The Sixth Annual HealthGrades Hospital Quality and Clinical Excellence Study

January 2008

HEALTHGRADES®
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Executive Summary

Each year HealthGrades assesses the quality of care provided at the nation's nearly 5,000 non-federal hospitals across 27 procedures and diagnoses and makes this information available to consumers at www.HealthGrades.com. In this sixth annual study, HealthGrades identifies hospitals that are performing among the best in the nation and designates each of these elite hospitals as a Distinguished Hospital for Clinical Excellence™.

In this study, HealthGrades also examines the differences in risk-adjusted mortality and complications between these top-performing hospitals and the rest of the nation's hospitals. HealthGrades' analysis demonstrates significant variations in patient outcomes and quality of care between top-performing hospitals and the rest.

HealthGrades' analysis is based on over 41 million Medicare hospital discharges for the years 2004, 2005 and 2006. HealthGrades identifies the top U.S. hospitals based on overall performance of risk-adjusted outcomes associated with 27 common Medicare inpatient procedures and diagnoses. For 18 inpatient procedures and diagnoses, the outcome of study was risk-adjusted mortality. In nine procedures, the outcome of study was risk-adjusted inhospital major complications.

Of the 4,971 short-term, non-federal, non-children's, acute care hospitals, only 269 hospitals are designated as Distinguished Hospitals for Clinical Excellence™ (DH-CE). In this study, these 269 Distinguished Hospitals for Clinical Excellence are compared to all other U.S. hospitals to identify trends in outcomes, relative risk, and improvement for the years 2004, 2005 and 2006.

Summary of Findings

Key findings from this study include:

Distinguished Hospitals for Clinical Excellence outperformed all other hospitals across all procedures and diagnoses studied. During 2004-2006, they had:

- Lower risk-adjusted inhospital mortality in all 18 procedures and diagnoses where mortality was the outcome of study. Among these hospitals, risk-adjusted mortality was between 11 percent and 34 percent lower than all other hospitals.
- Lower risk-adjusted inhospital major complications in all nine procedures where inhospital major complications were studied. Among these hospitals, risk-adjusted major complications were 1 to 12 percent lower than all other hospitals.

The most variation in risk-adjusted inhospital mortality between Distinguished Hospitals for Clinical Excellence and all other hospitals was seen in the following diagnoses.

Condition	DH-CE to all Other Hospitals
Pneumonia	34.17% lower risk-adjusted mortality
Pulmonary Embolism	34.13% lower risk-adjusted mortality
Diabetic Acidosis and Coma	33.15% lower risk-adjusted mortality
Chronic Obstructive Pulmonary Disease	32.83% lower risk-adjusted mortality

The most variation in risk-adjusted inhospital major complications between Distinguished Hospitals for Clinical Excellence and all other hospitals was seen in the following procedures.

Procedure	DH-CE to all Other Hospitals
Hip Fracture Repair	11.71% fewer risk-adjusted inhospital major complications
Prostatectomy	11.52% fewer risk-adjusted inhospital major complications
Total Hip Replacement	8.86% fewer risk-adjusted inhospital major complications

When extrapolated, if all Medicare patients, who were admitted to U.S. hospitals between 2004 and 2006 with any of the 27 conditions studied, were treated at hospitals that performed at the level of Distinguished Hospitals for Clinical Excellence, **171,424 lives may have been saved** and **9,671 patients may have avoided one or more inhospital major complications** (*see Exhibits C and D).*

In addition, while Distinguished Hospitals for Clinical Excellence out-performed their counterparts in terms of reduced morbidity and mortality, they also showed greater improvements over the three years of study. Comparing 2006 data with 2004 data, DH-CE hospitals had an average reduction in risk-adjusted inhospital mortality of 15.0 percent, versus 11.4 percent for other hospitals. For risk-adjusted inhospital complications, the corresponding reductions were 2.4 percent for DH-CE hospitals and 0.3 percent for other hospitals.

Introduction

When faced with difficult healthcare decisions, consumers require access to objective and reliable information about the quality of care provided at their local hospitals. Each year, HealthGrades meets this need by analyzing the quality of care provided at the nation's nearly 5,000 hospitals across 27 of the most common procedures and diagnoses among Medicare recipients. For each diagnosis and procedure, HealthGrades assigns the hospital a one, three, or five-star (poor, average, best) rating based on its clinical quality outcomes. Each month, approximately 3 million users access these free ratings published on the HealthGrades website at www.HealthGrades.com.

Using these 27 ratings as a basis, HealthGrades then researches and identifies the overall top-performing U.S. hospitals. The outstanding clinical performance among this elite group of hospitals ranks them among the top five percent in the nation. These top-performing hospitals are designated by HealthGrades as the 2008 Distinguished Hospitals for Clinical Excellence™ (DH-CE). For the full list of the 269 recipients, *see Exhibit A* or www.HealthGrades.com. For the percentage of DH-CE recipients by state, *see Exhibit B*.

This study highlights the variation in patient outcomes between the best and all other hospitals by assessing, comparing, and studying the quality outcomes and trends of Distinguished Hospitals for Clinical Excellence to all other U.S. hospitals across the 27 procedures and diagnoses rated by HealthGrades for the years 2004 through 2006.

Methodology

In order to evaluate overall hospital performance and to identify the best-performing hospitals in clinical excellence across the U.S., HealthGrades uses a two-step methodology process:

1. Assign star ratings for 27 procedures and diagnoses using the Mortality and Complication Based Outcomes Methodology.
2. Identify the overall best-performing hospitals using the Distinguished Hospital Award for Clinical Excellence™ Methodology.

The 27 procedures and diagnoses in this study are as follows.

- Atrial Fibrillation
- Back and Neck Surgery (Spinal Fusion)
- Back and Neck Surgery (Except Spinal Fusion)
- Bowel Obstruction
- Carotid Surgery
- Cholecystectomy
- Chronic Obstructive Pulmonary Disease (COPD)
- Coronary Bypass Surgery
- Coronary Interventional Procedures (Angioplasty/Stent)
- Diabetic Acidosis and Coma
- Gastrointestinal Bleed
- Gastrointestinal Surgeries and Procedures
- Heart Attack
- Heart Failure
- Hip Fracture Repair
- Pancreatitis
- Peripheral Vascular Bypass
- Pneumonia
- Prostatectomy
- Pulmonary Embolism
- Resection / Replacement of Abdominal Aorta
- Respiratory Failure
- Sepsis
- Stroke
- Total Hip Replacement
- Total Knee Replacement
- Valve Replacement Surgery

Mortality and Complication Based Outcomes 2008 Methodology

To help consumers evaluate and compare hospital performance, HealthGrades analyzes patient outcome data for virtually every hospital in the country (all hospitals with the exception of government/military hospitals). HealthGrades purchases the initial data from the Centers for Medicare and Medicaid Services (CMS). The Medicare data (MedPAR file) from CMS contains the 41 million inpatient records for Medicare patients for hospitalizations from 2004 to 2006.

Using a logistic-regression based risk-adjusted model to compare performance among hospitals, hospitals are assigned one of three star ratings: one-star (poor), three-star (average), or five-star (best). The purpose of risk adjustment is to obtain fair statistical comparisons between disparate populations or groups. Significant differences in demographic and clinical risk factors are found among patients treated in different hospitals and therefore, risk adjustment of the data is needed to make accurate and valid comparisons of clinical outcomes at different hospitals.

More information regarding the risk-adjustment methodology for the 27 procedures and diagnoses above can be found in *Exhibit E*.

Visit www.HealthGrades.com to view hospital ratings and to read the complete methodology white paper *Hospital Report Card™ Mortality and Complication Based Outcomes 2008 Methodology White Paper* (or see *Exhibit E*).

Distinguished Hospital Award for Clinical Excellence™ 2008 Methodology

For the Distinguished Hospital Award for Clinical Excellence™, hospitals were segregated into two groups: teaching and non-teaching.

Teaching hospitals are identified by the following method: A hospital is designated by HealthGrades as a teaching hospital if they indicated they were a teaching hospital in their Medicare Cost Report, or if their Indirect Medical Education (IME) payment was at least one percent of their overall reimbursement, as indicated in the most recent year of MedPAR data (2006). If a hospital indicated they were a teaching hospital but did not receive IME payment, they were contacted to confirm teaching status.

To be considered for the Distinguished Hospital Award for Clinical Excellence (DHA-CE), a hospital had to have received star ratings in at least 20 of the 27 HealthGrades procedures and diagnoses ratings using MedPAR data.

After creating a list of hospitals that met the above criteria, HealthGrades took the following steps to determine the DHA-CE recipients.

1. Calculated the average overall star rating for each hospital by averaging all their MedPAR-based ratings.
2. Calculated the average z-score for each hospital by averaging all their MedPAR-based z-scores.
3. Ranked hospitals in descending order by their average star rating within the two groups: teaching and non-teaching.
4. Broke ranking ties by average z-score.
5. Selected the top 20 percent of hospitals from each group.
6. Excluded hospitals whose average star was less than 3.36.
7. Designated the hospitals that remained on the list as 2008 DHA-CE recipients.

Comparison of Distinguished Hospitals for Clinical Excellence Hospitals to All Other Hospitals

To identify differences in performance between Distinguished Hospitals for Clinical Excellence (DH-CE) hospitals and all other hospitals, HealthGrades calculated the actual (observed) and predicted (expected) mortality rates for each of the 18 mortality-based procedures and diagnoses and the actual (observed) and predicted (expected) complication rates for the nine complication-based procedures for each hospital. Hospitals are divided into two groups, DH-CE and Non-DH-CE, and then overall observed and expected rates are calculated for both groups in each of the 27 procedures and diagnoses.

The purpose of comparing the predicted to actual is to make a fair comparison between hospitals with different populations. Sicker patients have higher associated observed mortality/complications so using the observed (O) to expected (E) ratio takes into consideration how sick the patient population is at a given hospital. Observed to expected ratios were calculated by procedure or diagnosis by year, for both groups of hospitals and were evaluated for differences.

- An O/E ratio of less than 1 means that the procedure or diagnosis measured had fewer deaths/complications than expected given the patient population.
- An O/E of greater than 1 means that the procedure or diagnosis measured had more deaths/complications than expected given the patient population.

Results

Distinguished Hospitals for Clinical Excellence (DH-CE) consistently outperformed all other hospitals during the years 2004, 2005, and 2006. They exhibited lower risk-adjusted inhospital mortality across all 18 mortality-based procedures and diagnoses and lower risk-adjusted inhospital complications across the nine complication-based procedures. In addition, not only did DH-CE hospitals have better clinical quality outcomes but they improved at a faster rate from 2004 to 2006 (see *Exhibit C*).

On Average, DH-CE had 27 Percent Lower Risk-Adjusted Inhospital Mortality.

When comparing DH-CE hospitals to all other hospitals, they had lower risk-adjusted inhospital mortality across all 18 procedures and diagnoses studied. The differences ranged from a low of 10.93 percent lower risk-adjusted inhospital mortality in resection/replacement of abdominal aortic aneurysm to a high of 34.17 percent in the treatment of pneumonia patients.

When comparing DH-CE to all other hospitals, the largest differences in risk-adjusted inhospital mortality were noted in the following areas.

Table 1
Relative Reduction in Risk-adjusted Mortality
Associated with DH-CE
Compared to All Other Hospitals

Pneumonia	34.17%
Pulmonary Embolism	34.13%
Diabetic Acidosis and Coma	33.15%
Chronic Obstructive Pulmonary Disease	32.83%

On Average, DH-CE Performed 5 Percent Better in Inhospital Complications.

Similar trends were also noted when evaluating inhospital risk-adjusted complications. Overall, Distinguished Hospitals for Clinical Excellence (DH-CE) demonstrated lower risk-adjusted inhospital complications compared to all other hospitals during 2004-2006. During the three years studied, DH-CE performed, on average, 5 percent better than all other hospitals in inhospital complications associated with orthopedic and neurosurgery, vascular surgery, prostate surgery, and gall bladder surgery *(see Exhibit D).* The differences ranged from a low of 0.72 percent in back and neck surgery (except spinal fusion) to a high of 11.71 percent in hip fracture repair.

When comparing DH-CE to all other hospitals, the largest differences in risk-adjusted inhospital complications were noted in the following areas.

Table 2
Relative Reduction in Risk-adjusted Complications
Associated with DH-CE
Compared to All Other Hospitals

Hip Fracture Repair	11.71%
Prostatectomy	11.52%
Total Hip Replacement	8.86%

Distinguished Hospitals for Clinical Excellence Improved at Greater Rate.

Even though Distinguished Hospitals for Clinical Excellence (DH-CE) had significantly lower risk-adjusted inhospital mortality and complications for all three years studied, they also improved at a greater rate in more procedures and diagnoses than all other hospitals. DH-CE hospitals showed more improvement than all other hospitals in 14 of the 18 mortality-based procedures and diagnoses studied and in six of the nine complication-based procedures (Table 3).

Comparing 2006 data with 2004 data, DH-CE hospitals had an average reduction in risk-adjusted inhospital mortality of 15.04 percent, versus 11.36 percent for other hospitals. For risk-adjusted inhospital complications, the corresponding reductions were 2.35 percent and 0.27 percent.

Table 3
Overall Improvement from 2004 to 2006 DH-CE Hospitals Compared to All Other Hospitals

	% Improvement Mortality-Based Procedures and Diagnoses	% Improvement Complication-Based Procedures
DH-CE Hospitals	15.04%	2.35%
All Others	11.36%	0.27%

Interpretation of Results

For the sixth consecutive year, HealthGrades hospital quality analysis has revealed a persistent and, in some cases, growing gap between the very best hospitals and all others. This year's study found that if all Medicare patients, who were admitted to U.S. hospitals between 2004 and 2006 with any of the 27 conditions studied, were treated in hospitals that performed at the level of Distinguished Hospitals for Clinical Excellence, **171,424 lives may have been saved** and **9,671 patients may have avoided one or more inhospital major complications**.

While the hospital industry as a whole in recent years has begun to focus on significant quality improvement, and the progress of top-performing hospitals is encouraging, the degree and swiftness of change still varies greatly. HealthGrades' research shows that DH-CE hospitals not only demonstrate lower risk-adjusted inhospital mortality and complications across all studied procedures and diagnoses year-after-year, but these hospitals improved outcomes at a demonstrably faster rate.

This variation in patient outcomes among U.S. hospitals has enormous societal implications – both in terms of cost and quality. It is therefore imperative that as consumers assume greater responsibility for choosing healthcare providers, that relevant and transparent information be made available to the public.

Exhibit A: List of Distinguished Hospitals for Clinical Excellence™

Teaching Distinguished Hospitals for Clinical Excellence™*

DH-CE Teaching Hospitals	City	State
D.C.H. Regional Medical Ctr.	Tuscaloosa	AL
Del E. Webb Memorial Hospital	Sun City West	AZ
Mayo Clinic Hospital	Phoenix	AZ
Scottsdale Healthcare–Osborn	Scottsdale	AZ
Cedars-Sinai Medical Ctr.	Los Angeles	CA
Fountain Valley Reg. Hospital & Medical Ctr.	Fountain Valley	CA
Glendale Adventist Medical Ctr.	Glendale	CA
Good Samaritan Hospital	Los Angeles	CA
Huntington Memorial Hospital	Pasadena	CA
Pacific Campus Hospital	San Francisco	CA
Presbyterian Intercommunity Hospital	Whittier	CA
Saint Vincent Medical Ctr.	Los Angeles	CA
Scripps Mercy Hospital	San Diego	CA
UCLA Medical Ctr.	Los Angeles	CA
Centura Health–Penrose St. Francis Health Svcs	Colorado Springs	CO
Medical Ctr. of Aurora	Aurora	CO
Poudre Valley Hospital	Fort Collins	CO
Rose Medical Ctr.	Denver	CO
Danbury Hospital	Danbury	CT
Hartford Hospital	Hartford	CT
Middlesex Hospital	Middletown	CT
Yale-New Haven Hospital	New Haven	CT
Christiana Care Health Sys–Christiana Hospital	Newark	DE
Baptist Medical Ctr.	Jacksonville	FL
Cleveland Clinic Hospital	Weston	FL
Fla. Hospital	Orlando	FL
Kendall Regional Medical Ctr.	Miami	FL
Mercy Hospital	Miami	FL
St. Luke's Hospital	Jacksonville	FL
St. Vincent's Medical Ctr.	Jacksonville	FL
Piedmont Hospital	Atlanta	GA
Mercy Medical Ctr.–Des Moines	Des Moines	IA
St. Lukes Hospital	Cedar Rapids	IA
Evanston Northwestern Healthcare	Evanston	IL
Mercy Hospital and Medical Ctr.	Chicago	IL
Northwestern Memorial Hospital	Chicago	IL
Our Lady of the Resurrection Medical Ctr.	Chicago	IL
Rush North Shore Medical Ctr.	Skokie	IL
Saint Joseph Hospital	Chicago	IL
St. Alexius Medical Ctr.	Hoffman Estates	IL
Swedish Covenant Hospital	Chicago	IL

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DH-CE Teaching Hospitals* (continued)	City	State
Via Christi Regional Medical Ctr.	Wichita	KS
Jewish Hospital	Louisville	KY
Norton Hospitals	Louisville	KY
St. Elizabeth Medical Ctr.–South	Edgewood	KY
Willis Knighton Medical Ctr.	Shreveport	LA
North Shore Medical Ctr.	Salem	MA
Franklin Square Hospital Ctr.	Baltimore	MD
Good Samaritan Hospital	Baltimore	MD
Greater Baltimore Medical Ctr.	Baltimore	MD
Harbor Hospital	Baltimore	MD
Saint Joseph Medical Ctr.	Towson	MD
Sinai Hospital of Baltimore	Baltimore	MD
Suburban Hospital	Bethesda	MD
Beaumont Hospital–Grosse Pointe	Grosse Point	MI
Genesys Regional Medical Ctr.	Grand Blanc	MI
Huron Valley Sinai Hospital	Commerce	MI
Munson Medical Ctr.	Traverse City	MI
Oakwood Southshore Medical Ctr.	Trenton	MI
Providence Hospital	Southfield	MI
Spectrum Health Hospitals	Grand Rapids	MI
St. Joseph Mercy Oakland	Pontiac	MI
William Beaumont Hospital	Royal Oak	MI
William Beaumont Hospital–Troy	Troy	MI
Healtheast St. John's Hospital	Maplewood	MN
Mercy Hospital	Coon Rapids	MN
Methodist Hospital	Minneapolis	MN
North Memorial Health Care	Robbinsdale	MN
St. Cloud Hospital	St. Cloud	MN
St. Joseph's Hospital	St. Paul	MN
St. Lukes Hospital	Duluth	MN
St. Marys Hospital	Rochester	MN
United Hospitals	St. Paul	MN
Unity Hospital	Fridley	MN
SSM St. Marys Health Ctr.	St. Louis	MO
St. Luke's Hospital	Chesterfield	MO
Mission Hospitals	Asheville	NC
St. Alexius Medical Ctr.	Bismarck	ND
Mary Hitchcock Memorial Hospital	Lebanon	NH
Atlanticare Regional Medical Ctr.	Atlantic City	NJ
Hackensack University Medical Ctr.	Hackensack	NJ
Saint Barnabas Medical Ctr.	Livingston	NJ
The Mountainside Hospital	Montclair	NJ
Benedictine Hospital	Kingston	NY
N.Y.-Presbyterian/Weill Cornell	New York	NY
Akron General Medical Ctr.	Akron	OH

