGs and other DRG-based severity systems. The APS-DRGs were developed using 2.5 million discharge records that were broadly representative of all hospitalizations in U.S. community hospitals. HSS found that APS-DRGs reduced unexplained variance in charges by 26 percent compared with the HCFA DRGs.

More extensive testing has been done using 1.5 million discharges from release 1 of the National Inpatient Sample from the Agency for Health Care Policy and Research's Healthcare Cost and Utilization Project.[9] The study sample contained all discharges that took place in sample hospitals during the fourth quarter of calendar year 1992. Comparisons were made among APS-DRGs, S-DRGs, and version 12 of the HCFA DRGs. Variances in average charge and length of stay were examined using untrimmed data. As the results in Table 2 indicate, APS-DRGs consistently outperformed the other two measures, even for the Medicare and non-Medicare subgroups. APS-DRGs explained 44.4 percent of the variance in charges compared with 40.8 percent for the S-DRGs and 37.6 percent for the HCFA DRGs. APS-DRGs ac-

Table 2. Percentage of variance explained by severity of illness measures: Charges and length of stay

	Variance	
Grouping	**Charges**	**Length of stay**
All payers		
APS-DRGs	44.4	16.2
S-DRGs	40.8	14.7
DRGs (version 12)	37.6	13.2
Medicare		
APS-DRGs	44.0	14.4
S-DRGs	42.9	13.7
DRGs (version 12)	38.9	11.7
Non-Medicare		
APS-DRGs	44.0	15.6
S-DRGs	38.6	13.2
DRGs (version 12)	35.8	12.2

Source: Healthcare Cost and Utilization Project, National Inpatient Sample, release 1 (1992 data).

counted for more than 16 percent of the variance in length of stay.

APS-DRG RELATIVE WEIGHTS

To assess the overall severity, intensity, and complexity of patients in each APS-DRG, relative weights were calculated individually for both charges and length of stay. Relative weights measure the relative clinical demand for charges and length of stay associated with each APS-DRG, where 1.000 represents the average demand across all severity classes across all DRGs. Hence a relative weight of 1.200 indicates a 20 percent greater demand for charges or length of stay, and a relative weight of 0.800 indicates a 20 percent lesser demand. The methodology used to develop the APS-DRG charge and length of stay weights was derived from the HCFA DRG relative weight methodology.[10] APS-DRG relative weights were calculated using a nationally representative all-payer database covering all case types and payer classifications from short-term, general, non-federal U.S. hospitals. The method for calculating the relative weights is as follows:

1. All patient records were classified by APS-DRG.
2. Charges were standardized to remove the effect of wage differences in rural and urban areas.
3. Statistical outliers were eliminated by removing all cases outside 3 standard deviations from the mean of the log distribution of charges.

Table 3. Comparison of APS-DRG relative weights

DRG by APS-DRG	**Charge relative weight***	**Length of stay relative weight**
DRG 127: Heart failure and shock		
1270 (severity class 0)	0.6791	0.9222
1271 (severity class 1)	0.9232	1.2417
1272 (severity class 2)	1.6634	1.8927
DRG 106: Coronary artery bypass graft surgery with cardiac catheterization		
1060 (severity class 0)	4.5677	1.8115
1061 (severity class 1)	5.1532	2.2216
1062 (severity class 2)	7.4571	3.3465

*The overall HCFA charge relative weights for DRGs 127 and 106 are 1.0302 and 5.6187, respectively.

Table 4. DRG charge comparison by hospital for DRG 127: Heart failure and shock

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Cases		Clinical demand index	Actual charge per case	Clinically adjusted (CA) charge per case*	Per case charge (CA) above(/below) peer group	Total charges (CA) above (/below) peer group
Hospital	Number	%					
A	433	31.8	0.986	$6,144	$6,231	($1,400)	($606,200)
B	273	20.1	0.939	$7,797	$8,304	$673	$183,729
C	262	19.3	1.037	$9,311	$8,979	$1,348	$353,176
D	138	10.1	0.988	$7,332	$7,421	($210)	($28,980)
E	131	9.6	1.049	$9,790	$9,333	$1,702	$222,962
F	124	9.1	1.067	$7,067	$6,623	($1,008)	($124,992)
Peer group	1,361	100.0	1.000	$7,641	$7,641	$0	$0

*The calculation for column 6 is a result of dividing column 5 by column 4.
Data source: 1994 HCFA Medicare Provider Analysis and Review file.

4. Average standardized charge per APS-DRG was calculated by summing the standardized charges for all cases in the APS-DRG and dividing that amount by the number of cases classified in the APS-DRG.
5. Average standardized charge for each APS-DRG was divided by the national average charge across all APS-DRGs to determine the relative charge weight for each individual APS-DRG.

In the same manner, the average length of stay for each APS-DRG was computed (excluding the statistical outliers) and divided by the national average length of stay across all APS-DRGs to determine the relative length of stay weight for each individual APS-DRG.

The need for charge and length of stay weights for patients in different DRGs but with the same severity class is represented in Table 3. For example, although severity class 2 patients in DRG 127 (heart failure and shock) and DRG 106 (coronary artery bypass graft surgery with cardiac catheterization) both represent the highest level of severity within their respective DRGs (APS-DRGs 1272 and 1062), they are not directly comparable because of differences in the intensity and complexity associated with their DRG assignment. The APS-DRG 1272 charge weight of 1.6634 and the APS-DRG 1062 weight of 7.4571 provide an objective means to quantify the differences in resource requirements across the two APS-DRGs.

Relative weights can also be used for comparisons within DRGs. Table 4 compares charges for DRG 127 (heart failure and shock) across six hospitals. Relative weights have been aggregated across severity classes within DRGs to provide an overall relative weight, referred to as a clinical demand index. The data show that Hospital F has the highest clinical demand index, 1.067, indicating that this hospital has the highest demand for resource consumption based on patient severity of illness. Consequently, after adjusting for severity, Hospital F's average charge per case decreases from

$7,067 to $6,623, allowing an accurate comparison of financial outcomes to be made.

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The increasing emphasis on comparing costs across health care providers has exposed the importance of adjusting for patient differences. The APS-DRGs are a logical extension of the HCFA S-DRGs, with several significant enhancements:

- the APS-DRG structure is simple, explicit, and easily understood
- the APS-DRGs, unlike the HCFA S-DRGs, represent an all-patient system
- the APS-DRGs provide a unique neonatal model
- the APS-DRGs implement major CC exclusion logic
- the APS-DRGs use a uniform clinical structure to represent levels of severity

Whatever severity adjustment system is used, it must balance statistical analysis with clinical coherence, it must be easily understood and explained, and it must be continually updated and enhanced to maintain consistency with changes in coding as well as changes in the delivery of health services.

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