

Overview of the RDRG[®] Severity System

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RDRG Development

RDRG development began at Yale University in 1986 when the same group of researchers that created the DRGs responded to a request from the Health Care Financing Administration (HCFA), now the Centers for Medicare and Medicaid Services (CMS), to investigate the concern that the DRGs did not adequately adjust for the severity of a patient's illness.

The study to refine the DRGs was funded by HCFA for \$600,000 and was completed in February 1989. Its title was "DRG Refinement with Diagnostic Specific Comorbidities and Complications: A Synthesis of Current Approaches to Patient Classification." Professor Robert Fetter was the Principal Investigator, Jean Freeman was the Co-Principal Investigator and Karen Schneider, now President of Health Systems Consultants, Inc., was the Project Director. A 3-volume final report¹ for the study is available, as well as an Executive Summary.

1. Data Sources and Data Requirements

The data sources for the development of the DRG refinement severity-of-illness system were two all payor, all patient acute care hospital data bases: about 600,000 discharges from the state of Maryland in 1984; and close to 3 ½ million discharges from the state of California in 1984. Researchers validated the final DRG refinement model using a 20 percent sample of 1986 Medicare hospital claims data (about 2 million discharges) and over 1 ½ million hospital discharges from the state of Ohio in 1986. Therefore the DRG refinement system is appropriate for all patients, not just Medicare patients.

The data requirements for the DRG refinement system are those available from the UB-92. They are the same data elements that are required for CMS DRG assignment and are shown in Appendix 1. Any future data source that includes information from the Uniform Hospital Discharge Data Set² will allow classification into the DRG refinement groups.

2. Methodology to Adjust for Severity

The DRG refinement methodology to adjust for severity is fully described in the project's final report¹, in Chapter 3 of the book, DRGs: Their Design and Development edited by Professor Robert Fetter³ and in an article entitled, "DRG Refinement With Diagnosis and Procedure Specific Comorbidities and Complications,"⁴ published in the August 1995 issue of Medical Care.

Severity of illness is addressed in the system's methodology by determining the relationship between secondary diagnoses and hospital resource use within diagnosis and procedure categories. The categories are named Adjacent DRGs or ADRGs and consist of sometimes one, but often more than one DRG defined by the same principal diagnoses (medical patients) or procedures (surgical patients).

Some examples of medical ADRGs from the digestive system include digestive malignancy, GI hemorrhage and complicated peptic ulcer; examples of surgical ADRGs from the same system include rectal resection and major small and large bowel procedures. The secondary diagnoses were those on the DRG comorbidities and complications (CC) list. These secondary diagnoses were grouped into clinically similar categories (DXCATs) to simplify the analysis of the data.

A physician panel identified those DXCATs that they predicted would be associated with higher levels of hospital resource use within each ADRG.

Hospital discharge data for all adult patients (18 years and over) in the Maryland and California data bases were analyzed using a regression procedure that identified the statistically significant associations between the DXCATs and hospital resource use in terms of length of stay (LOS) and total charges, the dependent variables. Separate analyses were performed for each ADRG. The unit of analysis was the hospital discharge. The independent variables were dummy variables denoting the presence or absence of the DXCAT on the patient record.

Descriptive statistics were produced to identify anomalies or outliers in the data. Two variables, temporary tracheostomy and early death for medical patients, were found to be strongly associated with extremely high or low resource use respectively. Patient discharges that included these variables were separated out as special subgroups and the regressions were performed on the remaining data.

DXCATs that were either hypothesized by the physician panel as important predictors of hospital use or identified by the regression procedure were assigned to classes representing different levels of resource use. The criteria for class assignment in each database and for medical and surgical patients are included in the Medical Care article⁴ and are based on the effect these DXCATs had on LOS and charges. This effect was measured by differences and ratios in mean resource use (LOS and charges) between patients with the DXCAT in an ADRG and the baseline patients in the ADRG. Baseline patients were those patients with no secondary diagnoses or with minor secondary diagnoses not found on the CC list. The criteria for the difference in mean charges used in the two data sets were different because daily charges for baseline patients in each data set were different. The model is hierarchical so that DXCATs meeting criteria for more than one class were assigned to the highest class. An additive model was attempted but improvement in terms of variance in LOS and charges was only slight and the complexity of the model was greatly increased.

Tables¹ were produced that summarized the class assignment for medical and surgical patients in each database. The columns of these tables gave the ADRGs in each Major Diagnostic Category (MDC) and the rows showed the DXCATs. Cells of the tables contained the information used for class assignment, the number of discharges and the class to which the DXCAT was assigned. Separate tables were generated for the Maryland and California databases.

