The Third Annual HealthGrades Hospital Quality and Clinical Excellence Study

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HEALTHGRADES®
THE HEALTHCARE QUALITY EXPERTS®

Executive Summary of Key Findings

For the third year in a row, HealthGrades is issuing the results of its *Study of Distinguished Hospitals for Clinical Excellence.* Unlike the annual HealthGrades *Hospital Quality in America Study*, which focuses on individual procedures at the nation's nearly 5,000 hospitals and is issued in the fall, this study examines *overall* quality at each of the nation's hospitals.

The 229 hospitals that fall into the top five percent in the nation in terms of mortality and complication rates across 28 common procedures and diagnoses are identified in the study as HealthGrades Distinguished Hospitals for Clinical Excellence™.

In creating the study each year, HealthGrades researchers examine millions of patient records submitted by hospitals to the Centers for Medicare and Medicaid Services, U.S. Department of Health and Human Services. These patient records cover the latest three-year period, in this case, federal fiscal years 2001, 2002 and 2003. The following are key findings from this year's study:

- Of the 28 medical procedures and diagnoses that HealthGrades used to evaluate the nation's hospitals for this study, four are analyzed in greater detail in the study. The findings showed significantly lower complication and mortality rates when comparing hospitals in the top five percent in the nation to the rest for coronary bypass surgery, treatment of heart attack (comparing only those hospitals with angioplasty and stent treatments available), treatment of stroke, and treatment of community acquired pneumonia.

- In those four categories, Medicare patients treated at the 229 HealthGrades Distinguished Hospitals for Clinical Excellence had, on average, the following improved chances of survival when compared to patients treated at the rest of hospitals nationwide:

Procedure/Diagnosis	Improved Chance of Survival at Distinguished Hospital for Clinical Excellence
Coronary Bypass Surgery	**15.30 percent**
Heart Attack (angioplasty/stent available)	**12.62 percent**
Stroke	**15.40 percent**
Community Acquired Pneumonia	**19.55 percent**

- Extrapolating these data to the entire patient population nationally, HealthGrades finds that approximately 52,949 lives could have been saved if all patients treated at other hospitals for these four categories during 2001, 2002 and 2003 had instead gone to a Distinguished Hospital. This number is comparable to the average attendance at an NFL football game.

- Hospitals in the top five percent in terms of clinical excellence also treated substantially more patients per hospital– for some diagnoses in some regions, more than twice the average hospital level – while treating sicker patients with higher expected mortality rates.

- The current Medicare and Medicaid systems – and for the most part, private-pay systems in the U.S. (which often pattern reimbursement schedules on the government model) – largely do not pay financial incentives or premiums to hospitals that demonstrate higher-quality

patient outcomes in terms of lower mortality and complication rates. While hospitals do receive higher Medicare payments if they are in high-wage regions (e.g., the Northeast) or treat higher proportions of Medicaid and Medicare patients (e.g., Disproportionate Share Hospital payments), these higher reimbursements are not tied directly to quality. Limited experimentation with reimbursement incentives that reward quality improvement practices and better outcomes are starting to emerge in Medicare and private plans. A key public policy question involves whether those incentive systems should be accelerated and expanded to make premium payments for superior clinical outcomes the industry standard.

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I. Introduction

As consumers, employers and payers nationwide continue to battle spiraling healthcare costs (e.g., annual double-digit premium increases), and the nation's media remain focused on high-profile patient safety incidents and related deaths at U.S. hospitals, the question remains: *Is there a difference among healthcare providers in terms of quality outcomes and value?*

Health Grades Inc., the nation's leading independent healthcare quality company, tackles this critical question in the following study, which attempts to identify and document differences in risk-adjusted mortality rates for common Medicare admissions at hospitals throughout the U.S.

Each year, HealthGrades uses Medicare patient data obtained directly from the United States Department of Health and Human Services' Centers for Medicare and Medicaid Services in order to independently and objectively analyze the clinical quality outcomes of nearly 5,000 hospitals. HealthGrades assigns quality ratings to hospitals according to their actual mortality and complication outcomes, versus what would be expected to occur at each facility given their respective patient populations.

Hospitals that perform in the top five percent nationally for outcomes across the 28 common medical procedures and diagnoses rated by HealthGrades are then designated as recipients of the annual Distinguished Hospital Award for Clinical Excellence™ (DHA-CE).

Based on Medicare patient billing data for Federal Fiscal Years 2001 through 2003 (October 1, 2000 through September 30, 2003), the evidence clearly shows that hospitals named to the HealthGrades DHA-CE list have substantially lower risk-adjusted mortality and complication rates than non-DHA-CE hospitals. This is true even given that the DHA-CE recipients, on average, treat substantially more patients, and patients with higher acuity levels (e.g., sicker patients with higher predicted mortality and complication rates), than non-DHA-CE facilities.