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DH-CE Teaching Hospitals* (continued)	City	State
Aultman Hospital	Canton	OH
Barberton Citizens Hospital	Barberton	OH
Bethesda North Hospital	Cincinnati	OH
Christ Hospital	Cincinnati	OH
Cleveland Clinic	Cleveland	OH
Fairview Hospital	Cleveland	OH
Good Samaritan Hospital	Dayton	OH
Good Samaritan Hospital	Cincinnati	OH
Grandview Medical Ctr.	Dayton	OH
Hillcrest Hospital	Mayfield Heights	OH
Jewish Hospital	Cincinnati	OH
Kettering Medical Ctr.	Kettering	OH
Miami Valley Hospital	Dayton	OH
Ohio State University Hospital East	Columbus	OH
South Pointe Hospital	Warrensville	OH
Southern Ohio Medical Ctr.	Portsmouth	OH
Southwest General Health Ctr.	Middleburg Heights	OH
St. Elizabeth Health Ctr.	Youngstown	OH
St. John West Shore Hospital	Westlake	OH
St. Vincent Charity Hospital	Cleveland	OH
Summa Health Systems Hospitals	Akron	OH
UHHS Bedford Medical Ctr.	Bedford	OH
Conemaugh Valley Memorial Hospital	Johnstown	PA
Easton Hospital	Easton	PA
Hamot Medical Ctr.	Erie	PA
Lancaster General Hospital	Lancaster	PA
Lehigh Valley Hospital	Allentown	PA
Lehigh Valley Hospital–Muhlenberg	Bethlehem	PA
Main Line Hospitals–Lankenau	Wynnewood	PA
Mercy Hospital Scranton	Scranton	PA
Pa. Hospital	Philadelphia	PA
Pinnacle Health System	Harrisburg	PA
St. Luke's Hospital	Bethlehem	PA
University of Pittsburgh Medical Ctr.–St Margaret	Pittsburgh	PA
Anmed Health	Anderson	SC
Avera McKennan Hospital & Univ. Health Ctr.	Sioux Falls	SD
Sanford USD Medical Ctr.	Sioux Falls	SD
Baptist Memorial Hospital	Memphis	TN
CHRISTUS Santa Rosa Health Care	San Antonio	TX
CHRISTUS Spohn Hospital–Corpus Christi Memorial	Corpus Christi	TX
McAllen Medical Ctr./Heart Hospital	Mcallen	TX
Memorial Hermann Healthcare System	Houston	TX
San Jacinto Methodist Hospital	Baytown	TX
St. Davids Hospital	Austin	TX
St. Lukes Episcopal Hospital	Houston	TX

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DH-CE Teaching Hospitals* (continued)	City	State
Valley Baptist Medical Ctr.	Harlingen	TX
St. Mark's Hospital	Salt Lake City	UT
Centra Health	Lynchburg	VA
CJW Medical Ctr.	Richmond	VA
Inova Fairfax Hospital	Falls Church	VA
Sentara Va. Beach General Hospital	Virginia Beach	VA
Va. Hospital Ctr.–Arlington	Arlington	VA
Winchester Medical Ctr.	Winchester	VA
Aspirus Wausau Hospital	Wausau	WI
Aurora St. Lukes Medical Ctr.	Milwaukee	WI
Gundersen Lutheran Medical Ctr.	La Crosse	WI
St. Josephs Hospital	Marshfield	WI
UW Health-UW Hospitals and Clinics	Madison	WI
West Allis Memorial Hospital	West Allis	WI
Charleston Area Medical Ctr.	Charleston	WV
United Hospital Ctr.	Clarksburg	WV

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Non-Teaching Distinguished Hospitals for Clinical Excellence™*

DH-CE Non-Teaching Hospitals*	City	State
Beverly Hospital	Montebello	CA
Eden Medical Ctr.	Castro Valley	CA
Eisenhower Medical Ctr.	Rancho Mirage	CA
El Camino Hospital	Mountain View	CA
Garfield Medical Ctr.	Monterey Park	CA
Glendale Memorial Hospital and Health Ctr.	Glendale	CA
Hoag Memorial Hospital Presbyterian	Newport Beach	CA
John Muir Medical Ctr.–Walnut Creek Campus	Walnut Creek	CA
Marshall Medical Ctr.	Placerville	CA
Mills-Peninsula Health Services	Burlingame	CA
John Muir Medical Ctr.–Concord Campus	Concord	CA
Providence Holy Cross Medical Ctr.	Mission Hill	CA
San Leandro Hospital	San Leandro	CA
Scripps Memorial Hospital–Encinitas	Encinitas	CA
Scripps Memorial Hospital–La Jolla	La Jolla	CA
Sequoia Hospital	Redwood City	CA
Sharp Chula Vista Medical Ctr.	Chula Vista	CA
St. Johns Hospital Health Ctr.	Santa Monica	CA
St. Johns Regional Medical Ctr.	Oxnard	CA
Sutter Roseville Medical Ctr.	Roseville	CA
Aventura Hospital and Medical Ctr.	Aventura	FL
Bay Medical Ctr.	Panama City	FL
Bethesda Memorial Hospital	Boynton Beach	FL
Boca Raton Community Hospital	Boca Raton	FL
Central Fla. Regional Hospital	Sanford	FL
Charlotte Regional Medical Ctr.	Punta Gorda	FL
Delray Medical Ctr.	Delray Beach	FL
Fawcett Memorial Hospital	Port Charlot	FL
Fla. Hospital–Fish Memorial	Orange City	FL
Fla. Hospital–Heartland Medical Ctr.	Sebring	FL
Fla. Hospital–Oceanside	Ormond Beach	FL
Fla. Hospital–Waterman	Tavares	FL
Flagler Hospital	St. Augustin	FL
Good Samaritan Medical Ctr.	West Palm Beach	FL
Gulf Coast Medical Ctr.	Panama City	FL
Helen Ellis Memorial Hospital	Tarpon Springs	FL
Holmes Regional Medical Ctr.	Melbourne	FL
Holy Cross Hospital	Fort Lauderdale	FL
Jupiter Medical Ctr.	Jupiter	FL
Lawnwood Regional Medical Ctr. & Heart Inst.	Fort Pierce	FL
Lee Memorial Hospital	Fort Myers	FL
Martin Memorial Medical Ctr.	Stuart	FL
Morton Plant Mease Healthcare Countryside	Safety Harbor	FL
Munroe Regional Medical Ctr.	Ocala	FL

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DH-CE Non-Teaching Hospitals* (continued)	City	State
NCH Healthcare System	Naples	FL
Ocala Regional Medical Ctr.	Ocala	FL
Palm Beach Gardens Medical Ctr.	Palm Beach Gardens	FL
Parrish Medical Ctr.	Titusville	FL
Peace River Regional Medical Ctr.	Port Charlotte	FL
Physicians Regional Medical Ctr.	Naples	FL
Sarasota Memorial Hospital	Sarasota	FL
Sebastian River Medical Ctr.	Sebastian	FL
South Bay Hospital	Sun City Center	FL
Gwinnett Medical Ctr.	Lawrenceville	GA
Houston Medical Ctr.	Warner Robins	GA
Northeast Ga. Medical Ctr.	Gainesville	GA
Saint Joseph's Hospital of Atlanta	Atlanta	GA
Advocate Good Samaritan Hospital	Downers Grove	IL
Advocate Good Shepherd Hospital	Barrington	IL
Advocate South Suburban Hospital	Hazel Crest	IL
Alexian Brothers Medical Ctr.	Elk Grove Village	IL
Centegra Memorial Medical Ctr.	Woodstock	IL
Central Dupage Hospital	Winfield	IL
Elmhurst Memorial Hospital	Elmhurst	IL
Ingalls Memorial Hospital	Harvey	IL
Northwest Community Hospital	Arlington Heights	IL
Palos Community Hospital	Palos Heights	IL
Provena St. Joseph Medical Ctr.	Joliet	IL
Community Hospital	Munster	IN
St. Catherine Hospital	East Chicago	IN
Baptist Hospital East	Louisville	KY
Glenwood Regional Medical Ctr.	West Monroe	LA
St. Francis Medical Ctr.	Monroe	LA
Willis Knighton Bossier Health Ctr.	Bossier City	LA
Braddock Hospital	Cumberland	MD
Doctor's Community Hospital	Lanham	MD
Upper Chesapeake Medical Ctr.	Bel Air	MD
Crittenton Hospital Medical Ctr.	Rochester	MI
Hackley Hospital	Muskegon	MI
Port Huron Hospital	Port Huron	MI
St. Mary Mercy Hospital	Livonia	MI
Fairview Southdale Hospital	Edina	MN
Skaggs Community Health Ctr.	Branson	MO
SSM St. Joseph Health Ctr.	St. Charles	MO
Benefis Healthcare	Great Falls	MT
Haywood Regional Medical Ctr.	Clyde	NC
Nash General Hospital	Rocky Mount	NC
Rex Hospital	Raleigh	NC

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DH-CE Non-Teaching Hospitals* (continued)	City	State
Clara Maass Medical Ctr.	Belleville	NJ
Community Medical Ctr.	Toms River	NJ
Holy Name Hospital	Teaneck	NJ
Valley Hospital	Ridgewood	NJ
St. Luke's Cornwall Hospital	Newburgh	NY
Deaconess Hospital	Cincinnati	OH
EMH Regional Medical Ctr.	Elyria	OH
Fort Hamilton Hughes Memorial Hospital	Hamilton	OH
Lakewood Hospital	Lakewood	OH
Marymount Hospital	Garfield Heights	OH
Meridia Euclid Hospital	Euclid	OH
Parma Community General Hospital	Parma	OH
Trumbull Memorial Hospital	Warren	OH
Mercy Medical Ctr.	Roseburg	OR
Alle Kiski Medical Ctr.	Natrona Heights	PA
Baptist Hospital of East Tenn.	Knoxville	TN
Memorial Healthcare System	Chattanooga	TN
Bayshore Medical Ctr. in Pasadena	Pasadena	TX
Doctors Hospital at Renaissance	Edinburg	TX
Harlingen Medical Ctr.	Harlingen	TX
Memorial Hermann Memorial City Hospital	Houston	TX
Rio Grande Regional Hospital	Mcallen	TX
Seton Medical Ctr.	Austin	TX
Valley Regional Medical Ctr.	Brownsville	TX
Woodland Heights Medical Ctr.	Lufkin	TX
Bon Secours Memorial Regional Medical Ctr.	Mechanicsville	VA
Henrico Doctors' Hospital	Richmond	VA
Inova Alexandria Hospital	Alexandria	VA
Lewis-Gale Medical Ctr.	Salem	VA
Rockingham Memorial Hospital	Harrisonburg	VA
Central Washington Hospital	Wenatchee	WA
Providence Everett Medical Ctr.–Colby Campus	Everett	WA
St. Mary Medical Ctr.	Walla Walla	WA
Aurora Baycare Medical Ctr.	Green Bay	WI

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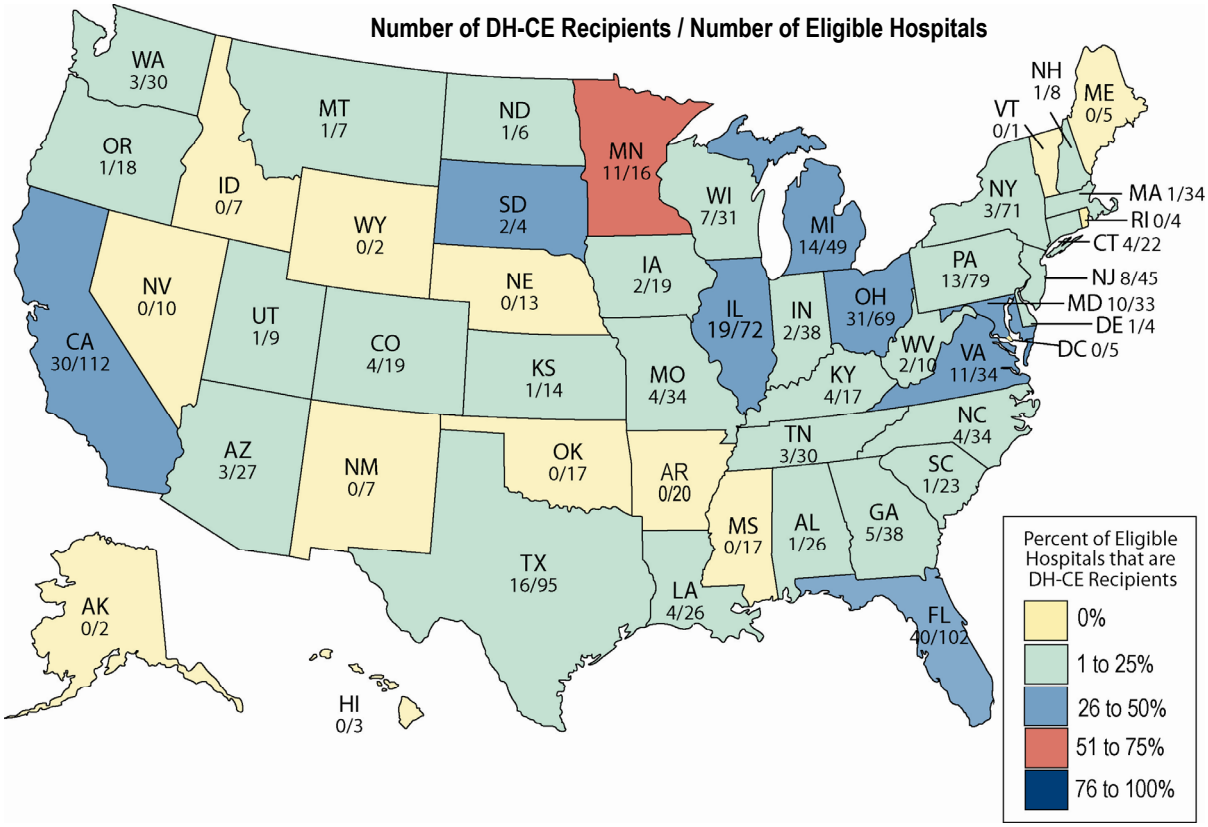
Exhibit B: Percentage of DH-CE Recipients by State



State / Abbreviation		Percent of Eligible	DH-CE Recipients	Eligible Hospitals
Alabama	AL	3.85%	1	26
Alaska	AK	.00%	0	2
Arizona	AZ	11.11%	3	27
Arkansas	AR	.00%	0	20
California	CA	26.79%	30	112
Colorado	CO	21.05%	4	19
Connecticut	CT	18.18%	4	22
Delaware	DE	25.00%	1	4
Dist. of Columbia	DC	.00%	0	5
Florida	FL	39.22%	40	102
Georgia	GA	13.16%	5	38
Hawaii	HI	.00%	0	3
Idaho	ID	.00%	0	7
Illinois	IL	26.39%	19	72
Indiana	IN	5.26%	2	38
Iowa	IA	10.53%	2	19
Kansas	KS	7.14%	1	14
Kentucky	KY	23.53%	4	17
Louisiana	LA	15.38%	4	26
Maine	ME	.00%	0	5
Maryland	MD	30.30%	10	33
Massachusetts	MA	2.94%	1	34
Michigan	MI	28.57%	14	49
Minnesota	MN	68.75%	11	16
Mississippi	MS	.00%	0	17
Missouri	MO	11.76%	4	34

State / Abbreviation		Percent of Eligible	DH-CE Recipients	Eligible Hospitals
Montana	MT	14.29%	1	7
Nebraska	NE	.00%	0	13
Nevada	NV	.00%	0	10
New	NH	12.50%	1	8
New Jersey	NJ	17.78%	8	45
New Mexico	NM	.00%	0	7
New York	NY	4.23%	3	71
North Carolina	NC	11.76%	4	34
North Dakota	ND	16.67%	1	6
Ohio	OH	44.93%	31	69
Oklahoma	OK	.00%	0	17
Oregon	OR	5.56%	1	18
Pennsylvania	PA	16.46%	13	79
Rhode Island	RI	.00%	0	4
South Carolina	SC	4.35%	1	23
South Dakota	SD	50.00%	2	4
Tennessee	TN	10.00%	3	30
Texas	TX	16.84%	16	95
Utah	UT	11.11%	1	9
Vermont	VT	.00%	0	1
Virginia	VA	32.35%	11	34
Washington	WA	10.00%	3	30
West Virginia	WV	20.00%	2	10
Wisconsin	WI	22.58%	7	31
Wyoming	WY	.00%	0	2

Exhibit C: Inhospital Mortality Performance: Distinguished Hospitals for Clinical Excellence (DH-CE) Compared to All Other U.S. Hospitals (3-Year Aggregate Relative Risk-Adjusted Inhospital Mortality Performance: 2004-2006)

Diagnosis or Procedure	Year	Total Number of U.S. Medicare Hospitalizations	DH-CE Hospitals Average Observed Inhospital Mortality to Expected Inhospital Mortality Ratio	% Improvement by DH-CE Hospitals[1]	All Other U.S. Hospitals Average Observed Inhospital Mortality to Expected Inhospital Mortality Ratio	% Improvement by All Other Hospitals[2]	Relative Risk Reduction Associated with DH-CE Hospitals Compared to All Other U.S. Hospitals[3]	Number of Lives That Could Have Been Saved If All Patients Treated at DH-CE Hospitals (2004-2006)[4]	P-Value (DH-CE Hospital Mortality Compared to National Mortality Average)
Atrial Fibrillation	2004	186,680	.82		1.12				<.001
	2005	188,072	.71		1.07				<.001
	2006	190,162	.68		1.00				<.001
	2004-2006	564,914	.73	17.28%	1.06	10.94%	30.84%	2,071	<.001
Bowel Obstruction	2004	157,622	.79		1.12				<.001
	2005	158,431	.74		1.04				<.001
	2006	154,684	.69		1.02				<.001
	2004-2006	470,737	.74	12.97%	1.06	9.02%	30.28%	5,214	<.001
Chronic Obstructive Pulmonary Disease (COPD)	2004	360,723	.77		1.10				<.001
	2005	378,496	.73		1.08				<.001
	2006	335,072	.63		.98				<.001
	2004-2006	1,074,291	.71	18.67%	1.06	11.46%	32.83%	7,083	<.001
Coronary Artery Bypass Surgery	2004	110,046	.88		1.15				<.001
	2005	103,520	.84		1.04				<.001
	2006	90,505	.75		.98				<.001
	2004-2006	304,071	.82	14.30%	1.06	14.96%	22.16%	1,608	<.001
Coronary Interventional Procedures (Angioplasty/ Stent)	2004	324,105	.86		1.01				<.001
	2005	328,442	.94		1.09				.044
	2006	323,704	.78		1.03				<.001
	2004-2006	976,251	.86	9.68%	1.04	-1.78%	17.44%	1,541	<.001
Diabetic Acidosis and Coma	2004	55,583	.76		1.16				<.001
	2005	56,683	.75		1.03				<.001
	2006	55,180	.60		.97				<.001
	2004-2006	167,446	.71	20.66%	1.06	15.89%	33.15%	953	<.001