The final model was constructed in three steps. First, each DXCAT was assigned to a generic or systemwide class based on where the plurality of discharges with that DXCAT in the combined Maryland and California databases were assigned. The generic classes for medical patients were 0, 1 or 2. Medical class 2 was the highest (most severe) class and medical class 0 was the lowest (least severe) class. The generic classes for surgical patients were 0, 1, 2, and 3. Surgical class 3 was the highest surgical class and surgical class 0 was the lowest (least severe) class.

In the second step in the final model, exceptions to the generic class assignments were made on an ADRG specific basis if both databases showed a different level of resource use for DXCATs in the specific ADRG. To allow this exception to the generic assignment, the physician panel had to agree on a clinical explanation and the ADRG had to contain at least 26 discharges.

The third and final step involved a re-examination of the initial generic class assignment based on the plurality rule, in light of these exceptions, especially those DXCATs assigned to the highest and lowest classes. Changes in the generic class assignment were made for 20 DXCATs.

The final model was evaluated for its performance in predicting charges and compared to the DRG

system using the 1986 MEDPAR data base and the Ohio 1986 all payor, all patient hospital database. The DRG refinement results for both databases were similar (r-square .381 for all patients; r-square .456 with 1 percent of outliers removed) compared to the 1986 DRGs (r-square .290 for all patients and r-square .340 with 1 percent of the outliers removed).

3. Severity Adjustment for all Hospitals and all Discharges Including Pediatric Cases

Although the DRG refinement model used adult patients from the Maryland and California hospital statewide databases and was validated using MEDPAR data and adult patients from Ohio, it is appropriate for all hospital patients including pediatric and neonatal cases. Near the end of the study the model was applied to a pediatric population from the 1986 Ohio database (115,000 children) and found to perform extremely well. Gradations among the classes were similar to those in the adult populations. However, in general, the pediatric cases had lower lengths of stay and lower charges than adult cases. If a reimbursement system were developed based on the model, a special study would be required to determine appropriate relative weights for the pediatric cases.

At the end of the study, the project team developed a special neonatal model using over 325,000 infants from the 1984 California state database. Unlike the DRG model, this model focused on birth weight. It produced 16 groups which, when evaluated in terms of predicting charges, provided an r-square of .365 compared to .213 for the neonatal DRGs. When 2 percent of the outliers were removed the r-squares were .430 and .235 respectively.

A total of 1146 refinement groups were created by the DRG refinement study: 167 medical ADRGs with 3 classes each; 145 surgical ADRGs with 4 classes each; 22 early death groups; 22 temporary tracheostomy groups; 16 neonate groups; and 5 unmodified ADRGs (468, 469, 470, 476, and 477). These last groups were not assigned classes.

4. Outcome Measures

Any casemix analysis that can be performed with DRGs can also be performed with the DRG refinement severity groups. However, DRG refinement system results will be more accurate because more information (particularly regarding secondary diagnoses) is taken into account. For example, it is possible to determine subsets of patients in a particular DRG requiring more hospital resources than the overall average for the DRG. These subsets of patients would be more severely ill than other patients in the DRG.

5. Comparison Norms and Validation Tests

Providing relative weights for the DRG refinement system is a straightforward task that can be accomplished using a number of methodologies such as Centers for Medicare and Medicaid Services' annual recalibration for the DRG system. Weights are not currently provided in the DRG refinement system software since users need to determine the comparison group that is most appropriate. For example, mean charges for discharges in a particular DRG refinement severity group from an individual hospital should probably be compared to the mean charges for that DRG refinement group from all the state's hospitals.

The DRG refinement system final report ¹ contains tables of mean charges from the MEDPAR database that can be used to generate comparison norms. More up-to-date comparison norms can be developed from recent MEDPAR data or from the many publicly available state hospital discharge datasets.

In addition to the evaluations described above in sections 2 and 3, the original Yale severity model was examined by Dr. Thomas MacKenzie of Queen's University in Ontario.⁵ His HCFA funded study, completed in February 1991, compared the DRG refinement severity system (described as RGN from Yale), AIM, APACHE, CSI, Disease Staging, the Medicare Mortality Predictor System (MMPS), MEDISGROUPS and PMCs. He concluded that the DRG refinement system seems "to be the system of choice." A study completed by the Massachusetts Health Data Consortium in January 1992 compared several classification systems including DRGs, APR-DRGs, and the DRG refinement severity system and showed that the APR-DRGs and the DRG refinement system had similar overall r-square values. However, the DRG refinement system outperformed the APR-DRGs in 20 of 23 MDCs. These data are shown in Appendix 2.