Four specific procedures and diagnoses are analyzed for the purposes of this study: coronary bypass surgery, stroke, treatment of heart attack (comparing only those hospitals that have angioplasty and stent procedures available), and treatment of community acquired pneumonia.

In terms of national averages, a Medicare patient who underwent coronary bypass surgery at a DHA-CE hospital had a 15.30 percent better chance of survival than a patient who was treated at a non-DHA facility. The improved chances of survival at a DHA-CE hospital were 15.4 percent for stroke, 12.62 percent for heart attack, and 19.55 percent for community-acquired pneumonia. The results are consistent when comparing DHA-CE and non-DHA-CE hospitals across regions.

While hospitals performing at the highest levels for clinical quality demonstrate far lower risk-adjusted mortality and complication rates despite treating more and sicker patients, the current Medicare and Medicaid systems (and by extension, private payer schedules that are patterned after government reimbursement models) largely do not reward this quality performance with

premium financial reimbursements. Hospitals in high-wage-index areas, and those that serve disproportionately higher numbers of Medicaid and Medicare patients (Disproportionate Share Hospital program), receive larger government payments by procedure and diagnosis, however, these higher payments are not linked to quality outcomes or designed as quality incentives.

Analysis of the potential link between government reimbursement levels and quality healthcare outcomes is material, as Medicare and Medicaid comprise, on average, between 45 and 70 percent of revenues for most hospitals. In some cases, such as with hospitals located in rural or central urban areas with comparatively high Medicare and Medicaid patient volumes, government payments can comprise more than 80 percent of total hospital revenues.

The system is beginning to show signs of change and innovation. The new CMS/Premier Quality Incentive Demonstration Project, for example, now offers relatively modest two percent and one percent Medicare base rate increases for hospitals that demonstrate top-decile clinical performance across 34 indicators for common diagnoses. A total of 278 hospitals nationwide – of the nearly 5,000 that treat Medicare patients – are currently participating in the three-year pilot, which is designed to determine whether financial incentives can push higher quality.

Still, an archaic reimbursement system flies in the face of market economics in other sectors, including those contracted by the federal government. Military and road construction contractors routinely receive bonus payments for higher quality and projects completed under budget. A consumer would not pay the same for a Mercedes S-Class Sedan and a used Ford Focus because the quality difference is obvious. In healthcare, these "products" cost the same, thereby eliminating the financial rewards for quality providers and exacerbating the quality improvement problem.

As a result, this study will cite some examples throughout the nation in which there is growing experimentation – largely in the private sector – with examining and rewarding quality outcomes by hospitals through "bonus" structures and premium compensation. While the jury is still out on the CMS/Premier project, it also provides a notable foray into the experimentation process.

A key public policy question, in light of evidence that demonstrates stark differences among hospitals, is whether financial incentives tied directly to quality outcomes could provide a powerful impetus for more focused quality-improvement initiatives. Such incentives could save lives, reduce major complications, and provide direct economic benefits in a sector that comprises one-seventh of U.S. Gross Domestic Product.

Note on the Relationship between HealthGrades and the DHA-CE Recipients:

For purposes of the HealthGrades ratings and rankings, and by extension, selection to the DHA-CE list, all U.S. hospitals are analyzed and evaluated on a blinded basis, using the exact same Medicare data, models and methodologies. Hospitals cannot choose whether or not to be included.

The entire list of 2005 DHA-CE recipients is published in Exhibit A of this study and on the HealthGrades web site (www.healthgrades.com), which is available to consumers free of charge.

II. Distinguished Hospitals for Clinical Excellence Demonstrate Superior Quality Outcomes vs. Non-Recipient Hospitals Nationwide and By Region

As part of its analysis, HealthGrades compared the clinical quality outcomes of DHA-CE recipient hospitals to non-recipient hospitals, both nationally and by region, based on risk-adjusted mortality rates. The analysis focused specifically on outcomes for coronary bypass surgery, treatment of heart attack (comparing only those hospitals in which angioplasty and stent procedures are available), treatment of stroke, and treatment of community-acquired pneumonia.

Each hospital's predicted mortality rate was used to determine the region's overall predicted mortality rate.

Moreover, HealthGrades calculated the Relative Risk Reduction (RRR) statistic by region and procedure/diagnosis, as an additional comparison tool for DHA-CE and non-recipient hospitals. The RRR illustrates that for an "average" patient, the risk of surviving the hospitalization at a DHA-CE facility is "xx%" better than if that patient had been treated at a non-recipient hospital.