Diagnosis or Procedure	Year	Total Number of U.S. Medicare Hospitalizations	DH-CE Hospitals Average Observed Inhospital Mortality to Expected Inhospital Mortality Ratio	% Improvement by DH-CE Hospitals[1]	All Other U.S. Hospitals Average Observed Inhospital Mortality to Expected Inhospital Mortality Ratio	% Improvement by All Other Hospitals[2]	Relative Risk Reduction Associated with DH-CE Hospitals Compared to All Other U.S. Hospitals[3]	Number of Lives That Could Have Been Saved If All Patients Treated at DH-CE Hospitals (2004-2006)[4]	P-Value (DH-CE Hospital Mortality Compared to National Mortality Average)
Gastrointestinal Bleed	2004	293,762	.85		1.14				<.001
	2005	286,622	.75		1.06				<.001
	2006	268,212	.66		.97				<.001
	2004-2006	848,596	.76	22.17%	1.06	14.79%	28.36%	6,264	<.001
Gastrointestinal Surgeries and Procedures	2004	85,974	.84		1.12				<.001
	2005	83,411	.78		1.03				<.001
	2006	81,725	.77		1.01				<.001
	2004-2006	251,110	.79	8.41%	1.05	9.38%	24.48%	5,304	<.001
Heart Attack	2004	293,321	.89		1.08				<.001
	2005	278,574	.82		1.04				<.001
	2006	252,122	.80		.98				<.001
	2004-2006	824,017	.84	10.19%	1.04	8.67%	19.01%	14,741	<.001
Heart Failure	2004	678,834	.80		1.12				<.001
	2005	665,127	.69		1.06				<.001
	2006	629,630	.68		1.00				<.001
	2004-2006	1,973,591	.72	15.10%	1.06	10.32%	31.98%	23,051	<.001
Pancreatitis	2004	55,711	.80		1.20				<.001
	2005	53,391	.70		1.03				<.001
	2006	51,252	.66		.95				<.001
	2004-2006	160,354	.72	17.60%	1.06	20.89%	32.03%	1,330	<.001
Pneumonia	2004	609,084	.80		1.15				<.001
	2005	617,066	.65		1.02				<.001
	2006	526,240	.62		.97				<.001
	2004-2006	1,752,390	.69	22.68%	1.05	15.24%	34.17%	31,015	<.001
Pulmonary Embolism	2004	45,726	.84		1.18				<.001
	2005	50,411	.63		1.07				<.001
	2006	51,454	.67		.98				<.001
	2004-2006	147,591	.71	20.36%	1.08	16.90%	34.13%	2,269	<.001

Diagnosis or Procedure	Year	Total Number of U.S. Medicare Hospitalizations	DH-CE Hospitals Average Observed Inhospital Mortality to Expected Inhospital Mortality Ratio	% Improvement by DH-CE Hospitals[1]	All Other U.S. Hospitals Average Observed Inhospital Mortality to Expected Inhospital Mortality Ratio	% Improvement by All Other Hospitals[2]	Relative Risk Reduction Associated with DH-CE Hospitals Compared to All Other U.S. Hospitals[3]	Number of Lives That Could Have Been Saved If All Patients Treated at DH-CE Hospitals (2004-2006)[4]	P-Value (DH-CE Hospital Mortality Compared to National Mortality Average)
Resection/Replacement of Abdominal Aorta	2004	20,555	.98		1.00				.358
	2005	21,696	.90		1.07				.048
	2006	21,672	.86		1.00				.016
	2004-2006	63,923	.91	11.61%	1.02	.02%	10.93%	307	.008
Respiratory Failure	2004	115,801	.87		1.12				<.001
	2005	136,403	.78		1.04				<.001
	2006	152,424	.78		1.01				<.001
	2004-2006	404,628	.80	10.03%	1.05	9.37%	23.43%	18,350	<.001
Sepsis	2004	207,080	.88		1.14				<.001
	2005	252,845	.79		1.05				<.001
	2006	272,398	.74		.99				<.001
	2004-2006	732,323	.80	15.39%	1.05	13.37%	24.41%	32,285	<.001
Stroke	2004	258,842	.85		1.09				<.001
	2005	255,043	.81		1.06				<.001
	2006	239,771	.73		.99				<.001
	2004-2006	753,656	.80	14.11%	1.05	9.81%	23.81%	16,370	<.001
Valve Replacement Surgery	2004	37,869	.86		1.18				<.001
	2005	37,727	.73		1.06				<.001
	2006	36,846	.78		1.00				<.001
	2004-2006	112,442	.79	9.53%	1.08	15.20%	26.35%	1,667	<.001
Totals		**11,582,331**						**171,424**	
3-Year Performance Averages			**0.77**	**15.04%**	**1.05**	**11.36%**	**26.66%**		

[1] Percent improvement determines improvement over time (2004 to 2006) for aggregate DH-CE hospitals. Calculated as follows: (O/E for 2004 – O/E for 2006) / (O/E for 2004) where the O/E is for the DH-CE hospitals.

[2] Percent improvement determines improvement over time (2004 to 2006) for aggregate Non-DH-CE hospitals. Calculated as follows: (O/E for 2004 – O/E for 2006) / (O/E for 2004) where the O/E is for the Non-DH-CE hospitals.

[3] Relative Risk Reduction determines the difference in performance between DH-CE and All Other hospitals. Calculated as follows: (Non-DH-CE O/E – DH-CE O/E) / Non-DH-CE O/E.

[4] Lives saved were calculated: All Other hospitals' 3-year actual number of mortalities – (All Other hospitals' 3-year expected number of mortalities x DH-CE O/E ratio).

Exhibit D: Inhospital Complications Performance: Distinguished Hospitals for Clinical Excellence (DH-CE) Compared to All Other U.S. Hospitals (3-Year Aggregate Relative Risk-Adjusted Inhospital Complications Performance: 2004-2006)

Diagnosis or Procedure	Year	Total Number of U.S. Medicare Hospitalizations	DH-CE Hospitals Average Observed Inhospital Complications to Expected Inhospital Complications Ratio	% Improvement by DH-CE Hospitals[1]	All Other U.S. Hospitals Average Observed Inhospital Complications to Expected Inhospital Complications Ratio	% Improvement by All Other Hospitals[2]	Relative Risk Reduction Associated with DH-CE Hospitals Compared to All Other U.S. Hospitals[3]	Number of Patients That Could Have Avoided Developing ≥1 Post-Op Complications If All Patients Treated at DH-CE Hospitals (2004-2006)[4]	P-Value (DH-CE Hospital Complications Compared to National Complication Average)
Back and Neck Surgery (Except Spinal Fusion)	2004	64,210	1.00		1.00				.443
	2005	61,864	1.00		1.02				.447
	2006	58,651	1.00		.99				.478
	2004-2006	184,725	1.00	-.20%	1.00	1.15%	.72%	109	.423
Back and Neck Surgery (Spinal Fusion)	2004	44,913	.99		.98				.410
	2005	49,057	.99		1.02				.375
	2006	51,337	1.02		1.03				.827
	2004-2006	145,307	1.00	-2.58%	1.01	-4.35%	.97%	181	.601
Carotid Surgery	2004	73,466	1.00		1.01				.512
	2005	74,054	1.00		.99				.546
	2006	72,259	.95		.99				.035
	2004-2006	219,779	.98	5.02%	.99	2.07%	.95%	120	.167
Cholecystectomy	2004	72,550	1.00		1.05				.444
	2005	70,728	.96		1.02				.025
	2006	68,124	.96		1.02				.020
	2004-2006	211,402	.97	3.68%	1.03	2.90%	5.41%	1,393	.008
Hip Fracture Repair	2004	144,225	.93		1.05				<.001
	2005	142,828	.92		1.02				<.001
	2006	140,005	.87		1.01				<.001
	2004-2006	427,058	.90	6.59%	1.02	3.43%	11.71%	4,491	<.001

Diagnosis or Procedure	Year	Total Number of U.S. Medicare Hospitalizations	DH-CE Hospitals Average Observed Inhospital Complications to Expected Inhospital Complications Ratio	% Improvement by DH-CE Hospitals[1]	All Other U.S. Hospitals Average Observed Inhospital Complications to Expected Inhospital Complications Ratio	% Improvement by All Other Hospitals[2]	Relative Risk Reduction Associated with DH-CE Hospitals Compared to All Other U.S. Hospitals[3]	Number of Patients That Could Have Avoided Developing ≥1 Post-Op Complications If All Patients Treated at DH-CE Hospitals (2004-2006)[4]	P-Value (DH-CE Hospital Complications Compared to National Complication Average)
Peripheral Vascular Bypass	2004	25,309	1.02		1.04				.709
	2005	23,685	.98		1.03				.297
	2006	20,645	1.01		.98				.590
	2004-2006	69,639	1.00	1.21%	1.02	5.02%	1.62%	82	.560
Prostatectomy	2004	65,317	.85		.99				<.001
	2005	60,355	.92		1.00				.005
	2006	56,638	.92		1.04				.006
	2004-2006	182,310	.89	-7.10%	1.01	-5.38%	11.52%	963	<.001
Total Hip Replacement	2004	76,801	.96		.99				.035
	2005	79,095	.91		1.02				<.001
	2006	75,239	.89		1.01				<.001
	2004-2006	231,135	.92	6.82%	1.01	-2.03%	8.86%	1,213	<.001
Total Knee Replacement	2004	162,794	1.02		1.00				.793
	2005	182,437	.96		1.02				.008
	2006	181,586	.94		1.00				<.001
	2004-2006	526,817	.97	7.68%	1.01	-.34%	4.02%	1,118	<.001
Totals		**2,198,172**						**9,671**	
3-Year Performance Average			**0.96**	**2.35%**	**1.01**	**0.27%**	**5.09%**		

[1] Percent improvement determines improvement over time (2004 to 2006) for aggregate DH-CE hospitals. Calculated as follows: (O/E for 2004 – O/E for 2006) / (O/E for 2004) where the O/E is for the DH-CE hospitals.

[2] Percent improvement determines improvement over time (2004 to 2006) for aggregate Non-DH-CE hospitals. Calculated as follows: (O/E for 2004 – O/E for 2006) / (O/E for 2004) where the O/E is for the Non-DH-CE hospitals.

[3] Relative Risk Reduction determines the difference in performance between DH-CE and All Other hospitals. Calculated as follows: (Non-DH-CE O/E – DH-CE O/E) / Non-DH-CE O/E.

[4] Complications avoided were calculated: All Other hospitals' 3-year actual number of complications – (All Other hospitals' 3-year expected number of complications x DH-CE O/E ratio).

Exhibit E: Hospital Report Card™ Mortality and Complication Based Outcomes 2008 Methodology White Paper

Introduction

To help consumers evaluate and compare hospital performance, HealthGrades analyzed patient outcome data for virtually every hospital in the country. Health Grades, Inc. uses the following data source:

- Medicare inpatient data from the MedPAR database (purchased from the Centers for Medicare and Medicaid Services) for fiscal years 2004 through 2006.

Ratings were based upon HealthGrades' risk-adjustment methodology described below. The purpose of risk adjustment is to obtain fair statistical comparisons among disparate populations or groups. Significant differences in demographic and clinical risk factors are found among patients treated in different hospitals. Risk adjustment of the data is needed to make accurate and valid comparisons of clinical outcomes at different hospitals.

Data Acquisition

The MedPAR data was selected for several reasons.

- First, it includes virtually every hospital in the country, with the exception of military and Veterans Administration hospitals.
- Second, hospitals are required by law to submit complete and accurate information with substantial penalties for those that report inaccurate or incomplete data.
- Third, the Medicare population represents a majority of the patients for virtually all of the clinical categories studied. For example, Medicare patients account for approximately 55 – 60 percent of all cardiac patients.

For Multivariate Logistic Regression-Based Ratings (see below), HealthGrades conducted a series of data quality checks to preserve the integrity of the ratings. Based on the results of these checks, we excluded a limited number of cases because they were inappropriate for inclusion in the database or miscoded.

Examples of excluded patient records were:

- Patients under the age of 65
- Patients who left the hospital against medical advice or who were transferred to another acute care hospital
- Patients discharged alive with a length of stay that is inconsistent with the reason for admission. (For example, a patient discharged alive with a one day length of stay for valve replacement surgery would be excluded because this procedure requires several days for recovery.)
- Patients who were still in the hospital when the Medicare claim was filed
- Patients with an invalid gender

Methodology for Ratings

HealthGrades' Multivariate Logistic Regression-Based Ratings methodology takes into account patient characteristics such as age, gender, and underlying medical conditions that could increase the patient's risk of mortality or complication.

Multivariate Logistic Regression-Based Ratings

The inhospital data for 27 procedures and diagnoses on the HealthGrades Web site represent three years of patient discharges from 2004 to 2006.

In the initial analysis of the data, a separate data set was created for each group of patients having a specific procedure or diagnosis based on ICD-9-CM coding (e.g., coronary bypass surgery, total hip replacement). Each group of patients was defined by using the information on diagnoses and procedures coded in the patient records. See *Appendix A* for a list of the diagnosis and procedure codes that define each patient cohort. The quality measure for some cohorts was mortality, whereas for other cohorts the quality measure was major complications.

For each patient cohort, we developed a list of specific procedures and diagnosis that define the cohort, a list of risk factors (*Appendix C*), and a list of post-surgical complications. These latter two lists were developed in the following manner:

1. Potential risk factors were identified as all diagnoses occurring in more than .5 percent of the patient population, demographic characteristics, and clinically relevant procedures.
2. Post-surgical complications were identified using a team of clinical and coding experts.

In some cases an ICD-9 code can be either a risk or a complication. In these cases, a code is differentiated by the presence of a 900 post-operative complication code. For example in the case where a patient record contains 427.31 Atrial Fibrillation, that code is considered a risk if it occurs by itself and a complication if there is a corresponding 997.1 Cardiac Complications, NEC code also present in the patient record.

Some diagnosis codes were merged together (e.g., primary and secondary pulmonary hypertension) to minimize the impact of coding variations.

Outcomes were binary, with documented major/minor complications either present or not, and patients recorded as either alive or expired. In cohorts where the quality measure is major complications, mortality is considered a complication. See *Appendix B* for a list of complications included in the quality measure "Major Complications."

Risk-Adjustment Methodology

Fair and valid comparisons between hospital providers can be made only to the extent that the risk-adjustment methodology considers important differences in patient demographic and clinical characteristics. The risk-adjustment methodology used by HealthGrades defines risk factors as those clinical and demographic variables that influence patient outcomes in significant and systematic ways. Risk factors may include age, gender, specific procedure performed, and comorbid conditions such as hypertension, chronic renal failure, heart failure, and diabetes. The methodology is disease-specific and outcome-specific. This means that individual risk models are constructed and tailored for each clinical condition or procedure, and also for each outcome.

Developing the HealthGrades ratings involved four steps for each cohort (e.g., coronary bypass surgery) and quality measure (e.g., inhospital mortality or complications).

1. First, the predicted value (e.g., predicted mortality or complications) was obtained using logistic regression models discussed in the next section *Statistical Models*.

2. Second, the predicted value was compared with the actual, or observed, value (e.g., actual mortality or complications). Only hospitals with at least 30 cases across three years of data and at least five cases in the most current year were included.

3. Third, a test was conducted to determine whether the difference between the predicted and actual values was statistically significant. This test was performed to make sure that differences were very unlikely to be caused by chance alone.

4. Fourth, a star rating was assigned based upon the outcome of the statistical test.

Statistical Models

Unique statistical models were developed for each patient cohort and each outcome using logistic regression.

Comorbid diagnoses (e.g., hypertension, chronic renal failure, anemia, diabetes), demographic characteristics (e.g., age and gender), and specific procedures (where clinically relevant) were classified as potential risk factors. We used logistic regression to determine which of these were actually risk factors and to what extent they were correlated with the quality measure (e.g., mortality). All risk factors that remained in the final model had to be highly significant ($p < 0.05$) in predicting the outcome (mortality, inhospital complications). In addition, risk factors are required to have an odds ratio greater than 1.0. There are occasional exceptions to this rule; for example, risk factors that have been documented in the medical literature to be protective and risk factors that are part of the cohort definition remain in the model even if the odds ratio was less than one (e.g., Streptococcal pneumoniae pneumonia is one type of pneumonia that makes up the pneumonia cohort).

Complications were not counted as risk factors as they were considered a result of care received during the admission. See *Appendix C* for a list of the top five risk factors for each procedure or diagnosis.

The statistical models were checked for validity and finalized. All of the models were highly significant, with C-statistics ranging from ~ 0.6 to ~ 0.9. These cohort and outcome-specific models were then used to estimate the probability of the outcome for each patient in the cohort. Patients were then aggregated for each hospital to obtain the predicted outcome for each hospital.

Statistical significance tests were performed for each patient cohort to identify, by hospital, whether the actual and predicted rates were significantly different. We used a z-score to establish an approximate 90% confidence interval.

Assignment of Star Ratings

The following rating system was applied to the data for all procedures and diagnoses:

Actual performance was **better than predicted** and the difference was statistically significant.

Actual performance was **not significantly different** from what was predicted.

Actual performance was **worse than predicted** and the difference was statistically significant.

In general, 70 percent to 80 percent of hospitals in each procedure/diagnosis are classified as three stars, with actual results statistically the same as predicted results. Approximately 10 percent to 15 percent were one-star hospitals and 10 percent to 15 percent were five-star hospitals.

Limitations of the Data Models

It must be understood that while these models may be valuable in identifying hospitals that perform better than others, one should not use this information alone to determine the quality of care provided at each hospital. The models are limited by the following factors:

- Cases may have been coded incorrectly or incompletely by the hospital.
- The models can only account for risk factors that are coded into the billing data–if a particular risk factor was not coded into the billing data, such as a patient's socioeconomic status and health behavior, then it was not accounted for with these models.
- Although Health Grades, Inc. has taken steps to carefully compile these data using its methodology, no techniques are infallible, and therefore some information may be missing, outdated or incorrect.

Please note that a high ranking for a particular hospital is not a recommendation or endorsement by Health Grades, Inc. of a particular hospital; it means that the data associated with a particular hospital has met the foregoing qualifications. Only individual patients can decide whether a particular hospital is suited for their unique needs.