Lisa Iezzoni at Harvard Medical School and Beth Israel Hospital in Boston, Massachusetts has compared the major severity systems including the DRG refinement system and has reported on her results in the literature.^{6,7}

The DRG refinement severity software, now called the RDRG severity system, is updated annually by Health Systems Consultants, Inc. in New Haven, Connecticut. It uses a team of physicians to incorporate Centers for Medicare and Medicaid Services' new DRG and ICD-9-CM changes and is validated using the most current Maryland hospital database. The source of these data is the Maryland Health Services Cost Review Commission in Baltimore, Maryland. The FY 2009 software is validated using full-year 2007 and half-year 2008 Maryland data. There are currently almost 20 versions of the RDRG system software allowing multi-year trend analyses. The most up-to-date version of the RDRG software for FY 2009 (October 1, 2008 – September 30, 2009) contains 538 DRGs and 1324 terminal refinement groups as shown in Appendix 3. All of the RDRG severity software provides both DRGs and RGNs (refinement group numbers or RDRG terminal groups). The most recent version of the software gives Version 24 DRGs and RDRG groups based on the CMS Medicare Severity DRGs (MS-DRGs). This RDRG version, 22.0/24.0, includes all the ICD-9-CM code changes, CC lists and new diagnosis and procedure codes in the Version 26 MS-DRGs.

A recent analysis by Health Systems Consultants shown in Appendix 4 compares the DRG, MS-DRG and RDRG systems for FY 2009 using the methodology adopted by the Yale research group for the original study in 1989. Separate tables are given for all patients and for non-outliers. MDC 26 contains surgical discharges with no surgical procedure related to the principal diagnosis. As seen in both tables, the RDRG system outperforms the other systems overall, and in almost every MDC, in terms of charges and length of stay. The results are impressive for many MDCs. The RDRG system is particularly strong in areas where the MS-DRGs are weak, namely newborns, pregnancy and childbirth, the female reproductive system and pediatrics.

6. Report Generation

The RDRG severity software interfaces readily with any report generation program. Most users install the PC version of the software and have available such packages as Microsoft Excel, Microsoft Access, etc. However, there is a VAX (VMS) version of the software and the software is available for Unix systems.

RDRG severity reports can be used to improve hospital casemix analysis, to compare hospitals to their peer group or to a state standard, to evaluate physician or department performance, to assess quality of care, to assist in hospital rate review, PPO negotiations or Medicaid reimbursement and to develop

global budgets.

7. Sample Reports

Sample reports using the software are shown in Appendix 5 for full year 2007 and half-year 2008 Maryland (1) medical patients in MDC 5 (Cardiovascular System), (2) surgical patients in MDC 6 (Digestive System), (3) common pediatric medical diagnoses, and (4) neonates.

8. Vendor

Health Systems Consultants, Inc. (HSC) has been in business for almost twenty years. It has been providing the RDRG software since February 1989. Karen Schneider, President of HSC, was the Project Director at the Health Systems Management Group at Yale University from 1982 through 1989 and currently has a research faculty position (Research Scientist) at the Yale School of Medicine.

9. Clients

It is difficult to determine an exact number of users of the RDRG system, since HSC provides the software to numerous vendors and consultants. However, patient discharge data from every hospital in the United States are currently analyzed using the RDRG system. In addition, the RDRG system was used to develop DRG severity systems in Australia, Canada, Germany, Sweden and Korea.

10. Product Enhancement

Health Systems Consultants, Inc. provides RDRG software that functions like the CMS DRG grouper and is provided in as many environments as possible to insure wide applicability. The company focuses on updating and validating the software annually and distributing the product widely. It plans increased marketing efforts in the current year. The company provides educational presentations to describe the RDRG system methodology and its applications. HSC provides the software to individual hospitals and hospital systems, but also to vendors and consultants who produce reports, create interfaces, and assist clients in making the best use of this severity-of-illness system.

11. Pricing Structure and Data Release

Health Systems Consultants, Inc. offers PC (Windows), Unix, and Vax versions of the RDRG system software to individual hospitals for a reasonable license fee according to hospital bed size. These prices include telephone assistance for installing the grouper. Contracts for use of the software are available for hospital systems, vendors (sublicensing), consulting companies, academic institutions, and national health care organizations. For detailed pricing information, please contact HSC at 203-785-0650.

The software is updated annually and is available on November 15 every year.

The software is easy to use. Health Systems Consultants, Inc. has never had to go on-site to assist with software installation. Training seminars to explain the system cost about \$750-1000 per day plus travel expenses.

12. Customer Feedback

The IBM PC (and compatibles) MS-DOS/Windows/Unix version "runs like a watch" according to one

client. Another client said he processed 400,000 records in a half-hour using the PC grouper.

A recent client said about Health Systems Consultants, "The service you provide to your customers is second to none."

Another said that HSC has "a wonderful product."