Key Findings:

- ***DHA-CE hospitals have substantially lower risk-adjusted mortality outcomes than non-recipient hospitals in their regions and nationally.***

- ***DHA-CE hospitals treat substantially higher volumes of patients across all procedures and diagnoses studied.***

DHA-CE Hospitals: Numbers and Locations

In total, 229 teaching and non-teaching hospitals nationwide received the 2005 HealthGrades Distinguished Hospital Award for Clinical Excellence™. A complete list of recipients, by state, is available on the web at www.healthgrades.com. Overall, there were 126 teaching hospitals and 103 non-teaching hospitals nationwide named to the HealthGrades DHA-CE list.

DHA-CE recipients by U.S. geographic region break down as follows:

US Region	# of DHA-CE Recipients	Percent of US Population	Percent of DHP-CE Recipients
Northeast (Includes CT, DE, DC, ME, MD, MA, NH, NJ, NY, PA, RI, VT)	36	21.4%	15.7%
Great Lakes (Includes IL, IN, MI, MN, MO, OH, WI)	72	19.8%	31.4%

Sunbelt (Includes AL, FL, GA, KY, MS, NC, SC, TN, VA, WV)	72	22.1%	31.4%
Great Plains (Includes AR, CO, IA, KS, LA, MT, NE, ND, NM, OK, SD, TX, WY)	30	16.9%	13.1%
West Coast (Includes AK, AZ, CA, HI, ID, NV, OR, UT, WA)	19	19.8%	8.3%

Based upon 2000 U.S. Census figures, the highest concentration of DHA-CE hospitals per capita is in the Great Lakes Region, with one DHA-CE facility per 773,181 residents (the equivalent of having one DHP-CE hospital serving a metropolitan statistical area the size of Grand Rapids, Mich.).

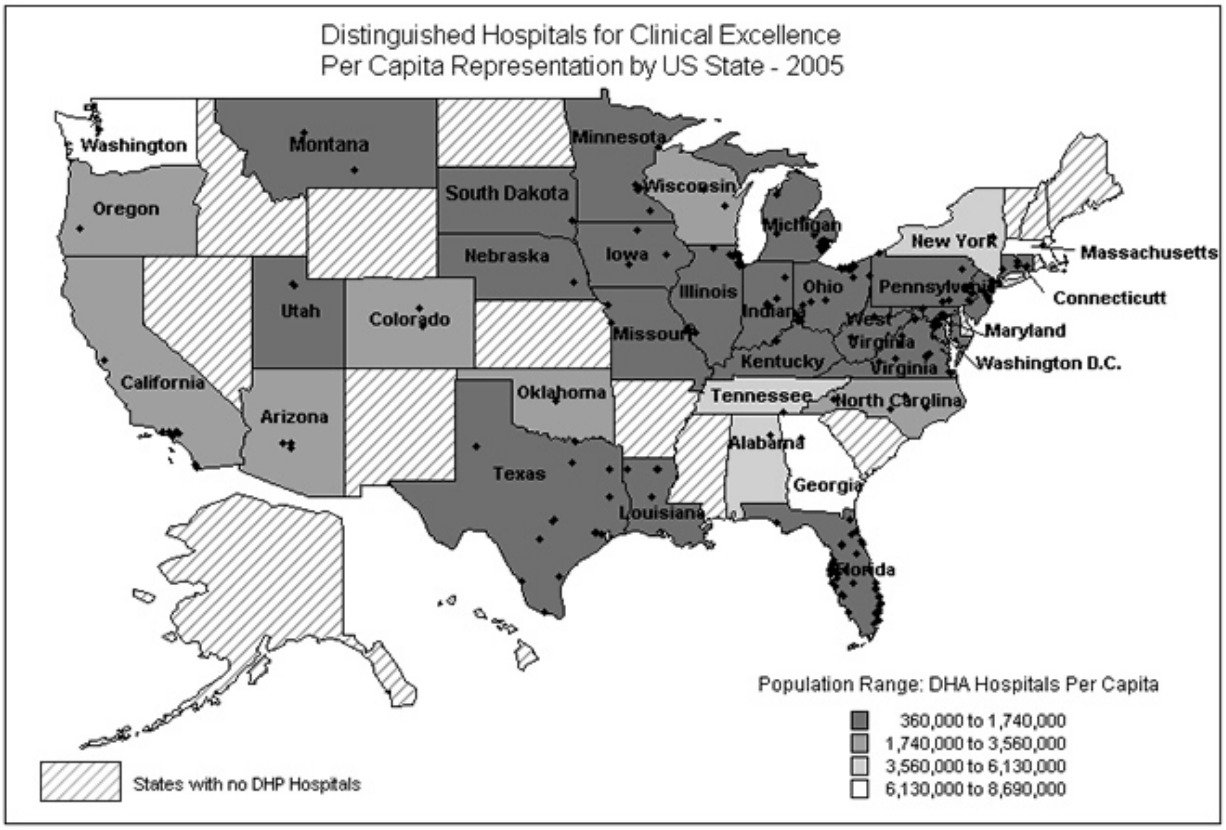
By contrast, the lowest concentration of DHA-CE hospitals is in the West Coast Region, with one DHA-CE facility per 2,930,613 residents (the equivalent of having one DHP-CE hospital for the entire San Diego, Calif., metropolitan statistical area).