Also note that if more than one hospital reported to CMS under a single provider ID, HealthGrades analyzed patient outcome data for those hospitals as a single unit. (Throughout this document, therefore, "hospital" refers to one hospital or a group of hospitals reporting under a single provider ID.)

Appendix A: Patient Cohorts and Related ICD-9-CM Codes

Patient Cohort	ICD-9-CM Procedure/Diagnosis Codes and Criteria
Atrial Fibrillation	**Inclusions**
	Principal Diagnosis: 427.31
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5 Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, 414.06, 414.07, V42.1, V66.7
Back and Neck Surgery (Spinal Fusion)	**Inclusions**
	Principal Procedure: 81.00, 81.01, 81.02, 81.03, 81.04, 81.05, 81.06, 81.07, 81.08, 81.61, 81.62, 81.63, 81.64
	Exclusions
	Procedures (Primary or Secondary): 03.02, 37.51, 37.52, 37.53, 37.54, 37.5, 78.69, 81.3, 81.30, 81.31, 81.32, 81.33, 81.34, 81.35, 81.36, 81.37, 81.38, 81.39, 81.65, 81.66, 84.58, 84.59, 84.60, 84.61, 84.62, 84.63, 84.64, 84.65, 84.66, 84.67, 84.68, 84.69 Principal Diagnoses: 996.4, 996.40, 996.41, 996.42, 996.43, 996.44, 996.47, 996.49 Diagnoses (Primary or Secondary): 722.80, 722.81, 722.82, 722.83, 996.45, 996.46, V45.4
Back and Neck Surgery (Except Spinal Fusion)	**Inclusions**
	Principal Procedure: 03.09, 03.53, 80.50, 80.51, 80.59, 84.58, 84.59, 84.60, 84.61, 84.62, 84.63, 84.64, 84.65
	Exclusions
	Procedures (Primary or Secondary): 03.02, 37.5, 37.51, 37.52, 37.53, 37.54, 78.49, 78.69, 81.00, 81.01, 81.02, 81.03, 81.04, 81.05, 81.06, 81.07, 81.08, 81.3, 81.30, 81.31, 81.32, 81.33, 81.34, 81.35, 81.36, 81.37, 81.38, 81.39, 81.61, 81.62, 81.63, 81.64, 81.65, 81.66, 84.66, 84.67, 84.68, 84.69 Principal Diagnoses: 996.4, 996.40, 996.41, 996.42, 996.43, 996.44, 996.47, 996.49 Diagnoses (Primary or Secondary): 722.80, 722.81, 722.82, 722.83, 996.45, 996.46, V42.4, V45.4, V54.0, V54.01, V54.09
Bowel Obstruction	**Inclusions**
	Principal Diagnosis: 532.01, 532.11, 532.21, 532.31, 532.41, 532.51, 532.61, 532.71, 532.91, 534.01, 534.11, 534.21, 534.31, 534.41, 534.51, 534.61, 534.71, 534.91, 537.2, 537.3, 550.10, 550.11, 550.12, 550.13, 552.00, 552.01, 552.02, 552.03, 552.1, 552.20, 552.21, 552.29, 552.8, 552.9, 560.0, 560.1, 560.2, 560.31, 560.39, 560.81, 560.89, 560.9, 936, 937
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5 Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, V66.7
Carotid Surgery	**Inclusions**
	Principal Procedure: 00.61, 00.63, 38.12, 39.72
	Exclusions
	Procedures (Primary or Secondary): 36.10, 36.11, 36.12, 36.13, 36.14, 36.15, 36.16, 36.17, 36.19, 36.1, 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5, 38.08, 38.16, 38.18, 38.36, 39.24, 39.25, 39.29, 39.59, 39.90
Cholecystectomy	**Inclusions**
	Principal Procedure: 51.21, 51.22, 51.23, 51.24
	Exclusions
	Procedures (Primary or Secondary): 37.5, 37.51, 37.52, 37.53, 37.54, 37.62, 37.63 Diagnoses (Primary or Secondary): V66.7
Chronic Obstructive Pulmonary Disease (COPD)	**Inclusions**
	Principal Diagnosis: 491.1, 491.20, 491.21, 491.22, 491.8, 491.9, 492.8, 493.20, 493.21, 493.22, 494, 494.0, 494.1, 496
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5 Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, 480.3, 480.8, V66.7

Coronary Bypass Surgery	**Inclusions**
	Principal Procedure: 36.10, 36.11, 36.12, 36.13, 36.14, 36.15, 36.16, 36.19
	Exclusions
	Procedures (Primary or Secondary): 35.10, 35.11, 35.12, 35.13, 35.14, 35.20, 35.21, 35.22, 35.23, 35.24, 35.25, 35.26, 35.27, 35.28, 35.55, 35.1, 35.2, 36.33, 36.34, 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5, 38.12, 38.34, 38.44, 38.64, 39.71, 44.12 Diagnoses (Primary or Secondary): 414.06, 414.07, 441.00, 441.01, 441.02, 441.03, V42.1
Coronary Interventional Procedures	**Inclusions**
	Principal Procedure: 00.66, 36.01, 36.02, 36.05, 36.06, 36.07, 36.09
	Exclusions
	Procedures (Primary or Secondary): 35.10, 35.11, 35.12, 35.13, 35.14, 35.20, 35.21, 35.22, 35.23, 35.24, 35.25, 35.26, 35.27, 35.28, 35.1, 35.2, 36.10, 36.11, 36.12, 36.13, 36.14, 36.15, 36.16, 36.19, 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5 Diagnoses (Primary or Secondary): 414.06, 414.07, V42.1
Diabetic Acidosis and Coma	**Inclusions**
	Principal Diagnosis: 250.10, 250.11, 250.12, 250.13, 250.20, 250.21, 250.22, 250.23, 250.30, 250.31, 250.32, 250.33, 250.80, 250.81, 250.82, 250.83
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5 Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, V66.7
Gastrointestinal Bleed	**Inclusions**
	Principal Diagnosis: 456.0, 456.20, 530.2, 530.21, 530.7, 530.82, 531.00, 531.01, 531.20, 531.21, 531.40, 531.41, 531.60, 531.61, 532.00, 532.01, 532.20, 532.21, 532.40, 532.41, 532.60, 532.61, 533.00, 533.01, 533.20, 533.21, 533.40, 533.41, 533.60, 533.61, 534.0, 534.00, 534.01, 534.20, 534.21, 534.40, 534.41, 534.60, 534.61, 535.01, 535.11, 535.21, 535.31, 535.41, 535.51, 535.61, 537.83, 537.84, 562.02, 562.03, 562.12, 562.13, 569.3, 569.82, 569.85, 569.86, 578, 578.0, 578.1, 578.9
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5 Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, V66.7
Gastrointestinal Surgeries and Procedures	**Inclusions**
	Principal Procedure: 43.81, 43.89, 43.91, 43.99, 43.5, 43.6, 43.7, 44.00, 44.01, 44.02, 44.03, 44.40, 44.41, 44.42, 44.63, 44.64, 44.65, 44.66, 44.69, 45.61, 45.62, 45.63, 45.71, 45.72, 45.73, 45.74, 45.75, 45.76, 45.79, 45.90, 45.91, 45.92, 45.93, 45.94, 45.95, 45.8
	Exclusions
	Diagnoses (Primary or Secondary): 151.0, 151.1, 151.2, 151.3, 151.4, 151.5, 151.6, 151.8, 151.9, 152.0, 152.1, 152.2, 152.3, 152.8, 152.9, 153.0, 153.1, 153.2, 153.3, 153.4, 153.5, 153.6, 153.7, 153.8, 153.9, 154.0, 154.1, 154.2, 154.3, 154.8, 155.0, 155.1, 155.2, 156.0, 156.1, 156.2, 156.8, 156.9, 157.0, 157.1, 157.2, 157.3, 157.4, 157.8, 157.9, 158.0, 158.8, 158.9, 159.0, 159.1, 159.8, 159.9, 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89
Heart Attack	**Inclusions**
	Principal Diagnosis: 410.01, 410.11, 410.21, 410.31, 410.41, 410.51, 410.61, 410.71, 410.81, 410.91
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5, 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5 Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, 414.06, 414.07, V42.1, V66.7, 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, 414.06, 414.07, V42.1, V66.7
Heart Failure	**Inclusions**
	Principal Diagnosis: 398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0, 428.1, 428.2, 428.20, 428.21, 428.22, 428.23, 428.3, 428.30, 428.31, 428.32, 428.33, 428.4, 428.40, 428.41, 428.42, 428.43, 428.9
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5, 39.95 Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, 414.06, 414.07, V42.1, V66.7

Hip Fracture Repair	Inclusions
	Principal Procedure: 79.05, 79.15, 79.25, 79.35, 81.52
	Exclusions
	Procedures (Primary or Secondary): 00.85, 37.51, 37.52, 37.53, 37.54, 37.5, 78.65, 78.66, 78.67, 80.05, 80.06, 81.51, 81.53, 81.54, 81.55 Principal Diagnoses: 996.4, 996.40, 996.41, 996.42, 996.43, 996.44, 996.47, 996.49, V66 Diagnoses (Primary or Secondary): 800.6, 820.10, 820.11, 820.12, 820.13, 820.19, 820.20, 820.30, 820.31, 820.32, 820.9, 821.10, 821.11, 821.30, 821.31, 821.32, 821.33, 821.39, 996.45, 996.46 Diagnoses (Primary or Secondary when occurs with V1588, V424, V4364, V4365, V454, V5401, V5402, V5409): 996.4, 996.40, 996.41, 996.42, 996.43, 996.44, 996.47, 996.49
Pancreatitis	**Inclusions**
	Principal Diagnosis: 577.0, 577.1
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5 Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, V66.7
Peripheral Vascular Bypass	**Inclusions**
	Principal Procedure: 39.29 Principal Diagnosis: 250.60, 250.61, 250.62, 250.63, 250.70, 250.71, 250.72, 250.73, 250.80, 250.81, 250.82, 250.83, 440.20, 440.21, 440.22, 440.23, 440.24, 440.29, 440.30, 440.32, 442.2, 442.3, 443.89, 443.9, 444.22, 444.81, 445.02, 447.1, 681.10, 682.6, 682.7, 686.8, 707.10, 707.12, 707.13, 707.14, 707.15, 707.19, 707.8, 730.06, 730.07, 730.16, 730.17, 730.18, 730.26, 730.27, 785.4, 902.53, 904.41
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5, 39.25, 39.49 Principal Diagnoses: 445.01, 996.74 Diagnoses (Primary or Secondary): 440.31
Pneumonia	**Inclusions**
	Principal Diagnosis: 481, 482.0, 482.1, 482.2, 482.30, 482.31, 482.32, 482.39, 482.40, 482.41, 482.49, 482.81, 482.82, 482.83, 482.84, 482.89, 482.9, 483.0, 483.1, 483.8, 485, 486, 487.0
	Exclusions
	Procedures (Primary or Secondary): 37.5, 37.51, 37.52, 37.53, 37.54, 37.62, 37.63 Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, 480.3, V66.7
Prostatectomy	**Inclusions**
	Principal Procedure: 60.21, 60.29, 60.61, 60.62, 60.69, 60.3, 60.4, 60.5
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5
Pulmonary Embolism	**Inclusions**
	Principal Diagnosis: 415.11, 415.19
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5 Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, V66.7
Resection / Replacement of Abdominal Aorta	**Inclusions**
	Principal Procedure: 38.34, 38.44, 38.64, 39.71
	Exclusions
	Procedures (Primary or Secondary): 00.61, 35.10, 35.11, 35.12, 35.13, 35.14, 35.20, 35.21, 35.22, 35.23, 35.24, 35.25, 35.26, 35.27, 35.28, 36.10, 36.11, 36.12, 36.13, 36.14, 36.15, 36.16, 36.17, 36.19, 36.1, 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5, 38.08, 38.16, 38.18, 38.36, 38.45, 39.24, 39.25, 39.29, 39.50, 39.59 Diagnoses (Primary or Secondary): 441.00, 441.01, 441.02, 441.03, 441.1, 441.2, 441.6, 441.7, 441.9
Respiratory Failure	**Inclusions**
	Principal Diagnosis: 518.81, 518.84
	Exclusions
	Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, V66.7

Sepsis	**Inclusions**
	Principal Diagnosis: 003.1, 022.3, 027.0, 036.2, 036.3, 038.0, 038.10, 038.11, 038.19, 038.2, 038.3, 038.40, 038.41, 038.42, 038.43, 038.44, 038.49, 038.8, 038.9, 054.5, 785.52, 785.59, 995.90, 995.91, 995.92
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5 Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, V66.7
Stroke	**Inclusions**
	Principal Diagnosis: 430, 431, 432.9, 433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.11, 434.91, 436
	Exclusions
	Procedures (Primary or Secondary): 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5 Diagnoses (Primary or Secondary): 196.0, 196.1, 196.2, 196.3, 196.5, 196.6, 196.8, 196.9, 197.0, 197.1, 197.2, 197.3, 197.4, 197.5, 197.6, 197.7, 197.8, 198.0, 198.1, 198.2, 198.3, 198.4, 198.5, 198.6, 198.7, 198.8, 198.81, 198.82, 198.89, V66.7
Total Hip Replacement	**Inclusions**
	Principal Procedure: 81.51
	Exclusions
	Procedures (Primary or Secondary): 00.70, 00.71, 00.72, 00.73, 00.80, 00.81, 00.82, 00.83, 00.84, 00.85, 00.86, 00.87, 37.51, 37.52, 37.53, 37.54, 37.5, 78.65, 78.67, 80.05, 80.06, 81.53, 81.54, 81.55 Principal Diagnoses: 996.4, 996.41, 996.42, 996.43, 996.44, 996.47, 996.49 Diagnoses (Primary or Secondary): 996.45, 996.46, E800, E800.0, E800.1, E800.2, E800.3, E800.8, E800.9, E801, E801.0, E801.1, E801.2, E801.3, E801.8, E801.9, E802, E802.0, E802.1, E802.2, E802.3, E802.8, E802.9, E803, E803.0, E803.1, E803.2, E803.3, E803.8, E803.9, E804, E804.0, E804.1, E804.2, E804.3, E804.8, E804.9, E805, E805.0, E805.1, E805.2, E805.3, E805.8, E805.9, E806, E806.0, E806.1, E806.2, E806.3, E806.8, E806.9, E807, E807.0, E807.1, E807.2, E807.3, E807.8, E807.9, E810, E810.0, E810.1, E810.2, E810.3, E810.4, E810.5, E810.6, E810.7, E810.8, E810.9, E811, E811.0, E811.1, E811.2, E811.3, E811.4, E811.5, E811.6, E811.7, E811.8, E811.9, E812, E812.0, E812.1, E812.2, E812.3, E812.4, E812.5, E812.6, E812.7, E812.8, E812.9, E813, E813.0, E813.1, E813.2, E813.3, E813.4, E813.5, E813.6, E813.7, E813.8, E813.9, E814, E814.0, E814.1, E814.2, E814.3, E814.4, E814.5, E814.6, E814.7, E814.8, E814.9, E815, E815.0, E815.1, E815.2, E815.3, E815.4, E815.5, E815.6, E815.7, E815.8, E815.9, E816, E816.0, E816.1, E816.2, E816.3, E816.4, E816.5, E816.6, E816.7, E816.8, E816.9, E817, E817.0, E817.1, E817.2, E817.3, E817.4, E817.5, E817.6, E817.7, E817.8, E817.9, E818, E818.0, E818.1, E818.2, E818.3, E818.4, E818.5, E818.6, E818.7, E818.8, E818.9, E819, E819.0, E819.1, E819.2, E819.3, E819.4, E819.5, E819.6, E819.7, E819.8, E819.9, E820, E820.0, E820.1, E820.2, E820.3, E820.4, E820.5, E820.6, E820.7, E820.8, E820.9, E821, E821.0, E821.1, E821.2, E821.3, E821.4, E821.5, E821.6, E821.7, E821.8, E821.9, E822, E822.0, E822.1, E822.2, E822.3, E822.4, E822.5, E822.6, E822.7, E822.8, E822.9, E823, E823.0, E823.1, E823.2, E823.3, E823.4, E823.5, E823.6, E823.7, E823.8, E823.9, E824, E824.0, E824.1, E824.2, E824.3, E824.4, E824.5, E824.6, E824.7, E824.8, E824.9, E825, E825.0, E825.1, E825.2, E825.3, E825.4, E825.5, E825.6, E825.7, E825.8, E825.9, E826, E826.0, E826.1, E826.2, E826.3, E826.4, E826.8, E826.9, E827, E827.0, E827.2, E827.3, E827.4, E827.8, E827.9, E828, E828.0, E828.2, E828.4, E828.8, E828.9, E829, E829.0, E829.4, E829.8, E829.9, E830, E830.0, E830.1, E830.2, E830.3, E830.4, E830.5, E830.6, E830.8, E830.9, E831, E831.0, E831.1, E831.2, E831.3, E831.4, E831.5, E831.6, E831.8, E831.9, E832, E832.0, E832.1, E832.2, E832.3, E832.4, E832.5, E832.6, E832.8, E832.9, E833, E833.0, E833.1, E833.2, E833.3, E833.4, E833.5, E833.6, E833.8, E833.9, E834, E834.0, E834.1, E834.2, E834.3, E834.4, E834.5, E834.6, E834.8, E834.9, E835, E835.0, E835.1, E835.2, E835.3, E835.4, E835.5, E835.6, E835.8, E835.9, E836, E836.0, E836.1, E836.2, E836.3, E836.4, E836.5, E836.6, E836.8, E836.9, E837, E837.0, E837.1, E837.2, E837.3, E837.4, E837.5, E837.6, E837.8, E837.9, E838, E838.0, E838.1, E838.2, E838.3, E838.4, E838.5, E838.6, E838.8, E838.9, E840, E840.0, E840.1, E840.2, E840.3, E840.4, E840.5, E840.6, E840.7, E840.8, E840.9, E841, E841.0, E841.1, E841.2, E841.3, E841.4, E841.5, E841.6, E841.7, E841.8, E841.9, E842, E842.6, E842.7, E842.8, E842.9, E843, E843.0, E843.1, E843.2, E843.3, E843.4, E843.5, E843.6, E843.7, E843.8, E843.9, E844, E844.0, E844.1, E844.2, E844.3, E844.4, E844.5, E844.6, E844.7, E844.8, E844.9, E845, E845.0, E845.8, E845.9, E846, E847, E848, E849, E849.0, E849.1, E849.2, E849.3, E849.4, E849.5, E849.6, E849.7, E849.8, E849.9, E880, E880.0, E880.1, E880.9, E881, E881.0, E881.1, E882, E883, E883.0, E883.1, E883.2, E883.9, E884, E884.0, E884.1, E884.2, E884.3, E884.4, E884.5, E884.6, E884.9, E885, E885.0, E885.1, E885.2, E885.3, E885.4, E885.9, E886, E886.0, E886.9, E887, E888, E888.0, E888.1, E888.8, E888.9, E890.0, E890.8, E891.0, E891.8, E916, E917.0, E917.1, E917.2, E917.3, E917.4, E917.5, E917.6, E917.7, E917.8, E917.9, E918, E919.0, E919.1, E919.2, E919.3, E919.4, E919.5, E919.6, E919.7, E919.8, E919.9, E920, E920.0, E920.1, E920.2, E920.3, E920.4, E920.5, E920.8, E920.9, E921,