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Appendix 1

Data Fields

<u>Name</u>	<u>Coding</u>
Principal diagnosis	ICD-9-CM, first listed
Secondary diagnoses	ICD-9-CM, up to 30
Procedures	ICD-9-CM, up to 30
Age	0 through 124
Gender	1=male, 2=female
Disposition	1=home, 2=short term hospital, 3=skilled nursing facility, 4=intermediate care facility, 5=cancer center or children's hospital, 6=home health service, 7=left against medical advice, 20=died, 30=still a patient, 43=federal hospital, 50=hospice, home, 51=hospice, medical facility, 61=swing bed, 62=rehab facility/unit, 63=LTC hospital, 64=nursing facility-Medicaid certified, 70=other institution, 71=OP services-other facility, 72=OP services-this facility
LOS (length of stay)	3-digit number (days)
Birth weight (optional)	4-digit number (grams)

Appendix 2

Massachusetts Health Data Consortium Study
 January, 1992
 880,000 Hospital Records
 R-squared Calculated Using Untrimmed Adjusted Charges

Category	HCFA 6.0	AP-DRG 8.0	APR 7.0	RDRG 2.3
Overall	0.2781	0.3940	0.3987	0.3904
MDC 1 Nervous	0.1246	0.1926	0.1910	0.2933
MDC 2 Eye	0.0357	0.0746	0.0988	0.4468
MDC 3 Ear, Nose	0.2117	0.2441	0.2990	0.3336
MDC 4 Respiratory	0.3453	0.2348	0.2362	0.3848
MDC 5 Circulatory	0.3239	0.4129	0.4262	0.4655
MDC 6 Digestive	0.2475	0.3362	0.3360	0.3888
MDC 7 Hepatobiliary	0.2396	0.2833	0.2970	0.3835
MDC 8 Musculoskeletal	0.2754	0.3472	0.3665	0.3754
MDC 9 Skin	0.1317	0.1588	0.1694	0.1818
MDC 10 Endocrine	0.0775	0.1322	0.1212	0.1396
MDC 11 Kidney/Urinary	0.1986	0.2684	0.2941	0.3358
MDC 12 Male Reproductive	0.1606	0.2327	0.2741	0.3168
MDC 13 Female/Reproductive	0.1632	0.2223	0.2964	0.3998
MDC 14 Pregnancy/Childbirth	0.2889	0.3072	0.3289	0.3209
MDC 15 Newborns	0.1750	0.4554	0.4549	0.4044
MDC 16 Blood	0.0854	0.1519	0.1590	0.2474
MDC 17 Myeloproliferative	0.2122	0.3081	0.3214	0.3661
MDC 18 Infectious/Parasitic	0.1748	0.2757	0.2808	0.3943
MDC 19 Mental	0.0331	0.0344	0.0568	0.0602
MDC 20 Alcohol/Drug Use	0.1278	0.0913	0.1079	0.1536
MDC 21 Injuries/Poisonings	0.1409	0.2239	0.2507	0.2950
MDC 22 Burns	0.4269	0.4289	0.4956	0.5126
MDC 23 Health Status	0.1677	0.1666	0.2364	0.2350
MDC 24 HIV Infections		0.0307	0.0306	
MDC 25 Multiple Trauma		0.1211	0.2119	

Appendix 3

MDC	Med ADRG	Med RGN	Surg ADRG	Surg RGN	Tot RGNs
1	21	63	9	36	99
2	4	12	6	24	36
3	10	30	12	48	78
4	15	45	2	8	53
5	15	45	28	112	157
6	10	30	13	52	82
7	5	15	8	32	47
8	16	48	26	104	152
9	7	21	9	36	57
10	5	15	8	32	47
11	9	27	9	36	63
12	5	15	8	32	47
13	3	9	11	44	53
14	9	27	5	20	47
16	4	12	2	8	20
17	8	24	4	16	40
18	6	18	2	8	26
19	8	24	1	4	28
20	3	9	0	0	9
21	5	15	4	16	31
22	7	21	1	4	25
23	4	12	1	4	16
24	1	3	3	12	15
25	2	6	1	4	10
Pre MDC					
Heart Trans 103			1	4	4
Liver Trans 480			1	4	4
Bone Marrow 481			1	4	4
Trach/mouth 482			1	4	4
Lung Tran 495			1	4	4
Pan/kid Tran 512			1	4	4
Pan Trans 513			1	4	4
Unrel OR Proc					
468			1	4	4
476			1	4	4
477			1	4	4
Total	182	546	183	732	
Early Death		24		0	24
Newborn		18		0	18
DRG 469		1		0	1
DRG 470		1		1	1
PreMDC					
Trach--541-542				2	2
TOTAL					1324

Appendix 4

**R-squared analysis: Maryland 1/2007-6/2008 data, Version 22 RGNs, Version 24 CMS-DRGs and Version 26 MS-DRGs, All Ages
All Patients**

Group		Title	Num Pts	A Chg	ALOS	R2 Chg	R2 Chg	R2 Chg	R2 LOS	R2 LOS	R2 LOS
			RGN	RGN	RGN	RGN	CMS	MS-DRG	RGN	CMS	MS-DRG
All	0		1111111	\$11,149	4.3	0.5004	0.4422	0.4728	0.4268	0.3476	0.3884
MDC	0	Pre-MDC	4276	\$150,259	33.0	0.1976	0.1728	0.1772	0.2425	0.2128	0.2251
MDC	1	NERVOUS	66936	\$ 11,543	4.2	0.3285	0.2707	0.3251	0.3248	0.2263	0.2830
MDC	2	EYE	2014	\$ 7,757	2.7	0.2957	0.0531	0.0861	0.3088	0.1238	0.1842
MDC	3	EAR, NOSE, MOUTH	12397	\$ 7,409	2.6	0.3524	0.2298	0.2852	0.2261	0.1131	0.1646
MDC	4	RESPIRATORY	98475	\$ 10,555	4.8	0.4005	0.3519	0.3969	0.3313	0.2534	0.2956
MDC	5	CIRCULATORY	176482	\$ 12,055	3.6	0.5125	0.4623	0.4990	0.4484	0.3547	0.3948
MDC	6	DIGESTIVE	93625	\$ 10,826	4.5	0.3733	0.2918	0.3644	0.4107	0.3415	0.3780
MDC	7	HEPATOBIILIARY	28032	\$ 12,382	4.8	0.2705	0.1900	0.2638	0.2812	0.1741	0.2490
MDC	8	MUSCULOSKELETAL	92496	\$ 18,139	3.9	0.3676	0.3091	0.3770	0.3668	0.2673	0.3389
MDC	9	SKIN & BREAST	28173	\$ 8,031	3.7	0.2261	0.1560	0.2049	0.2679	0.2179	0.2086
MDC	10	ENDOCRINE	35331	\$ 8,358	3.5	0.2623	0.1956	0.2589	0.2765	0.2048	0.2335
MDC	11	KIDNEY	43773	\$ 11,305	4.5	0.5354	0.4881	0.5231	0.2633	0.1240	0.2144
MDC	12	MALE REPRODUCTIVE	6254	\$ 9,700	2.7	0.3412	0.1575	0.2300	0.3222	0.1803	0.2515
MDC	13	FEMALE REPRODUCTIVE	21389	\$ 8,487	2.5	0.3536	0.1737	0.2708	0.3460	0.2286	0.3026
MDC	14	PREG/CHILDBIRTH	119082	\$ 5,933	2.8	0.1588	0.0883	0.0998	0.3077	0.2726	0.2797
MDC	15	NEWBORNS	109488	\$ 4,366	3.7	0.6189	0.2909	0.2909	0.4955	0.4375	0.4375
MDC	16	BLOOD	15327	\$ 10,012	4.1	0.1398	0.0693	0.1301	0.1714	0.0463	0.1266
MDC	17	MYELOPROLIFERATIVE	8185	\$ 22,031	6.5	0.2866	0.1849	0.3058	0.3573	0.2292	0.3394
MDC	18	INFECTIOUS	37346	\$ 17,128	7.3	0.2978	0.2327	0.2937	0.3780	0.2142	0.2592
MDC	19	MENTAL	47551	\$ 7,952	5.9	0.0400	0.0278	0.0280	0.0787	0.0646	0.0645
MDC	20	ALCOHOL/DRUG	12825	\$ 4,246	3.2	0.2079	0.0674	0.1647	0.1450	0.1092	0.1410
MDC	21	INJURIES/POISONINGS	16046	\$ 9,969	3.7	0.2037	0.1230	0.2125	0.2898	0.1675	0.2588
MDC	22	BURNS	732	\$ 21,708	6.7	0.5945	0.5433	0.5376	0.5624	0.5143	0.4529
MDC	23	HEALTH STATUS	21196	\$ 14,028	8.2	0.1858	0.1296	0.1636	0.3994	0.3512	0.3747
MDC	24	MULTIPLE TRAUMA	2359	\$ 40,772	7.7	0.3159	0.1618	0.2438	0.3143	0.1366	0.2180
MDC	25	HIV	5640	\$ 18,150	7.3	0.1616	0.1208	0.1901	0.1819	0.0772	0.1694
MDC	26	UNRELATED OR PROC	5681	\$ 24,423	8.3	0.1631	0.0293	0.1738	0.4183	0.0053	0.4025

Appendix 4

R-squared analysis: Maryland 1/2007-6/2008 data, Version 22 RGNs, Version 24 CMS-DRGs and Version 26 MS-DRGs, All Ages Non Outliers