	E921.0, E921.1, E921.8, E921.9, E922, E922.0, E922.1, E922.2, E922.3, E922.4, E922.5, E922.8, E922.9, E923, E923.0, E923.1, E923.2, E923.8, E923.9, E928.8, E928.9, E929, E929.0, E929.1, E929.2, E929.3, E929.4, E929.5, E929.8, E929.9, E955.0, E955.1, E955.2, E955.3, E955.4, E955.5, E955.6, E955.7, E955.9, E956, E957.0, E957.1, E957.2, E957.9, E958.0, E958.5, E958.6, E960.0, E965.0, E965.1, E965.2, E965.3, E965.4, E965.5, E965.6, E965.7, E965.8, E965.9, E966, E968.1, E968.2, E968.5, E968.6, E969, E970, E971, E973, E974, E977, E985, E985.0, E985.1, E985.2, E985.3, E985.4, E985.5, E985.6, E985.7, E986, E987, E987.0, E987.1, E987.2, E987.9, E988, E988.0, E988.5, E988.6, E989, V15.5, V58.43, V58.49
Total Knee Replacement	**Inclusions**
	Principal Procedure: 81.54
	Exclusions
	Procedures (Primary or Secondary): 00.74, 00.75, 00.76, 00.80, 00.81, 00.82, 00.83, 00.84, 37.51, 37.52, 37.53, 37.54, 37.5, 78.65, 78.67, 80.05, 80.06, 81.51, 81.52, 81.53, 81.55 Principal Diagnoses: 996.4, 996.40, 996.41, 996.42, 996.43, 996.44, 996.47, 996.49 Diagnoses (Primary or Secondary): 996.45, 996.46
Valve Replacement Surgery	**Inclusions**
	Principal or Secondary Procedure: 35.20, 35.21, 35.22, 35.23, 35.24, 35.25, 35.26, 35.27, 35.28
	Exclusions
	Procedures (Primary or Secondary): 35.33, 35.55, 35.1, 36.33, 36.34, 37.51, 37.52, 37.53, 37.54, 37.62, 37.63, 37.5, 38.12, 38.34, 38.44, 38.64, 39.71, 44.12 Diagnoses (Primary or Secondary): 414.06, 414.07, 441.00, 441.01, 441.02, 441.03, 441.2, V42.1

Appendix B: Major Complications

Major Complications – Back and Neck Surgery (Spinal Fusion)

Major Complications – Back and Neck Surgery (Spinal Fusion)			
292.81	DRUG-INDUCED DELIRIUM	483.1	CHLAMYDIAL PNEUMONIA
293.0	DELIRIUM D/T CCE	483.8	PNEUMONIA D/T ORG NEC
410.01	ANTEROLAT AMI-INITIAL	484	PNEUM IN OTH INF DIS
410.11	ANT AMI NEC-INITIAL	484.1	PNEUMONIA IN CMV DISEASE
410.21	INFEROLAT AMI-INITIAL	484.3	PNEUMONIA IN WHOOP COUGH
410.31	INFEROPOST AMI-INITIAL	484.5	PNEUMONIA IN ANTHRAX
410.41	INF AMI NEC-INITIAL	484.6	PNEUM IN ASPERGILLOSIS
410.51	LAT AMI NEC-INITIAL	484.7	PNEUM IN SYST MYCOSESNEC
410.61	POSTERIOR AMI-INITIAL	484.8	PNEUM IN INFECT DIS NEC
410.71	SUBEND INFARCT-INITIAL	485	BRONCHOPNEUMONIA ORG NOS
410.81	AMI NEC-INITIAL EPISODE	486	PNEUMONIA ORGANISM NOS
410.91	AMI NOS-INITIAL EPISODE	507.0	FOOD/VOMIT PNEUMONITIS
415.11	IATRO PULM EMBOL/INFARCT	511.9	PLEURAL EFFUSION NOS
415.19	PULMON EMBOL/INFARCT NEC	518.5	POSTTR PULMON INSUFF
480	VIRAL PNEUMONIA	518.81	AC RESPIRATORY FAILURE
480.0	ADENOVIRAL PNEUMONIA	584.5	AC RF W TUBULAR NEPHR
480.1	RSV PNEUMONIA	584.8	ACUTE RENAL FAILURE NEC
480.2	PARINFLUENZA VIRAL PNEUM	584.9	ACUTE RENAL FAILURE NOS
480.3	SARS PNEUMONIA	995.91	SEPSIS
480.8	VIRAL PNEUMONIA NEC	995.92	SEVERE SEPSIS
480.9	VIRAL PNEUMONIA NOS	996.4	MECH COMP INT ORTH DEV
481	PNEUMOCOCCAL PNEUMONIA	996.40	MECH COMP INT ORTH NOS
482	OTHER BACT PNEUMONIA	996.42	DISLOCATION JOINT PROSTH
482.0	K. PNEUMONIAE PNEUMONIA	996.41	MECH LOOSENING JT PROSTH
482.1	PSEUDOMONAL PNEUMONIA	996.43	PROSTH JOINT FAILURE
482.2	H. INFLUENZAE PNEUMONIA	996.44	PERI-PROSTHETIC FRACTURE
482.3	STREPTOCOCCAL PNEUMONIA	996.45	PERI-PROSTH OSTEOLYSIS
482.4	PNEUMONIA-STAPHYLOCOCCUS	996.46	JT PROSTH SURFACE WEAR
482.30	STREP PNEUMONIA NOS	996.47	MECH COMP JT PROSTH NEC
482.31	GROUP A STREP PNEUMONIA	996.49	MECH COMP INT ORTH NEC
482.32	GROUP B STREP PNEUMONIA	996.77	COMP NEC D/T JT PROSTH
482.39	STREP PNEUMONIA NEC	996.78	COMP NEC ORTH DEV NEC
482.4	STAPHYLOCOCCAL PNEUMONIA	997.02	IATROGEN CV INFARCT/HEM
482.40	STAPH PNEUMONIA NOS	997.09	NERV SYST SURG COMP NEC
482.41	STAPH AUREUS PNEUMONIA	997.1	SURG COMP-HEART
482.49	STAPH PNEUMONIA NEC	997.3	SURG COMP-RESP NEC
482.8	OTH BACTERIAL PNEUMONIA	997.4	SURG COMP-DIGESTIVE
482.81	PNEUMONIA D/T ANAEROBES	997.5	SURG COMP-URINARY NEC
482.82	E. COLI PNEUMONIA	998.0	POSTOPERATIVE SHOCK
482.83	GRAM-NEG PNEUMONIA NEC	998.11	HEMORRHAGE COMP PX
482.84	LEGIONNAIRES' DISEASE	998.2	ACCIDENTAL OP LACERATION
482.89	BACTERIAL PNEUMONIA NEC	998.3	POSTOP WOUND DISRUPTION
482.9	BACTERIAL PNEUMONIA NOS	998.31	DISRUPT INTERNAL OP WND
483	PNEUMONIA ORGANISM NEC	998.32	DISRUPT EXTERNAL OP WND
483.0	M. PNEUMONIAE PNEUMONIA	998.59	POSTOP INFECTION NEC

Dependent Complications – Back and Neck Surgery (Spinal Fusion)

Must occur with 997.1 Cardiac Complications			
427.0	PSVT	428.23	AC & CHR SYSTOLIC HF
427.1	PVT	428.3	DIASTOLIC HEART FAILURE
427.31	ATRIAL FIBRILLATION	428.30	DIASTOLIC HF NOS
427.32	ATRIAL FLUTTER	428.31	ACUTE DIASTOLIC HF
427.89	OTH CARDIAC DYSRHYTHMIAS	428.33	AC & CHR DIASTOLIC HF
427.9	CARDIAC DYSRHYTHMIA NOS	428.4	SYSTOLIC & DIASTOLIC HF
428.0	CHF NOS	428.40	SYS & DIASTOLIC HF NOS
428.1	LEFT HEART FAILURE	428.41	AC SYS & DIASTOLIC HF
428.2	SYSTOLIC HEART FAILURE	428.43	ACCHR SYS & DIASTOLIC HF
428.20	SYSTOLIC HF NOS	428.9	HEART FAILURE NOS
428.21	ACUTE SYSTOLIC HF		
Must occur with 997.4 Digestive System Complications			
560.1	PARALYTIC ILEUS		
Must occur with 997.5 Urinary Complications			
593.9	RENAL/URETER DISORD NOS	788.20	RETENTION OF URINE NOS
599.0	URINARY TRACT INF NOS	788.29	RETENTION OF URINE NEC
Must occur with 998.59 Postoperative Infection			
038	SEPTICEMIA	038.40	GRAM-NEG SEPTICEMIA NOS
038.0	STREPTOCOCCAL SEPTICEMIA	038.41	H. INFLUENZAE SEPTICEMIA
038.1	STAPH SEPTICEMIA	038.42	E. COLI SEPTICEMIA
038.10	STAPH SEPTICEMIA NOS	038.43	PSEUDOMONAS SEPTICEMIA
038.11	STAPH AUREUS SEPTICEMIA	038.44	SERRATIA SEPTICEMIA
038.19	STAPH SEPTICEMIA NEC	038.49	GRAM-NEG SEPTICEMIA NEC
038.2	PNEUMOCOCCAL SEPTICEMIA	038.8	SEPTICEMIA NEC
038.3	ANAEROBIC SEPTICEMIA	038.9	SEPTICEMIA NOS
038.4	OTH GRAM-NEG SEPTICEMIA		

Major Complications – Back and Neck Surgery (Except Spinal Fusion)

Major Complications – Back and Neck Surgery (Except Spinal Fusion)			
292.81	DRUG-INDUCED DELIRIUM	483.0	M. PNEUMONIAE PNEUMONIA
293.0	DELIRIUM D/T CCE	483.1	CHLAMYDIAL PNEUMONIA
410.01	ANTEROLAT AMI-INITIAL	483.8	PNEUMONIA D/T ORG NEC
410.11	ANT AMI NEC-INITIAL	484	PNEUM IN OTH INF DIS
410.21	INFEROLAT AMI-INITIAL	484.1	PNEUMONIA IN CMV DISEASE
410.31	INFEROPOST AMI-INITIAL	484.3	PNEUMONIA IN WHOOP COUGH
410.41	INF AMI NEC-INITIAL	484.5	PNEUMONIA IN ANTHRAX
410.51	LAT AMI NEC-INITIAL	484.6	PNEUM IN ASPERGILLOSIS
410.61	POSTERIOR AMI-INITIAL	484.7	PNEUM IN SYST MYCOSESNEC
410.71	SUBEND INFARCT-INITIAL	484.8	PNEUM IN INFECT DIS NEC
410.81	AMI NEC-INITIAL EPISODE	485	BRONCHOPNEUMONIA ORG NOS
410.91	AMI NOS-INITIAL EPISODE	486	PNEUMONIA ORGANISM NOS
480	VIRAL PNEUMONIA	507.0	FOOD/VOMIT PNEUMONITIS
480.0	ADENOVIRAL PNEUMONIA	511.9	PLEURAL EFFUSION NOS
480.1	RSV PNEUMONIA	518.5	POSTTR PULMON INSUFF
480.2	PARINFLUENZA VIRAL PNEUM	518.81	AC RESPIRATORY FAILURE
480.3	SARS PNEUMONIA	584.5	AC RF W TUBULAR NEPHR
480.8	VIRAL PNEUMONIA NEC	584.8	ACUTE RENAL FAILURE NEC
480.9	VIRAL PNEUMONIA NOS	584.9	ACUTE RENAL FAILURE NOS
481	PNEUMOCOCCAL PNEUMONIA	995.91	SEPSIS
482	OTHER BACT PNEUMONIA	995.92	SEVERE SEPSIS
482.0	K. PNEUMONIAE PNEUMONIA	996.4	MECH COMP INT ORTH DEV
482.1	PSEUDOMONAL PNEUMONIA	996.40	MECH COMP INT ORTH NOS
482.2	H. INFLUENZAE PNEUMONIA	996.41	MECH LOOSENING JT PROSTH
482.3	STREPTOCOCCAL PNEUMONIA	996.42	DISLOCATION JOINT PROSTH
482.30	STREP PNEUMONIA NOS	996.43	PROSTH JOINT FAILURE
482.31	GROUP A STREP PNEUMONIA	996.44	PERI-PROSTHETIC FRACTURE
482.32	GROUP B STREP PNEUMONIA	996.47	MECH COMP JT PROSTH NEC
482.39	STREP PNEUMONIA NEC	996.49	MECH COMP INT ORTH NEC
482.4	STAPHYLOCOCCAL PNEUMONIA	996.77	COMP NEC D/T JT PROSTH
482.40	STAPH PNEUMONIA NOS	996.78	COMP NEC ORTH DEV NEC
482.41	STAPH AUREUS PNEUMONIA	997.00	NERV SYST SURG COMP NOS
482.49	STAPH PNEUMONIA NEC	997.02	IATROGEN CV INFARCT/HEM
482.8	OTH BACTERIAL PNEUMONIA	997.09	NERV SYST SURG COMP NEC
482.81	PNEUMONIA D/T ANAEROBES	997.1	SURG COMP-HEART
482.82	E. COLI PNEUMONIA	997.3	SURG COMP-RESP NEC
482.83	GRAM-NEG PNEUMONIA NEC	997.4	SURG COMP-DIGESTIVE
482.84	LEGIONNAIRES' DISEASE	997.5	SURG COMP-URINARY NEC
482.89	BACTERIAL PNEUMONIA NEC	998.11	HEMORRHAGE COMP PX
482.9	BACTERIAL PNEUMONIA NOS	998.2	ACCIDENTAL OP LACERATION
483	PNEUMONIA ORGANISM NEC	998.59	POSTOP INFECTION NEC

Dependent Complications - Back and Neck Surgery (Except Spinal Fusion)

Must occur with 997.1 Cardiac Complications			
427.0	PSVT	428.23	AC & CHR SYSTOLIC HF
427.1	PVT	428.3	DIASTOLIC HEART FAILURE
427.31	ATRIAL FIBRILLATION	428.30	DIASTOLIC HF NOS
427.89	OTH CARDIAC DYSRHYTHMIAS	428.31	ACUTE DIASTOLIC HF
427.9	CARDIAC DYSRHYTHMIA NOS	428.33	AC & CHR DIASTOLIC HF
428.0	CHF NOS	428.4	SYSTOLIC & DIASTOLIC HF
428.1	LEFT HEART FAILURE	428.40	SYS & DIASTOLIC HF NOS
428.2	SYSTOLIC HEART FAILURE	428.41	AC SYS & DIASTOLIC HF
428.20	SYSTOLIC HF NOS	428.9	HEART FAILURE NOS
428.21	ACUTE SYSTOLIC HF		
Must occur with 997.4 Digestive System Complications			
560.1	PARALYTIC ILEUS		
Must occur with 997.5 Urinary Complications			
593.9	KIDNEY & URETER DIS, NOS	788.20	RETENTION OF URINE, NOS
599.0	URINARY TRACT INF NOS	788.29	RETENTION OF URINE, NEC
Must occur with 998.59 Postoperative Infection			
038	SEPTICEMIA	038.40	GRAM-NEG SEPTICEMIA NOS
038.0	STREPTOCOCCAL SEPTICEMIA	038.41	H. INFLUENZAE SEPTICEMIA
038.1	STAPH SEPTICEMIA	038.42	E. COLI SEPTICEMIA
038.10	STAPH SEPTICEMIA NOS	038.43	PSEUDOMONAS SEPTICEMIA
038.11	STAPH AUREUS SEPTICEMIA	038.44	SERRATIA SEPTICEMIA
038.19	STAPH SEPTICEMIA NEC	038.49	GRAM-NEG SEPTICEMIA NEC
038.2	PNEUMOCOCCAL SEPTICEMIA	038.8	SEPTICEMIA NEC
038.3	ANAEROBIC SEPTICEMIA	038.9	SEPTICEMIA NOS
038.4	OTH GRAM-NEG SEPTICEMIA		

Major Complications – Carotid Surgery

Major Complications – Carotid Surgery			
410.01	ANTEROLAT AMI-INITIAL	482.89	BACTERIAL PNEUMONIA NEC
410.11	ANT AMI NEC-INITIAL	482.9	BACTERIAL PNEUMONIA NOS
410.21	INFEROLAT AMI-INITIAL	483	PNEUMONIA ORGANISM NEC
410.51	LAT AMI NEC-INITIAL	483.0	M. PNEUMONIAE PNEUMONIA
410.61	POSTERIOR AMI-INITIAL	483.1	CHLAMYDIAL PNEUMONIA
410.71	SUBEND INFARCT-INITIAL	483.8	PNEUMONIA D/T ORG NEC
410.81	AMI NEC-INITIAL EPISODE	484	PNEUM IN OTH INF DIS
410.91	AMI NOS-INITIAL EPISODE	484.1	PNEUMONIA IN CMV DISEASE
427.5	CARDIAC ARREST	484.3	PNEUMONIA IN WHOOP COUGH
480	VIRAL PNEUMONIA	484.5	PNEUMONIA IN ANTHRAX
480.0	ADENOVIRAL PNEUMONIA	484.6	PNEUM IN ASPERGILLOSIS
480.1	RSV PNEUMONIA	484.7	PNEUM IN SYST MYCOSESNEC
480.2	PARINFLUENZA VIRAL PNEUM	484.8	PNEUM IN INFECT DIS NEC
480.3	SARS PNEUMONIA	485	BRONCHOPNEUMONIA ORG NOS
480.8	VIRAL PNEUMONIA NEC	486	PNEUMONIA ORGANISM NOS
480.9	VIRAL PNEUMONIA NOS	507.0	FOOD/VOMIT PNEUMONITIS
481	PNEUMOCOCCAL PNEUMONIA	518.5	POSTTR PULMON INSUFF
482	OTHER BACT PNEUMONIA	518.81	AC RESPIRATORY FAILURE
482.0	K. PNEUMONIAE PNEUMONIA	780.01	COMA
482.1	PSEUDOMONAL PNEUMONIA	951.7	INJURY HYPOGLOSSAL NERVE
482.2	H. INFLUENZAE PNEUMONIA	957.1	INJURY TO NERVE NEC
482.3	STREPTOCOCCAL PNEUMONIA	997.00	NERV SYST SURG COMP NOS
482.30	STREP PNEUMONIA NOS	997.01	CNS SURG COMP
482.31	GROUP A STREP PNEUMONIA	997.02	IATROGEN CV INFARCT/HEM
482.32	GROUP B STREP PNEUMONIA	997.09	NERV SYST SURG COMP NEC
482.39	STREP PNEUMONIA NEC	997.1	SURG COMP-HEART
482.4	STAPHYLOCOCCAL PNEUMONIA	997.3	SURG COMP-RESP NEC
482.40	STAPH PNEUMONIA NOS	997.4	SURG COMP-DIGESTIVE
482.41	STAPH AUREUS PNEUMONIA	997.5	SURG COMP-URINARY NEC
482.49	STAPH PNEUMONIA NEC	997.91	SURG COMP-HYPERTENSION
482.8	OTH BACTERIAL PNEUMONIA	998.0	POSTOPERATIVE SHOCK
482.81	PNEUMONIA D/T ANAEROBES	998.11	HEMORRHAGE COMP PX
482.82	E. COLI PNEUMONIA	998.2	ACCIDENTAL OP LACERATION
482.83	GRAM-NEG PNEUMONIA NEC	998.59	POSTOP INFECTION NEC
482.84	LEGIONNAIRES' DISEASE		