Group	Title	Num Pts	A Chg	ALOS	R2 Chg	R2 Chg	R2 Chg	R2 LOS	R2 LOS	R2 LOS
		RGN	RGN	RGN	RGN	CMS	MS-DRG	RGN	CMS	MS-DRG
All	0	1098440	\$ 10,784	4.2	0.5931	0.5224	0.5542	0.4382	0.3581	0.3982
MDC	0 Pre-MDC	4058	\$147,944	33.1	0.2455	0.2148	0.2189	0.2752	0.2419	0.2547
MDC	1 NERVOUS	66217	\$ 11,128	4.1	0.4646	0.3913	0.4576	0.3349	0.2345	0.2920
MDC	2 EYE	1795	\$ 6,672	2.4	0.2078	0.0741	0.1645	0.2744	0.1872	0.2280
MDC	3 EAR, NOSE, MOUTH	11918	\$ 7,109	2.5	0.4369	0.2944	0.3622	0.2335	0.1311	0.1786
MDC	4 RESPIRATORY	97915	\$ 10,275	4.7	0.4909	0.4365	0.4845	0.3376	0.2592	0.3002
MDC	5 CIRCULATORY	174963	\$ 11,708	3.6	0.6174	0.5625	0.6018	0.4549	0.3610	0.4002
MDC	6 DIGESTIVE	93007	\$ 10,500	4.4	0.4538	0.3590	0.4353	0.4189	0.3495	0.3845
MDC	7 HEPATOBILIARY	27573	\$ 11,881	4.7	0.3566	0.2636	0.3469	0.2866	0.1802	0.2538
MDC	8 MUSCULOSKELETAL	91277	\$ 17,798	3.8	0.4771	0.4088	0.4801	0.3732	0.2739	0.3450
MDC	9 SKIN & BREAST	27848	\$ 7,772	3.7	0.2868	0.2070	0.2531	0.2695	0.2229	0.2105
MDC	10 ENDOCRINE	34976	\$ 8,107	3.4	0.3440	0.2692	0.3328	0.2807	0.2121	0.2363
MDC	11 KIDNEY	43252	\$ 10,828	4.4	0.6627	0.6024	0.6459	0.2680	0.1266	0.2175
MDC	12 MALE REPRODUCTIVE	5922	\$ 8,987	2.4	0.3308	0.2288	0.2612	0.2836	0.1787	0.2271
MDC	13 FEMALE REPRODUCTIVE	21069	\$ 8,299	2.4	0.3957	0.2024	0.3079	0.3459	0.2288	0.3137
MDC	14 PREG/CHILDBIRTH	117003	\$ 5,709	2.7	0.2474	0.1389	0.1518	0.3362	0.3017	0.3074
MDC	15 NEWBORNS	108668	\$ 4,213	3.7	0.6907	0.3142	0.3142	0.5132	0.4416	0.4416
MDC	16 BLOOD	15203	\$ 9,406	4.0	0.2271	0.1121	0.2057	0.1712	0.0451	0.1252
MDC	17 MYELOPROLIFERATIVE	8066	\$ 21,379	6.4	0.3340	0.2161	0.3520	0.3661	0.2381	0.3478
MDC	18 INFECTIOUS	37189	\$ 16,748	7.2	0.3454	0.2743	0.3385	0.3854	0.2200	0.2643
MDC	19 MENTAL	46906	\$ 7,369	5.5	0.0698	0.0490	0.0492	0.0842	0.0691	0.0691
MDC	20 ALCOHOL/DRUG	12742	\$ 4,151	3.2	0.2409	0.0764	0.1899	0.1480	0.1108	0.1448
MDC	21 INJURIES/POISONINGS	15874	\$ 9,430	3.6	0.2948	0.1802	0.3003	0.2956	0.1702	0.2631
MDC	22 BURNS	643	\$ 14,009	5.3	0.4542	0.3583	0.3348	0.5175	0.4769	0.4158
MDC	23 HEALTH STATUS	20918	\$ 13,895	8.2	0.2211	0.1586	0.1949	0.4269	0.3772	0.4010
MDC	24 MULTIPLE TRAUMA	2294	\$ 40,504	7.8	0.3400	0.1861	0.2673	0.3250	0.1487	0.2292
MDC	25 HIV	5575	\$ 17,257	7.1	0.2002	0.1604	0.2378	0.1885	0.0864	0.1766
MDC	26 UNRELATED OR PROC	5569	\$ 23,531	8.1	0.2384	0.0436	0.2495	0.4264	0.0082	0.4082

Appendix 5

Table 1: All Patients (2008 Grouper)
 Descriptive Statistics by ADRG and Class (Maryland 2007 + Half-Year 2008)
 (Each cell contains the #PAT, Mean LOS, Mean CHG, CV LOS and CV CHG)

Medical MDC 5, Diseases and Disorders of the Circulatory System

		All Patients			

ADRG					
-					
NUM	Description	Total	Cls-B	Cls-C	Cls-
D					

-					
A130	PERIPHERAL VASCULAR DISORDERS	6290	1582	2583	
2125					
		4.23	5.78	4.24	
3.06					
		8065	11120	7928	
5956					
		0.82	0.74	0.79	
0.73					
		0.80	0.76	0.73	
0.73					
A132	ATHEROSCLEROSIS	5314	639	1250	
3425					
		2.18	3.92	2.50	
1.73					
		4837	8246	5429	
3984					
		0.96	1.07	0.76	
0.68					
		0.86	1.09	0.64	
0.53					
A134	HYPERTENSION	4013	454	1250	
2309					
		2.32	3.63	2.65	
1.89					
		5354	8227	5888	
4501					
		1.00	0.84	1.19	
0.65					
		0.79	0.82	0.82	
0.58					
A135	CARDIAC CONGENITAL & VALVULAR DISORDERS	553	159	219	
175					

2.41		3.90	5.77	3.73
5345		8360	13233	7230
0.71		1.19	0.96	1.35
0.75		1.38	1.42	0.87
A138	CARDIAC ARRHYTHMIA & CONDUCTION DISORDERS	15376	2880	4375
8121		3.00	5.00	3.16
2.20		6145	10276	6383
4552		0.89	0.84	0.74
0.68		0.86	0.85	0.67
0.58				
A140	ANGINA PECTORIS	2725	214	604
1907		1.77	2.64	2.11
1.57		4228	6164	4916
3793		0.67	0.76	0.62
0.59		0.56	0.73	0.51
0.47				
A141	SYNCOPE & COLLAPSE	12293	1552	4323
6418		2.42	3.49	2.74
1.94		5409	7356	5947
4575		0.77	0.80	0.73
0.63		0.65	0.73	0.64
0.49				
A143	CHEST PAIN	27058	1948	6506
18604		1.58	2.41	1.93
1.37		4118	5666	4786
3722		0.74	0.88	0.76
0.56		0.56	0.68	0.58
0.46				

Appendix 5

Table 2: All Patients (2008 Grouper)
 Descriptive Statistics by ADRG and Class (Maryland 2007 + Half-Year 2008)
 (Each cell contains the #PAT, Mean LOS, Mean CHG, CV LOS and CV CHG)

Surgical MDC 6, Diseases and Disorders of the Digestive System

		All Patients				
ADRG		-----				
-		-----				
NUM	Description	Total	Cls-A	Cls-B	Cls-C	Cls-D
D		-----				
-		-----				
A146	RECTAL RESECTION	686	200	215	89	182
		7.65	11.58	7.34	5.45	4.79
		23471	32426	23683	19053	15539
		0.78	0.70	0.66	0.52	0.43
		0.80	0.70	0.87	0.52	0.40
A150	PERITONEAL ADHESIOLYSIS	2625	462	882	326	955
		6.51	12.74	6.86	5.11	3.66
		17261	32148	17002	13664	11525
		0.93	0.79	0.60	0.77	0.76
		0.86	0.79	0.56	0.55	0.59
A152	MINOR SMALL & LARGE BOWEL PROCEDURES	523	64	191	60	208
		5.42	10.23	5.88	4.03	3.92
		15005	32006	14907	11414	10901
		0.65	0.78	0.43	0.47	0.44
		0.81	0.78	0.47	0.47	0.46
A157	ANAL & STOMAL PROCEDURES	1123	115	314	116	578
		3.65	7.72	4.67	3.46	2.32
		8703	16863	10840	8595	5940
		1.05	0.86	0.80	0.84	0.70
		0.97	0.86	0.84	0.87	0.69
A159	HERNIA PROC EXCEPT INGUINAL & FEMORAL	1911	191	571	105	1044
		3.53	8.27	4.33	3.15	2.26
		12087	23935	13635	12246	9056
		1.14	0.75	1.13	0.67	0.73
		0.87	0.75	0.82	0.62	0.65
A161	INGUINAL & FEMORAL HERNIA PROCEDURES	775	63	203	68	441
		2.86	8.32	3.83	2.26	1.73
		8989	22102	10603	7430	6614
		1.22	0.91	0.86	1.02	0.66
		0.93	0.91	0.66	0.59	0.44

A164	APPENDECTOMY W COMPLICATED PRINCIPAL DIAG	2029	190	514	52	1273
		3.95	8.02	5.38	3.60	2.77
		10368	19245	12408	10362	8219
		0.82	0.66	0.59	0.58	0.67
		0.63	0.66	0.46	0.41	0.42