Dependent Complications - Carotid Surgery

Must occur with 997.02 Nervous System Complications			
434.11	CEREBRAL EMBOLISM-INFRCT	434.91	CEREBR ART OCCL-INFARCTN
Must occur with 997.1 Cardiac Complications			
427.1	PVT	428.3	DIASTOLIC HEART FAILURE
427.31	ATRIAL FIBRILLATION	428.30	DIASTOLIC HF NOS
427.89	OTH CARDIAC DYSRHYTHMIAS	428.31	ACUTE DIASTOLIC HF
428.0	CHF NOS	428.33	AC & CHR DIASTOLIC HF
428.1	LEFT HEART FAILURE	428.4	SYSTOLIC & DIASTOLIC HF
428.2	SYSTOLIC HEART FAILURE	428.40	SYS & DIASTOLIC HF NOS
428.20	SYSTOLIC HF NOS	428.41	AC SYS & DIASTOLIC HF
428.21	ACUTE SYSTOLIC HF	428.43	ACCHR SYS & DIASTOLIC HF
428.23	AC & CHR SYSTOLIC HF	428.9	HEART FAILURE NOS
Must occur with 997.4 Digestive System Complications			
560.1	PARALYTIC ILEUS		
Must occur with 997.5 Urinary Complications			
584.5	AC RF W TUBULAR NEPHR	593.9	RENAL/URETER DISORD NOS
584.8	ACUTE RENAL FAILURE NEC	599.0	URINARY TRACT INF NOS
584.9	ACUTE RENAL FAILURE NOS	788.20	RETENTION OF URINE NOS
Must occur with 998.59 Postoperative Infection			
038	SEPTICEMIA	038.40	GRAM-NEG SEPTICEMIA NOS
038.0	STREPTOCOCCAL SEPTICEMIA	038.41	H. INFLUENZAE SEPTICEMIA
038.1	STAPH SEPTICEMIA	038.42	E. COLI SEPTICEMIA
038.10	STAPH SEPTICEMIA NOS	038.43	PSEUDOMONAS SEPTICEMIA
038.11	STAPH AUREUS SEPTICEMIA	038.44	SERRATIA SEPTICEMIA
038.19	STAPH SEPTICEMIA NEC	038.49	GRAM-NEG SEPTICEMIA NEC
038.2	PNEUMOCOCCAL SEPTICEMIA	038.8	SEPTICEMIA NEC
038.3	ANAEROBIC SEPTICEMIA	038.9	SEPTICEMIA NOS
038.4	OTH GRAM-NEG SEPTICEMIA		

Major Complications – Cholecystectomy

Major Complications – Cholecystectomy			
008.45	C. DIFFICILE ENTERITIS	997.4	SURG COMP-DIGESTIVE
292.81	DRUG-INDUCED DELIRIUM	997.5	SURG COMP-URINARY NEC
415.11	IATRO PULM EMBOL/INFARCT	998.0	POSTOPERATIVE SHOCK
415.19	PULMON EMBOL/INFARCT NEC	998.11	HEMORRHAGE COMP PX
512.1	IATROGENIC PNEUMOTHORAX	998.2	ACCIDENTAL OP LACERATION
518.5	POSTTR PULMON INSUFF	998.3	POSTOP WOUND DISRUPTION
518.81	AC RESPIRATORY FAILURE	998.31	DISRUPT INTERNAL OP WND
997.02	IATROGEN CV INFARCT/HEM	998.32	DISRUPT EXTERNAL OP WND
997.1	SURG COMP-HEART	998.59	POSTOP INFECTION NEC
997.3	SURG COMP-RESP NEC		

Dependent Complications - Cholecystectomy

Must occur with 997.1 Cardiac Complications			
410.01	ANTEROLAT AMI-INITIAL	428.1	LEFT HEART FAILURE
410.11	ANT AMI NEC-INITIAL	428.2	SYSTOLIC HEART FAILURE
410.21	INFEROLAT AMI-INITIAL	428.20	SYSTOLIC HF NOS
410.51	LAT AMI NEC-INITIAL	428.21	ACUTE SYSTOLIC HF
410.61	POSTERIOR AMI-INITIAL	428.23	AC & CHR SYSTOLIC HF
410.71	SUBEND INFARCT-INITIAL	428.3	DIASTOLIC HEART FAILURE
410.81	AMI NEC-INITIAL EPISODE	428.30	DIASTOLIC HF NOS
410.91	AMI NOS-INITIAL EPISODE	428.31	ACUTE DIASTOLIC HF
427.0	PSVT	428.33	AC & CHR DIASTOLIC HF
427.1	PVT	428.4	SYSTOLIC & DIASTOLIC HF
427.31	ATRIAL FIBRILLATION	428.40	SYS & DIASTOLIC HF NOS
427.32	ATRIAL FLUTTER	428.41	AC SYS & DIASTOLIC HF
427.41	VENTRICULAR FIBRILLATION	428.43	ACCHR SYS & DIASTOLIC HF
427.89	OTH CARDIAC DYSRHYTHMIAS	428.9	HEART FAILURE NOS
428.0	CHF NOS		

Dependent Complications – Cholecystectomy (continued)

Must occur with 997.3 Respiratory Complications			
480	VIRAL PNEUMONIA	482.82	E. COLI PNEUMONIA
480.0	ADENOVIRAL PNEUMONIA	482.83	GRAM-NEG PNEUMONIA NEC
480.1	RSV PNEUMONIA	482.84	LEGIONNAIRES' DISEASE
480.2	PARINFLUENZA VIRAL PNEUM	482.89	BACTERIAL PNEUMONIA NEC
480.3	SARS PNEUMONIA	482.9	BACTERIAL PNEUMONIA NOS
480.8	VIRAL PNEUMONIA NEC	483	PNEUMONIA ORGANISM NEC
480.9	VIRAL PNEUMONIA NOS	483.0	M. PNEUMONIAE PNEUMONIA
481	PNEUMOCOCCAL PNEUMONIA	483.1	CHLAMYDIAL PNEUMONIA
482	OTHER BACT PNEUMONIA	483.8	PNEUMONIA D/T ORG NEC
482.0	K. PNEUMONIAE PNEUMONIA	484	PNEUM IN OTH INF DIS
482.1	PSEUDOMONAL PNEUMONIA	484.1	PNEUMONIA IN CMV DISEASE
482.2	H. INFLUENZAE PNEUMONIA	484.3	PNEUMONIA IN WHOOP COUGH
482.3	STREPTOCOCCAL PNEUMONIA	484.5	PNEUMONIA IN ANTHRAX
482.30	STREP PNEUMONIA NOS	484.6	PNEUM IN ASPERGILLOSIS
482.31	GROUP A STREP PNEUMONIA	484.7	PNEUM IN SYST MYCOSESNEC
482.32	GROUP B STREP PNEUMONIA	484.8	PNEUM IN INFECT DIS NEC
482.39	STREP PNEUMONIA NEC	485	BRONCHOPNEUMONIA ORG NOS
482.4	STAPHYLOCOCCAL PNEUMONIA	486	PNEUMONIA ORGANISM NOS
482.40	STAPH PNEUMONIA NOS	507.0	FOOD/VOMIT PNEUMONITIS
482.41	STAPH AUREUS PNEUMONIA	799.0	ASPHYXIA & HYPOXEMIA
482.49	STAPH PNEUMONIA NEC	799.01	ASPHYXIA
482.8	OTH BACTERIAL PNEUMONIA	799.02	HYPOXEMIA
482.81	PNEUMONIA D/T ANAEROBES		
Must occur with 997.5 Urinary Complications			
584.5	AC RF W TUBULAR NEPHR	599.0	URINARY TRACT INF NOS
584.8	ACUTE RENAL FAILURE NEC	788.20	RETENTION OF URINE NOS
584.9	ACUTE RENAL FAILURE NOS	788.29	RETENTION OF URINE NEC
Must occur with 998.11 and 998.2 Hemorrhage Complicating a Procedure with Accidental Puncture or Laceration During a Procedure			
568.81	HEMOPERITONEUM		
Must occur with 997.4 and 998.2 Digestive System Complications with Accidental Puncture or Laceration During a Procedure			
569.83	PERFORATION OF INTESTINE		
Must occur with 998.59 Postoperative Infection			
038	SEPTICEMIA	038.41	H. INFLUENZAE SEPTICEMIA
038.0	STREPTOCOCCAL SEPTICEMIA	038.42	E. COLI SEPTICEMIA
038.1	STAPH SEPTICEMIA	038.43	PSEUDOMONAS SEPTICEMIA
038.10	STAPH SEPTICEMIA NOS	038.44	SERRATIA SEPTICEMIA
038.11	STAPH AUREUS SEPTICEMIA	038.49	GRAM-NEG SEPTICEMIA NEC
038.19	STAPH SEPTICEMIA NEC	038.8	SEPTICEMIA NEC
038.2	PNEUMOCOCCAL SEPTICEMIA	038.9	SEPTICEMIA NOS
038.3	ANAEROBIC SEPTICEMIA	682.2	TRUNK CELLULITIS
038.4	OTH GRAM-NEG SEPTICEMIA	785.52	SEPTIC SHOCK
038.40	GRAM-NEG SEPTICEMIA NOS	995.91	SEPSIS

Major Complications – Hip Fracture Repair

Major Complications – Hip Fracture Repair			
292.81	DRUG-INDUCED DELIRIUM	996.78	COMP NEC ORTH DEV NEC
293.0	DELIRIUM D/T CCE	997.02	IATROGEN CV INFARCT/HEM
415.11	IATRO PULM EMBOL/INFARCT	997.1	SURG COMP-HEART
415.19	PULMON EMBOL/INFARCT NEC	997.3	SURG COMP-RESP NEC
512.1	IATROGENIC PNEUMOTHORAX	997.4	SURG COMP-DIGESTIVE
518.5	POSTTR PULMON INSUFF	997.5	SURG COMP-URINARY NEC
560.1	PARALYTIC ILEUS	998.0	POSTOPERATIVE SHOCK
785.59	SHOCK W/O TRAUMA NEC	998.11	HEMORRHAGE COMP PX
996.77	COMP NEC D/T JT PROSTH	998.59	POSTOP INFECTION NEC

Dependent Complications – Hip Fracture Repair

Must occur with 997.1 Cardiac Complications			
410.01	ANTEROLAT AMI-INITIAL	427.89	OTH CARDIAC DYSRHYTHMIAS
410.11	ANT AMI NEC-INITIAL	428.0	CHF NOS
410.21	INFEROLAT AMI-INITIAL	428.1	LEFT HEART FAILURE
410.31	INFEROPOST AMI-INITIAL	428.20	SYSTOLIC HF NOS
410.41	INF AMI NEC-INITIAL	428.21	ACUTE SYSTOLIC HF
410.51	LAT AMI NEC-INITIAL	428.23	AC & CHR SYSTOLIC HF
410.61	POSTERIOR AMI-INITIAL	428.30	DIASTOLIC HF NOS
410.71	SUBEND INFARCT-INITIAL	428.31	ACUTE DIASTOLIC HF
410.81	AMI NEC-INITIAL EPISODE	428.33	AC & CHR DIASTOLIC HF
410.91	AMI NOS-INITIAL EPISODE	428.40	SYS & DIASTOLIC HF NOS
427.0	PSVT	428.41	AC SYS & DIASTOLIC HF
427.1	PVT	428.43	ACCHR SYS & DIASTOLIC HF
427.31	ATRIAL FIBRILLATION	428.9	HEART FAILURE NOS
427.32	ATRIAL FLUTTER		
Must occur with 997.3 Respiratory Complications			
480.9	VIRAL PNEUMONIA NOS	482.89	BACTERIAL PNEUMONIA NEC
481	PNEUMOCOCCAL PNEUMONIA	482.9	BACTERIAL PNEUMONIA NOS
482.0	K. PNEUMONIAE PNEUMONIA	483.0	M. PNEUMONIAE PNEUMONIA
482.1	PSEUDOMONAL PNEUMONIA	483.8	PNEUMONIA D/T ORG NEC
482.2	H. INFLUENZAE PNEUMONIA	484.6	PNEUM IN ASPERGILLOSIS
482.30	STREP PNEUMONIA NOS	484.7	PNEUM IN SYST MYCOSESNEC
482.32	GROUP B STREP PNEUMONIA	484.8	PNEUM IN INFECT DIS NEC
482.39	STREP PNEUMONIA NEC	485	BRONCHOPNEUMONIA ORG NOS
482.40	STAPH PNEUMONIA NOS	486	PNEUMONIA ORGANISM NOS
482.41	STAPH AUREUS PNEUMONIA	507.0	FOOD/VOMIT PNEUMONITIS
482.49	STAPH PNEUMONIA NEC	518.81	AC RESPIRATORY FAILURE
482.82	E. COLI PNEUMONIA	518.82	OTHER PULMONARY INSUFF
482.83	GRAM-NEG PNEUMONIA NEC	518.84	AC & CHR RESP FAILURE
482.84	LEGIONNAIRES' DISEASE		
Must occur with 997.5 Urinary Complications			
584.5	AC REN FAIL-LES TUBL, NEC	593.9	KIDNEY & URETER DIS, NOS
584.8	AC REN FAIL-PATH LES, NEC	788.20	RETENTION OF URINE, NOS
584.9	ACUTE RENAL FAILURE, NOS		
Must occur with 998.59 Postoperative Infection			
008.45	C. DIFFICILE ENTERITIS	038.42	E. COLI SEPTICEMIA
038.0	STREPTOCOCCAL SEPTICEMIA	038.43	PSEUDOMONAS SEPTICEMIA
038.10	STAPH SEPTICEMIA NOS	038.44	SERRATIA SEPTICEMIA
038.11	STAPH AUREUS SEPTICEMIA	038.49	GRAM-NEG SEPTICEMIA NEC
038.19	STAPH SEPTICEMIA NEC	038.8	SEPTICEMIA NEC
038.2	PNEUMOCOCCAL SEPTICEMIA	038.9	SEPTICEMIA NOS
038.3	ANAEROBIC SEPTICEMIA	041.4	E. COLI INFECT NOS
038.40	GRAM-NEG SEPTICEMIA NOS	785.52	SEPTIC SHOCK
038.41	H. INFLUENZAE SEPTICEMIA	995.91	SEPSIS

Major Complications – Peripheral Vascular Bypass

Major Complications – Peripheral Vascular Bypass			
008.45	C. DIFFICILE ENTERITIS	997.5	SURG COMP-URINARY NEC
518.5	POSTTR PULMON INSUFF	998.0	POSTOPERATIVE SHOCK
997.1	SURG COMP-HEART	998.11	HEMORRHAGE COMP PX
997.3	SURG COMP-RESP NEC	998.2	ACCIDENTAL OP LACERATION
997.4	SURG COMP-DIGESTIVE	998.59	POSTOP INFECTION NEC
Must occur with 997.1 Cardiac Complications			
410.01	ANTEROLAT AMI-INITIAL	428.2	SYSTOLIC HEART FAILURE
410.11	ANT AMI NEC-INITIAL	428.20	SYSTOLIC HF NOS
410.21	INFEROLAT AMI-INITIAL	428.21	ACUTE SYSTOLIC HF
410.51	LAT AMI NEC-INITIAL	428.23	AC & CHR SYSTOLIC HF
410.61	POSTERIOR AMI-INITIAL	428.3	DIASTOLIC HEART FAILURE
410.71	SUBEND INFARCT-INITIAL	428.30	DIASTOLIC HF NOS
410.81	AMI NEC-INITIAL EPISODE	428.31	ACUTE DIASTOLIC HF
410.91	AMI NOS-INITIAL EPISODE	428.33	AC & CHR DIASTOLIC HF
427.1	PVT	428.4	SYSTOLIC & DIASTOLIC HF
427.31	ATRIAL FIBRILLATION	428.40	SYS & DIASTOLIC HF NOS
427.32	ATRIAL FLUTTER	428.41	AC SYS & DIASTOLIC HF
427.89	OTH CARDIAC DYSRHYTHMIAS	428.43	ACCHR SYS & DIASTOLIC HF
428.0	CHF NOS	428.9	HEART FAILURE NOS
428.1	LEFT HEART FAILURE		