A166	APPENDECTOMY W/O COMPLIC PRINCIPAL DIAG	5054	103	605	230	4116
		1.75	6.01	2.69	2.16	1.49
		7178	17023	8981	7926	6624
		0.87	0.78	0.76	0.71	0.56
		0.54	0.78	0.56	0.43	0.38

Appendix 5

Table 1: Pediatric Patients (2008 Grouper)
 Descriptive Statistics by ADRG and Class (Maryland 2007 + Half-Year 2008)
 (Each cell contains the #PAT, Mean LOS, Mean CHG, CV LOS and CV CHG)

Common Pediatric Medical Diagnoses

ADRG		All Patients			
		Total	Cls-B	Cls-C	Cls-D
-	-				
NUM	Description				
D					
-					
A562	SEIZURE	1050	93	282	
675					
		2.35	3.35	2.57	
2.12					
		6155	10151	6764	
5350					
		0.93	1.03	0.91	
0.85					
		0.99	1.17	0.91	
0.82					
A068	OTITIS MEDIA & URI	879	54	257	
568					
		2.08	2.94	2.29	
1.90					
		4462	8567	5204	
3736					
		0.69	0.83	0.73	
0.59					
		0.83	0.96	0.79	
0.58					
A089	SIMPLE PNEUMONIA & PLEURISY	3159	401	1632	
1126					
		2.55	4.11	2.48	
2.10					
		5497	10076	5371	
4050					
		0.79	0.91	0.66	
0.56					
		1.00	1.15	0.72	
0.56					
A096	BRONCHITIS & ASTHMA	6460	1218	860	
4382					

2.01		2.27	3.02	2.57
4328		5047	7125	5770
0.63		0.72	0.75	0.72
0.68		0.83	0.88	0.83
A182	ESOPHAGITIS, GASTROENT & MISC DIGEST	2131	87	662
1382		2.09	4.61	2.44
1.77		4429	11081	5250
3618		1.28	2.18	0.94
0.74		1.40	2.14	1.02
0.74				
A296	NUTRITIONAL & MISC METABOLIC DISORDERS	1657	124	431
1102		2.19	3.57	2.87
1.77		4155	7295	5633
3224		1.20	1.80	1.03
0.76		1.32	1.89	1.05
0.84				
A373	VAGINAL DELIVERY W/O COMPLICATING DIAG	2071		393
1677		2.37		2.66
2.30		5579		6291
5412		0.43		0.73
0.26		0.36		0.49
0.31				
A410	CHEMOTHERAPY W/O ACUTE LEUKEMIA AS SEC DX	428	31	345
52		3.17	6.71	2.99
2.25		10974	27560	10059
7159		0.86	1.09	0.57
0.70				

0.54

1.10 1.35 0.55

Appendix 5

Table 1: All Patients (2008 Grouper)
 Descriptive Statistics by ADRG and Class (Maryland 2007 + Half-Year 2008)
 (Each cell contains the #PAT, Mean LOS, Mean CHG, CV LOS and CV CHG)

Neonatal MDC 15, Newborns and Other Neonates		All Patients				
ADRG	Description	Total	Cls-A	Cls-B	Cls-C	Cls-D
MDC15	BIRTH WGT 1000-2499G W/ RESP ASST	671				
		29.44				
		50995				
		0.64				
		0.70				
MDC15	BIRTH WGT 1000-2499G W/ PRLNGD RESP ASST	220				
		55.39				
		134456				
		0.74				
		1.01				
MDC15	BIRTH WGT < 1000G W/ RESP ASST	161				
		52.82				
		103151				
		0.54				
		0.54				
MDC15	BIRTH WGT < 1000G W/ PRLNGD RESP ASST	434				
		74.48				
		184618				
		0.64				
		0.64				
MDC15	EARLY DEATH	112				
		1.27				
		6639				
		0.35				
		0.68				
MDC15	EARLY TRANSFER	528				
		1.66				
		3583				
		0.55				
		0.88				
A386	BIRTH WEIGHT < 1000G	209	145	19	4	41
		26.64	37.33	2.53	2.25	2.39
		44606	63412	2189	1364	1970
		1.11	0.97	0.28	0.56	0.37
		1.31	0.97	0.57	0.29	0.68
A388	BIRTH WEIGHT 1000-2499G	7723	3538	2806	84	1295
		8.80	14.82	4.29	2.82	2.51

11617	21215	4361	1971	1744
1.14	0.94	0.83	0.42	0.42
1.42	0.94	1.29	0.64	0.56

A391 BIRTH WEIGHT >= 2500G

99474	14283	18852	4606	61733
2.64	4.53	2.49	2.40	2.26
2282	6095	1911	1689	1558
0.97	2.55	0.44	0.37	0.35
2.70	2.55	0.83	0.69	0.49