Dependent Complications – Peripheral Vascular Bypass

Must occur with 997.3 Respiratory Complications			
480	VIRAL PNEUMONIA	482.81	PNEUMONIA D/T ANAEROBES
480.0	ADENOVIRAL PNEUMONIA	482.82	E. COLI PNEUMONIA
480.1	RSV PNEUMONIA	482.83	GRAM-NEG PNEUMONIA NEC
480.2	PARINFLUENZA VIRAL PNEUM	482.84	LEGIONNAIRES' DISEASE
480.3	SARS PNEUMONIA	482.89	BACTERIAL PNEUMONIA NEC
480.8	VIRAL PNEUMONIA NEC	482.9	BACTERIAL PNEUMONIA NOS
480.9	VIRAL PNEUMONIA NOS	483	PNEUMONIA ORGANISM NEC
481	PNEUMOCOCCAL PNEUMONIA	483.0	M. PNEUMONIAE PNEUMONIA
482	OTHER BACT PNEUMONIA	483.1	CHLAMYDIAL PNEUMONIA
482.0	K. PNEUMONIAE PNEUMONIA	483.8	PNEUMONIA D/T ORG NEC
482.1	PSEUDOMONAL PNEUMONIA	484	PNEUM IN OTH INF DIS
482.2	H. INFLUENZAE PNEUMONIA	484.1	PNEUMONIA IN CMV DISEASE
482.3	STREPTOCOCCAL PNEUMONIA	484.3	PNEUMONIA IN WHOOP COUGH
482.30	STREP PNEUMONIA NOS	484.5	PNEUMONIA IN ANTHRAX
482.31	GROUP A STREP PNEUMONIA	484.6	PNEUM IN ASPERGILLOSIS
482.32	GROUP B STREP PNEUMONIA	484.7	PNEUM IN SYST MYCOSESNEC
482.39	STREP PNEUMONIA NEC	484.8	PNEUM IN INFECT DIS NEC
482.4	STAPHYLOCOCCAL PNEUMONIA	485	BRONCHOPNEUMONIA ORG NOS
482.40	STAPH PNEUMONIA NOS	486	PNEUMONIA ORGANISM NOS
482.41	STAPH AUREUS PNEUMONIA	507.0	FOOD/VOMIT PNEUMONITIS
482.49	STAPH PNEUMONIA NEC	518.81	AC RESPIRATORY FAILURE
482.8	OTH BACTERIAL PNEUMONIA		
Must occur with 997.4 Digestive System Complications			
560.1	PARALYTIC ILEUS		
Must occur with 997.5 Urinary Complications			
584.5	AC RF W TUBULAR NEPHR	593.9	RENAL/URETER DISORD NOS
584.8	ACUTE RENAL FAILURE NEC	599.0	URINARY TRACT INF NOS
584.9	ACUTE RENAL FAILURE NOS	788.20	RETENTION OF URINE NOS
Must occur with 998.59 and 998.51 Postoperative Infection with Infected Postoperative Seroma			
041.04	BACTR INF DT GRP D STREP	041.7	PSEUDOMONAS IN OTHER DIS
041.11	BACTERL INF DT S. AUREUS		
Must occur with 998.59 Postoperative Infection			
038	SEPTICEMIA	038.40	GRAM-NEG SEPTICEMIA NOS
038.0	STREPTOCOCCAL SEPTICEMIA	038.41	H. INFLUENZAE SEPTICEMIA
038.1	STAPH SEPTICEMIA	038.42	E. COLI SEPTICEMIA
038.10	STAPH SEPTICEMIA NOS	038.43	PSEUDOMONAS SEPTICEMIA
038.11	STAPH AUREUS SEPTICEMIA	038.44	SERRATIA SEPTICEMIA
038.19	STAPH SEPTICEMIA NEC	038.49	GRAM-NEG SEPTICEMIA NEC
038.2	PNEUMOCOCCAL SEPTICEMIA	038.8	SEPTICEMIA NEC
038.3	ANAEROBIC SEPTICEMIA	038.9	SEPTICEMIA NOS
038.4	OTH GRAM-NEG SEPTICEMIA	995.92	SEVERE SEPSIS

Major Complications – Prostatectomy

Major Complications – Prostatectomy			
008.45	C. DIFFICILE ENTERITIS	427.5	CARDIAC ARREST
410.01	ANTEROLAT AMI-INITIAL	507.0	FOOD/VOMIT PNEUMONITIS
410.11	ANT AMI NEC-INITIAL	518.5	POSTTR PULMON INSUFF
410.21	INFEROLAT AMI-INITIAL	518.81	AC RESPIRATORY FAILURE
410.31	INFEROPOST AMI-INITIAL	996.76	COMP NEC D/T GU DEVICE
410.41	INF AMI NEC-INITIAL	997.1	SURG COMP-HEART
410.51	LAT AMI NEC-INITIAL	997.3	SURG COMP-RESP NEC
410.61	POSTERIOR AMI-INITIAL	997.4	SURG COMP-DIGESTIVE
410.71	SUBEND INFARCT-INITIAL	997.5	SURG COMP-URINARY NEC
410.81	AMI NEC-INITIAL EPISODE	998.11	HEMORRHAGE COMP PX
410.91	AMI NOS-INITIAL EPISODE	998.2	ACCIDENTAL OP LACERATION

Dependent Complications – Prostatectomy

Must occur with 997.1 Cardiac Complications			
427.1	PVT	428.3	DIASTOLIC HEART FAILURE
427.31	ATRIAL FIBRILLATION	428.30	DIASTOLIC HF NOS
427.89	OTH CARDIAC DYSRHYTHMIAS	428.31	ACUTE DIASTOLIC HF
428.0	CHF NOS	428.33	AC & CHR DIASTOLIC HF
428.1	LEFT HEART FAILURE	428.4	SYSTOLIC & DIASTOLIC HF
428.2	SYSTOLIC HEART FAILURE	428.40	SYS & DIASTOLIC HF NOS
428.20	SYSTOLIC HF NOS	428.41	AC SYS & DIASTOLIC HF
428.21	ACUTE SYSTOLIC HF	428.43	ACCHR SYS & DIASTOLIC HF
428.23	AC & CHR SYSTOLIC HF	428.9	HEART FAILURE NOS
Must occur with 997.3 Respiratory Complications			
480	VIRAL PNEUMONIA	482.8	OTH BACTERIAL PNEUMONIA
480.0	ADENOVIRAL PNEUMONIA	482.81	PNEUMONIA D/T ANAEROBES
480.1	RSV PNEUMONIA	482.82	E. COLI PNEUMONIA
480.2	PARINFLUENZA VIRAL PNEUM	482.83	GRAM-NEG PNEUMONIA NEC
480.3	SARS PNEUMONIA	482.84	LEGIONNAIRES' DISEASE
480.8	VIRAL PNEUMONIA NEC	482.89	BACTERIAL PNEUMONIA NEC
480.9	VIRAL PNEUMONIA NOS	482.9	BACTERIAL PNEUMONIA NOS
481	PNEUMOCOCCAL PNEUMONIA	483	PNEUMONIA ORGANISM NEC
482	OTHER BACT PNEUMONIA	483.0	M. PNEUMONIAE PNEUMONIA
482.0	K. PNEUMONIAE PNEUMONIA	483.1	CHLAMYDIAL PNEUMONIA
482.1	PSEUDOMONAL PNEUMONIA	483.8	PNEUMONIA D/T ORG NEC
482.2	H. INFLUENZAE PNEUMONIA	484	PNEUM IN OTH INF DIS
482.3	STREPTOCOCCAL PNEUMONIA	484.1	PNEUMONIA IN CMV DISEASE
482.30	STREP PNEUMONIA NOS	484.3	PNEUMONIA IN WHOOP COUGH
482.31	GROUP A STREP PNEUMONIA	484.5	PNEUMONIA IN ANTHRAX
482.32	GROUP B STREP PNEUMONIA	484.6	PNEUM IN ASPERGILLOSIS
482.39	STREP PNEUMONIA NEC	484.7	PNEUM IN SYST MYCOSESNEC
482.4	STAPHYLOCOCCAL PNEUMONIA	484.8	PNEUM IN INFECT DIS NEC
482.40	STAPH PNEUMONIA NOS	485	BRONCHOPNEUMONIA ORG NOS
482.41	STAPH AUREUS PNEUMONIA	486	PNEUMONIA ORGANISM NOS
482.49	STAPH PNEUMONIA NEC		
Must occur with 997.4 Digestive Complications			
560.1	PARALYTIC ILEUS		
Must occur with 997.5 Urinary Complications			
584.5	AC REN FAIL-LES TUBL, NEC	584.9	ACUTE RENAL FAILURE, NOS
584.8	AC REN FAIL-PATH LES, NEC		
Must occur with 998.59 Postoperative Infection			
038	SEPTICEMIA	038.40	GRAM-NEG SEPTICEMIA NOS
038.0	STREPTOCOCCAL SEPTICEMIA	038.41	H. INFLUENZAE SEPTICEMIA
038.1	STAPH SEPTICEMIA	038.42	E. COLI SEPTICEMIA
038.10	STAPH SEPTICEMIA NOS	038.43	PSEUDOMONAS SEPTICEMIA
038.11	STAPH AUREUS SEPTICEMIA	038.44	SERRATIA SEPTICEMIA
038.19	STAPH SEPTICEMIA NEC	038.49	GRAM-NEG SEPTICEMIA NEC
038.2	PNEUMOCOCCAL SEPTICEMIA	038.8	SEPTICEMIA NEC
038.3	ANAEROBIC SEPTICEMIA	038.9	SEPTICEMIA NOS
038.4	OTH GRAM-NEG SEPTICEMIA		

Major Complications – Total Hip Replacement

Major Complications – Total Hip Replacement			
292.81	DRUG-INDUCED DELIRIUM	484	PNEUM IN OTH INF DIS
410.01	ANTEROLAT AMI-INITIAL	484.1	PNEUMONIA IN CMV DISEASE
410.11	ANT AMI NEC-INITIAL	484.3	PNEUMONIA IN WHOOP COUGH
410.21	INFEROLAT AMI-INITIAL	484.5	PNEUMONIA IN ANTHRAX
410.31	INFEROPOST AMI-INITIAL	484.6	PNEUM IN ASPERGILLOSIS
410.41	INF AMI NEC-INITIAL	484.7	PNEUM IN SYST MYCOSESNEC
410.51	LAT AMI NEC-INITIAL	484.8	PNEUM IN INFECT DIS NEC
410.61	POSTERIOR AMI-INITIAL	485	BRONCHOPNEUMONIA ORG NOS
410.71	SUBEND INFARCT-INITIAL	486	PNEUMONIA ORGANISM NOS
410.81	AMI NEC-INITIAL EPISODE	507.0	FOOD/VOMIT PNEUMONITIS
410.91	AMI NOS-INITIAL EPISODE	518.5	POSTTR PULMON INSUFF
415.11	IATRO PULM EMBOL/INFARCT	518.81	AC RESPIRATORY FAILURE
415.19	PULMON EMBOL/INFARCT NEC	584.5	AC RF W TUBULAR NEPHR
480	VIRAL PNEUMONIA	584.8	ACUTE RENAL FAILURE NEC
480.0	ADENOVIRAL PNEUMONIA	584.9	ACUTE RENAL FAILURE NOS
480.1	RSV PNEUMONIA	707.0	DECUBITUS ULCER
480.2	PARINFLUENZA VIRAL PNEUM	707.00	DECUBITUS ULCER-SITE NOS
480.3	SARS PNEUMONIA	707.01	DECUBITUS ULCER-ELBOW
480.8	VIRAL PNEUMONIA NEC	707.02	DECUBITUS ULCER-UP BACK
480.9	VIRAL PNEUMONIA NOS	707.03	DECUBITUS ULCER-LOW BACK
481	PNEUMOCOCCAL PNEUMONIA	707.04	DECUBITUS ULCER-HIP
482	OTHER BACT PNEUMONIA	707.05	DECUBITUS ULCER-BUTTOCK
482.0	K. PNEUMONIAE PNEUMONIA	707.06	DECUBITUS ULCER-ANKLE
482.1	PSEUDOMONAL PNEUMONIA	707.07	DECUBITUS ULCER-HEEL
482.2	H. INFLUENZAE PNEUMONIA	707.09	DECUBITUS ULCER-SITE NEC
482.3	STREPTOCOCCAL PNEUMONIA	799.1	RESPIRATORY ARREST
482.30	STREP PNEUMONIA NOS	995.92	SEVERE SEPSIS
482.31	GROUP A STREP PNEUMONIA	996.4	MECH COMP INT ORTH DEV
482.32	GROUP B STREP PNEUMONIA	996.40	MECH COMP INT ORTH NOS
482.39	STREP PNEUMONIA NEC	996.41	MECH LOOSENING JT PROSTH
482.4	STAPHYLOCOCCAL PNEUMONIA	996.42	DISLOCATION JOINT PROSTH
482.40	STAPH PNEUMONIA NOS	996.43	PROSTH JOINT FAILURE
482.41	STAPH AUREUS PNEUMONIA	996.44	PERI-PROSTHETIC FRACTURE
482.49	STAPH PNEUMONIA NEC	996.47	MECH COMP JT PROSTH NEC
482.8	OTH BACTERIAL PNEUMONIA	996.77	COMP NEC D/T JT PROSTH
482.81	PNEUMONIA D/T ANAEROBES	996.78	COMP NEC ORTH DEV NEC
482.82	E. COLI PNEUMONIA	997.02	IATROGEN CV INFARCT/HEM
482.83	GRAM-NEG PNEUMONIA NEC	997.1	SURG COMP-HEART
482.84	LEGIONNAIRES' DISEASE	997.3	SURG COMP-RESP NEC
482.89	BACTERIAL PNEUMONIA NEC	997.4	SURG COMP-DIGESTIVE
482.9	BACTERIAL PNEUMONIA NOS	997.5	SURG COMP-URINARY NEC
483	PNEUMONIA ORGANISM NEC	998.0	POSTOPERATIVE SHOCK
483.0	M. PNEUMONIAE PNEUMONIA	998.11	HEMORRHAGE COMP PX
483.1	CHLAMYDIAL PNEUMONIA	998.59	POSTOP INFECTION NEC
483.8	PNEUMONIA D/T ORG NEC	999.8	TRANSFUSION REACTION NEC

Dependent Complications – Total Hip Replacement

Must occur with 997.1 Cardiac Complications			
427.0	PSVT	428.3	DIASTOLIC HEART FAILURE
427.1	PVT	428.30	DIASTOLIC HF NOS
427.31	ATRIAL FIBRILLATION	428.31	ACUTE DIASTOLIC HF
427.89	OTH CARDIAC DYSRHYTHMIAS	428.33	AC & CHR DIASTOLIC HF
427.9	CARDIAC DYSRHYTHMIA NOS	428.4	SYSTOLIC & DIASTOLIC HF
428.0	CHF NOS	428.40	SYS & DIASTOLIC HF NOS
428.1	LEFT HEART FAILURE	428.41	AC SYS & DIASTOLIC HF
428.2	SYSTOLIC HEART FAILURE	428.43	ACCHR SYS & DIASTOLIC HF
428.20	SYSTOLIC HF NOS	428.9	HEART FAILURE NOS
428.21	ACUTE SYSTOLIC HF	785.0	TACHYCARDIA NOS
428.23	AC & CHR SYSTOLIC HF		
Must occur with 997.4 Digestive Complications			
560.1	PARALYTIC ILEUS		
Must occur with 997.5 Urinary Complications			
593.9	KIDNEY & URETER DIS, NOS	788.20	RETENTION OF URINE, NOS
599.0	URINARY TRACT INFECT, NOS	788.29	RETENTION OF URINE, NEC

Dependent Complications – Total Hip Replacement (continued)

Must occur with 998.59 Postoperative Infection			
038	SEPTICEMIA	038.40	GRAM-NEG SEPTICEMIA NOS
038.0	STREPTOCOCCAL SEPTICEMIA	038.41	H. INFLUENZAE SEPTICEMIA
038.1	STAPH SEPTICEMIA	038.42	E. COLI SEPTICEMIA
038.10	STAPH SEPTICEMIA NOS	038.43	PSEUDOMONAS SEPTICEMIA
038.11	STAPH AUREUS SEPTICEMIA	038.44	SERRATIA SEPTICEMIA
038.19	STAPH SEPTICEMIA NEC	038.49	GRAM-NEG SEPTICEMIA NEC
038.2	PNEUMOCOCCAL SEPTICEMIA	038.8	SEPTICEMIA NEC
038.3	ANAEROBIC SEPTICEMIA	038.9	SEPTICEMIA NOS
038.4	OTH GRAM-NEG SEPTICEMIA		

Major Complications – Total Knee Replacement

Major Complications – Total Knee Replacement			
292.81	DRUG-INDUCED DELIRIUM	484.1	PNEUMONIA IN CMV DISEASE
410.01	ANTEROLAT AMI-INITIAL	484.3	PNEUMONIA IN WHOOP COUGH
410.11	ANT AMI NEC-INITIAL	484.5	PNEUMONIA IN ANTHRAX
410.21	INFEROLAT AMI-INITIAL	484.6	PNEUM IN ASPERGILLOSIS
410.31	INFEROPOST AMI-INITIAL	484.7	PNEUM IN SYST MYCOSESNEC
410.41	INF AMI NEC-INITIAL	484.8	PNEUM IN INFECT DIS NEC
410.51	LAT AMI NEC-INITIAL	485	BRONCHOPNEUMONIA ORG NOS
410.61	POSTERIOR AMI-INITIAL	486	PNEUMONIA ORGANISM NOS
410.71	SUBEND INFARCT-INITIAL	507.0	FOOD/VOMIT PNEUMONITIS
410.81	AMI NEC-INITIAL EPISODE	518.5	POSTTR PULMON INSUFF
410.91	AMI NOS-INITIAL EPISODE	518.81	AC RESPIRATORY FAILURE
415.11	IATRO PULM EMBOL/INFARCT	584.5	AC RF W TUBULAR NEPHR
415.19	PULMON EMBOL/INFARCT NEC	584.8	ACUTE RENAL FAILURE NEC
480	VIRAL PNEUMONIA	584.9	ACUTE RENAL FAILURE NOS
480.0	ADENOVIRAL PNEUMONIA	707.0	DECUBITUS ULCER
480.1	RSV PNEUMONIA	707.00	DECUBITUS ULCER-SITE NOS
480.2	PARINFLUENZA VIRAL PNEUM	707.01	DECUBITUS ULCER-ELBOW
480.3	SARS PNEUMONIA	707.02	DECUBITUS ULCER-UP BACK
480.8	VIRAL PNEUMONIA NEC	707.03	DECUBITUS ULCER-LOW BACK
480.9	VIRAL PNEUMONIA NOS	707.04	DECUBITUS ULCER-HIP
481	PNEUMOCOCCAL PNEUMONIA	707.05	DECUBITUS ULCER-BUTTOCK
482	OTHER BACT PNEUMONIA	707.06	DECUBITUS ULCER-ANKLE
482.0	K. PNEUMONIAE PNEUMONIA	707.07	DECUBITUS ULCER-HEEL
482.1	PSEUDOMONAL PNEUMONIA	707.09	DECUBITUS ULCER-SITE NEC
482.2	H. INFLUENZAE PNEUMONIA	799.1	RESPIRATORY ARREST
482.3	STREPTOCOCCAL PNEUMONIA	995.92	SEVERE SEPSIS
482.30	STREP PNEUMONIA NOS	996.4	MECH COMP INT ORTH NOS
482.31	GROUP A STREP PNEUMONIA	996.40	MECH COMP INT ORTH NOS
482.32	GROUP B STREP PNEUMONIA	996.41	MECH LOOSENING JT PROSTH
482.39	STREP PNEUMONIA NEC	996.42	DISLOCATION JOINT PROSTH
482.4	STAPHYLOCOCCAL PNEUMONIA	996.43	PROSTH JOINT FAILURE
482.40	STAPH PNEUMONIA NOS	996.44	PERI-PROSTHETIC FRACTURE
482.41	STAPH AUREUS PNEUMONIA	996.47	MECH COMP JT PROSTH NEC
482.49	STAPH PNEUMONIA NEC	996.49	MECH COMP INT ORTH NEC
482.8	OTH BACTERIAL PNEUMONIA	996.77	COMP NEC D/T JT PROSTH
482.81	PNEUMONIA D/T ANAEROBES	996.78	COMP NEC ORTH DEV NEC
482.82	E. COLI PNEUMONIA	997.02	IATROGEN CV INFARCT/HEM
482.83	GRAM-NEG PNEUMONIA NEC	997.1	SURG COMP-HEART
482.84	LEGIONNAIRES' DISEASE	997.3	SURG COMP-RESP NEC
482.89	BACTERIAL PNEUMONIA NEC	997.4	SURG COMP-DIGESTIVE
482.9	BACTERIAL PNEUMONIA NOS	997.5	SURG COMP-URINARY NEC
483	PNEUMONIA ORGANISM NEC	998.0	POSTOPERATIVE SHOCK
483.0	M. PNEUMONIAE PNEUMONIA	998.11	HEMORRHAGE COMP PX
483.1	CHLAMYDIAL PNEUMONIA	998.59	POSTOP INFECTION NEC
483.8	PNEUMONIA D/T ORG NEC	999.8	TRANSFUSION REACTION NEC
484	PNEUM IN OTH INF DIS		

Dependent Complications – Total Knee Replacement

Must occur with 997.1 Cardiac Complications			
427.0	PSVT	428.3	DIASTOLIC HEART FAILURE
427.1	PVT	428.30	DIASTOLIC HF NOS
427.31	ATRIAL FIBRILLATION	428.31	ACUTE DIASTOLIC HF
427.89	OTH CARDIAC DYSRHYTHMIAS	428.33	AC & CHR DIASTOLIC HF
427.9	CARDIAC DYSRHYTHMIA NOS	428.4	SYSTOLIC & DIASTOLIC HF
428.0	CHF NOS	428.40	SYS & DIASTOLIC HF NOS
428.1	LEFT HEART FAILURE	428.41	AC SYS & DIASTOLIC HF
428.2	SYSTOLIC HEART FAILURE	428.43	ACCHR SYS & DIASTOLIC HF
428.20	SYSTOLIC HF NOS	428.9	HEART FAILURE NOS
428.21	ACUTE SYSTOLIC HF	785.0	TACHYCARDIA NOS
428.23	AC & CHR SYSTOLIC HF		
Must occur with 997.4 Digestive System Complications			
560.1	PARALYTIC ILEUS		
Must occur with 997.5 Urinary Complications			
593.9	KIDNEY & URETER DIS, NOS	788.20	RETENTION OF URINE, NOS
599.0	URINARY TRACT INFECT, NOS	788.29	RETENTION OF URINE, NEC
Must occur with 998.59 Postoperative Infection			
038	SEPTICEMIA	038.40	SEPTICEMIA GRAM-NEGS, NOS
038.0	STREPTOCOCCAL SEPTICEMIA	038.41	SEPTICEMIA-H. INFLUENZAE
038.1	STAPHYLOCOCCL SEPTICEMIA	038.42	SEPTICEMIA DT E. COLI
038.10	STAPHLOCOCC SEPTICEM, NOS	038.43	SEPTICEMIA - PSEUDOMONAS
038.11	SEPTICEMIA-STAPH AUREUS	038.44	SEPTICMIA DT SERRATIA
038.19	STAPHLOCOCC SEPTICEM, NEC	038.49	SEPTICEMIA GRAM-NEG, NEC
038.2	PNEUMOCOCCAL SEPTICEMIA	038.8	OTH SPECIFIED SEPTICEMIA
038.3	SEPTICEMIA DT ANAEROBES	038.9	UNSPECIFIED SEPTICEMIA
038.4	SEPTICEMIA GRAM-NEGS, NEC		

Appendix C: Top Five Risk Factors by Procedure or Diagnosis

Proc = Procedure Code Diag = Diagnosis Code

Atrial Fibrillation	
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE
Diag 162.9	MALIGNANT NEOPLASM OF BRONCHUS AND LUNG, UNSPECIFIED
Diag 260, 261, 262, 263.0, 263.1, 263.2, 263.8, 263.9	MALNUTRITION
Diag 480, 480.0, 480.1, 480.2, 480.3, 480.8, 480.9, 481, 482, 482.0, 482.1, 482.2, 482.3, 482.30, 482.31, 482.32, 482.39, 482.4, 482.40, 482.41, 482.49, 482.8, 482.81, 482.82, 482.83, 482.84, 482.89, 482.9, 483, 483.0, 483.1, 483.8, 484, 484.1, 484.3, 484.5, 484.6, 484.7, 484.8, 485, 486	PNEUMONIA
Diag 578.9	HEMORRHAGE OF GASTROINTESTINAL TRACT, UNSPECIFIED
Back and Neck Surgery (Spinal Fusion)	
Diag 260, 261, 262, 263.0, 263.1, 263.2, 263.8, 263.9	MALNUTRITION
Diag 403.11, 403.91	NON-MALIGNANT RENAL DISEASE W/ FAILURE
Diag 276.5	VOLUME DEPLETION
Diag 787.2	DYSPHAGIA
Diag 81.04	DORSAL AND DORSOLUMBAR FUSION, ANTERIOR TECHNIQUE
Back and Neck Surgery (Except Spinal Fusion)	
Diag 276.5	VOLUME DEPLETION
Diag 403.11, 403.91	NON-MALIGNANT RENAL DISEASE W/ FAILURE
Diag 349.2	DISORDERS OF MENINGES, NOT ELSEWHERE CLASSIFIED
Diag 276.1	HYPOSMOLALITY AND/OR HYPONATREMIA
Diag 428.0	CONGESTIVE HEART FAILURE, UNSPECIFIED
Bowel Obstruction	
Diag 276.2	ACIDOSIS
Diag 458.8, 458.9	HYPOTENSION, UNSPECIFIED OR NEC
Diag 569.83	PERFORATION OF INTESTINE
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE
Diag 427.1	PAROXYSMAL VENTRICULAR TACHYCARDIA
Carotid Surgery	
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE
Diag 342.90	UNSPECIFIED HEMIPLEGIA AND HEMIPARESIS AFFECTING UNSPECIFIED SIDE
Diag 787.2	DYSPHAGIA
Diag 427.32	ATRIAL FLUTTER
Diag 39.72	ENDOVASCULAR REPAIR OR OCCLUSION OF HEAD AND NECK VESSELS
Cholecystectomy	
Diag 276.2	ACIDOSIS
Diag 511.9	UNSPECIFIED PLEURAL EFFUSION
Diag 567.2	OTHER SUPPURATIVE PERITONITIS
Diag 491.21	OBSTRUCTIVE CHRONIC BRONCHITIS, W/ (ACUTE) EXACERBATION
Diag 51.21	OTHER PARTIAL CHOLECYSTECTOMY
Chronic Obstructive Pulmonary Disease (COPD)	
Diag 518.81	ACUTE RESPIRATORY FAILURE
Diag 518.84	ACUTE AND CHRONIC RESPIRATORY FAILURE
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE
Diag 578.9	HEMORRHAGE OF GASTROINTESTINAL TRACT, UNSPECIFIED
Diag 162.9	MALIGNANT NEOPLASM OF BRONCHUS AND LUNG, UNSPECIFIED

Coronary Bypass Surgery	
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE
Diag V45.1	POSTSURGICAL RENAL DIALYSIS STATUS
Proc 37.61	IMPLANT OF PULSATION BALLOON
Diag 410.01, 410.11, 410.21, 410.51, 410.61, 410.81, 410.91	ANTERIOR/LATERAL WALL AMI
Diag 260, 261, 262, 263.0, 263.1, 263.2, 263.8, 263.9	MALNUTRITION
Coronary Interventional Procedures	
Diag 410.01, 410.11, 410.21, 410.51, 410.61, 410.81, 410.91	ANTERIOR/LATERAL WALL AMI
Diag 410.31, 410.41	INFERIOR WALL AMI
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE
Diag V45.1	POSTSURGICAL RENAL DIALYSIS STATUS
Diag 426.0	ATRIOVENTRICULAR BLOCK, COMPLETE
Diabetic Acidosis and Coma	
Diag 518.81	ACUTE RESPIRATORY FAILURE
Diag 038, 038.0, 038.1, 038.10, 038.11, 038.19, 038.2, 038.3, 038.4, 038.40, 038.41, 038.42, 038.43, 038.44, 038.49, 038.8, 038.9	SEPSIS
Diag 578.9	HEMORRHAGE OF GASTROINTESTINAL TRACT, UNSPECIFIED
Diag 458.8, 458.9	HYPOTENSION, UNSPECIFIED OR NEC
Diag 427.1	PAROXYSMAL VENTRICULAR TACHYCARDIA
Gastrointestinal Bleed	
Diag 518.81	ACUTE RESPIRATORY FAILURE
Diag 785.59	OTHER SHOCK W/O MENTION OF TRAUMA
Diag 532.60	CHRONIC OR UNSPECIFIED DUODENAL ULCER W/ HEMORRHAGE AND PERFORATION, W/O MENTION OF OBSTRUCTION
Diag 531.60	CHRONIC OR UNSPECIFIED GASTRIC ULCER W/ HEMORRHAGE AND PERFORATION, W/O MENTION OF OBSTRUCTION
Diag 276.2	ACIDOSIS
Gastrointestinal Surgeries and Procedures	
Proc 43.99	OTHER TOTAL GASTRECTOMY
Diag 038, 038.0, 038.1, 038.10, 038.11, 038.19, 038.2, 038.3, 038.4, 038.40, 038.41, 038.42, 038.43, 038.44, 038.49, 038.8, 038.9	SEPSIS
Proc 43.7	PARTIAL GASTRECTOMY WITH ANASTOMOSIS TO JEJUNUM
Diag V45.1	POSTSURGICAL RENAL DIALYSIS STATUS
Diag 276.2	ACIDOSIS
Heart Attack	
Diag 518.81	ACUTE RESPIRATORY FAILURE
Proc 37.61	IMPLANT OF PULSATION BALLOON
Diag 276.2	ACIDOSIS
Diag 410.01, 410.11, 410.21, 410.51, 410.61, 410.81, 410.91	ANTERIOR/LATERAL WALL AMI
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE
Heart Failure	
Diag 410.01, 410.11, 410.21, 410.51, 410.61, 410.81, 410.91	ANTERIOR/LATERAL WALL AMI
Diag 518.81	ACUTE RESPIRATORY FAILURE
Diag 507.0	PNEUMONITIS DUE TO INHALATION OF FOOD OR VOMITUS
Diag 458.8, 458.9	HYPOTENSION, UNSP OR NEC
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE

Hip Fracture Repair	
Diag 038, 038.0, 038.1, 038.10, 038.11, 038.19, 038.2, 038.3, 038.4, 038.40, 038.41, 038.42, 038.43, 038.44, 038.49, 038.8, 038.9	SEPSIS
Diag 507.0	PNEUMONITIS DUE TO INHALATION OF FOOD OR VOMITUS
Diag 276.2	ACIDOSIS
Diag 511.9	UNSPECIFIED PLEURAL EFFUSION
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE
Pancreatitis	
Diag 458.8, 458.9	HYPOTENSION, UNSP OR NEC
Diag 038, 038.0, 038.1, 038.10, 038.11, 038.19, 038.2, 038.3, 038.4, 038.40, 038.41, 038.42, 038.43, 038.44, 038.49, 038.8, 038.9	SEPSIS
Diag 276.2	ACIDOSIS
Diag 507.0	PNEUMONITIS DUE TO INHALATION OF FOOD OR VOMITUS
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE
Peripheral Vascular Bypass	
Diag 682.6	CELLULITIS AND ABSCESS OF LEG, EXCEPT FOOT
Diag 480, 480.0, 480.1, 480.2, 480.3, 480.8, 480.9, 481, 482, 482.0, 482.1, 482.2, 482.3, 482.30, 482.31, 482.32, 482.39, 482.4, 482.40, 482.41, 482.49, 482.8, 482.81, 482.82, 482.83, 482.84, 482.89, 482.9, 483, 483.0, 483.1, 483.8, 484, 484.1, 484.3, 484.5, 484.6, 484.7, 484.8, 485, 486	PNEUMONIA
Diag 491.21	OBSTRUCTIVE CHRONIC BRONCHITIS, W/ (ACUTE) EXACERBATION
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE
Diag 287.5	THROMBOCYTOPENIA, UNSPECIFIED
Pneumonia	
Diag 518.81	ACUTE RESPIRATORY FAILURE
Diag 518.82	OTHER PULMONARY INSUFFICIENCY, NOT ELSEWHERE CLASSIFIED
Diag 038, 038.0, 038.1, 038.10, 038.11, 038.19, 038.2, 038.3, 038.4, 038.40, 038.41, 038.42, 038.43, 038.44, 038.49, 038.8, 038.9	SEPSIS
Diag 162.9	MALIGNANT NEOPLASM OF BRONCHUS AND LUNG, UNSPECIFIED
Diag 276.2	ACIDOSIS
Prostatectomy	
Proc 60.3	SUPRAPUBIC PROSTATECTOMY
Proc 60.4	RETROPUBIC PROSTATECTOMY
Proc 60.69	OTHER PROSTATECTOMY
Diag 276.1	HYPOSMOLALITY/HYPONATREMIA
Proc 60.5	RADICAL PROSTATECTOMY
Pulmonary Embolism	
Diag 518.81	ACUTE RESPIRATORY FAILURE
Diag 276.2	ACIDOSIS
Diag 518.82	OTHER PULMONARY INSUFFICIENCY, NOT ELSEWHERE CLASSIFIED
Diag 458.8, 458.9	HYPOTENSION, UNSP OR NEC
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE
Resection / Replacement of Abdominal Aorta	
Proc 38.64	OTHER EXCISION OF AORTA
Diag 441.3	ABDOMINAL ANEURYSM, RUPTURED
Diag 557.0	ACUTE VASCULAR INSUFFICIENCY OF INTESTINE
Diag 286.9	OTHER AND UNSPECIFIED COAGULATION DEFECTS
Diag 458.8, 458.9	HYPOTENSION, UNSP OR NEC

Respiratory Failure	
Diag 785.51	CARDIOGENIC SHOCK
Diag 785.50	SHOCK, UNSPECIFIED
Diag 162.9	MALIGNANT NEOPLASM OF BRONCHUS AND LUNG, UNSPECIFIED
Diag 410.01, 410.11, 410.21, 410.51, 410.61, 410.81, 410.91	ANTERIOR/LATERAL WALL AMI
Diag 512.8	OTHER SPONTANEOUS PNEUMOTHORAX
Sepsis	
Diag 557.0	ACUTE VASCULAR INSUFFICIENCY OF INTESTINE
Diag 410.01, 410.11, 410.21, 410.51, 410.61, 410.81, 410.91	ANTERIOR/LATERAL WALL AMI
Diag 586	RENAL FAILURE, UNSPECIFIED
Diag 518.81	ACUTE RESPIRATORY FAILURE
Diag 286.6	DEFIBRINATION SYNDROME
Stroke	
Diag 780.01	COMA
Diag 432.9	UNSPECIFIED INTRACRANIAL HEMORRHAGE
Diag 518.81	ACUTE RESPIRATORY FAILURE
Diag 431	INTRACEREBRAL HEMORRHAGE
Diag 430	SUBARACHNOID HEMORRHAGE
Total Hip Replacement	
Diag 403.11, 403.91	NON-MALIGNANT RENAL DISEASE WITH FAILURE
Diag 287.5	THROMBOCYTOPENIA, UNSPECIFIED
Diag 428.0	CONGESTIVE HEART FAILURE, UNSPECIFIED
Proc 81.51	BILATERAL HIP REPLACEMENT
Diag 496	CHRONIC AIRWAY OBSTRUCTION, NOT ELSEWHERE CLASSIFIED
Total Knee Replacement	
Diag 403.11, 403.91	NON-MALIGNANT RENAL DISEASE WITH FAILURE
Diag 428.0	CONGESTIVE HEART FAILURE, UNSPECIFIED
Proc 81.54	BILATERAL KNEE REPLACEMENT
Diag 280.0	IRON DEFICIENCY ANEMIA SECONDARY TO BLOOD LOSS (CHRONIC)
Diag 496	CHRONIC AIRWAY OBSTRUCTION, NOT ELSEWHERE CLASSIFIED
Valve Replacement Surgery	
Proc 37.61	IMPLANT OF PULSATION BALLOON
Diag 584.5, 584.8, 584.9	ACUTE RENAL FAILURE
Diag V45.1	POSTSURGICAL RENAL DIALYSIS STATUS
Proc 35.27, 35.28	TRICUSPID VALVE REPLACEMENT
Diag 996.61	INFECTION AND INFLAMMATORY REACTION DUE TO CARDIAC DEVICE, IMPLANT, AND GRAFT

Appendix D: Methodology Enhancements for 2008 Ratings Models

The following changes were determined and implemented after input from outside coding and clinical experts. For the following service lines, we describe the major changes for each rated cohort and provide the rationale behind these changes.

Cardiac

Cohorts Affected	2008 Ratings' Model Change	Rationale for Changes
Percutaneous Coronary Intervention	Changed inclusion criteria to principle procedure of PCI only.	To include only those patients in the cohort whose primary procedure during the hospitalization was an interventional procedure.

Critical Care

Cohorts Affected	2008 Ratings' Model Change	Rationale for Changes
Respiratory Failure	Changed the methodology to a HealthGrades logistic regression-based risk-adjustment methodology from a 3M APR DRG risk-adjustment.	To maintain consistency between HealthGrades' public Medicare hospital ratings.

Gastrointestinal

Cohorts Affected	2008 Ratings' Model Change	Rationale for Changes
Gastrointestinal Surgeries and Procedures	Changed the methodology to a HealthGrades logistic regression-based risk-adjustment methodology from a 3M APR DRG risk-adjustment.	To maintain consistency between HealthGrades' public Medicare hospital ratings.

Orthopedics

Cohorts Affected	2008 Ratings' Model Change	Rationale for Changes
Total Knee Replacement and Total Hip Replacement	Included patients with a length of stay of one day.	With the use of minimally invasive techniques for joint replacement surgeries, it is now possible that some patients may have a length of stay of only one day.
Hip Fracture Repair and Partial Hip Replacement	Combined into one cohort, Hip Fracture Repair.	Partial Hip Replacement is one technique to address a hip fracture. The Partial Hip Replacement population and the Hip Fracture Repair populations are similar but the technique used to treat the fracture differs.

Respiratory

Cohorts Affected	2008 Ratings' Model Change	Rationale for Changes
Pneumonia	Changed the pneumonia cohort definition to be consistent with the definition used by the Centers for Medicare and Medicaid Hospital Compare.	Hospitals are focused on improving the process of care for pneumonia patients using the Hospital Compare definition. This definition was changed to provide an outcome measure for these processes of care.

Stroke

Cohorts Affected	2008 Ratings' Model Change	Rationale for Changes
Stroke	Removed subdural and extradural strokes from the stroke cohort.	Most subdural and extradural hemorrhages are the result of blunt trauma to the head and are technically not classified as strokes.

Vascular

Cohorts Affected	2008 Ratings' Model Change	Rationale for Changes
Carotid Surgery	Changed the name from Carotid Endaterectomy to Carotid Surgery.	The cohort now includes carotid endarterectomies as well as carotid stenting procedures.