Other regional per capita calculations for DHA-CE hospital penetration include:

- Sunbelt Region: One DHA-CE facility per 863,043 residents.
- Great Plains Region: One DHA-CE facility per 1,589,463 residents.
- Northeast Region: One DHA-CE facility per 1,673,515 residents.

Consistent with the regional analysis, the map on page 8 provides a numerical range of DHA-CE hospitals per capita, by state, based on population statistics from the U.S. Census Bureau (2000 census).

The highest numbers of DHA-CE hospitals per capita are in Florida and across the Upper Great Lakes**,** with the lowest per-capita in Washington, Georgia and Massachusetts**.** States depicted with a cross-hatch pattern (e.g., Maine, Wyoming, Nevada, etc.) did not have any hospitals qualifying for the DHA-CE list in 2005.



The complete list of 2005 HealthGrades Distinguished Hospital Award for Clinical Excellence recipients is provided in Exhibit A of this study.

DHA-CE Hospitals Have Dramatically Better Survival Rates

During the data period from FY 2001-03, Medicare patients treated at Distinguished Hospitals for Clinical Excellence, on average, had the following overall improved chances of survival when compared to patients treated at non-DHA-CE hospitals nationwide:

Procedure/Diagnosis	Improved Chance of Survival at DHA Hospital
Coronary Bypass Surgery	**15.3 percent**
Heart Attack (angioplasty/stent available)	**12.62 percent**
Stroke	**15.4 percent**
Community Acquired Pneumonia	**19.55 percent**

The following table displays the vast differences in quality outcomes, based upon risk-adjusted mortality rates and RRR, by hospital category (e.g., DHA-CE and non-recipient), procedure/ diagnosis, and region, and also compares outcomes to the nationwide actual mortality rate.

Medicare Mortality Rates (2001 – 2003)				
	Coronary Bypass	**Heart Attack***	**Stroke**	**Pneumonia****
US Actual Mortality Rate	3.35%	11.57%	12.13%	7.54%
Northeast Region				
DHA-CE	2.60%	10.20%	10.60%	6.30%
Non-DHA	3.00%	12.50%	13.30%	8.40%
Relative Risk Reduction	13.33%	18.40%	20.30%	25.00%
Great Lakes Region				
DHA-CE	2.70%	10.40%	8.50%	4.80%
Non-DHA	3.70%	13.00%	11.20%	8.40%
Relative Risk Reduction	27.03%	20.00%	24.11%	42.86%
Sunbelt Region				
DHA-CE	2.70%	11.00%	8.40%	5.20%
Non-DHA	4.00%	14.20%	12.00%	7.60%
Relative Risk Reduction	32.50%	22.54%	30.00%	31.58%
Great Plains Region				
DHA-CE	3.10%	11.30%	8.90%	5.20%
Non-DHA	4.00%	12.90%	11.30%	6.10%
Relative Risk Reduction	22.50%	12.40%	21.24%	14.75%
West Coast Region				
DHA-CE	3.30%	10.80%	9.60%	5.60%
Non-DHA	3.90%	12.90%	12.20%	7.30%
Relative Risk Reduction	15.38%	16.28%	21.31%	23.29%

** Includes admissions at hospitals with angioplasty/stent available.*
*** Defined as Community Acquired Pneumonia.*

Regionally, the greatest variability in chances of survival at DHA-CE versus non-recipient hospitals was demonstrated in the Sunbelt Region for coronary bypass surgery (32.50 percent), treatment of heart attack (22.54 percent) and treatment of stroke (30.00 percent); and in the Great Lakes Region for treatment of community acquired pneumonia (42.86 percent).

Extrapolating the data and findings to the entire U.S. population, if all patients during 2001 through 2003 who were treated for coronary bypass surgery, heart attack, stroke and community acquired pneumonia at non-DHA hospitals had gone to DHA-CE facilities instead, approximately 52,949 lives could have been saved nationwide. This is approximately equivalent to the average attendance at a professional football game.

DHA-CE Hospitals Treat Substantially Higher Volumes

DHA-CE hospitals also treated a substantially higher number of Medicare patients during 2001 through 2003. This is a consistent theme from previous HealthGrades studies of the DHA-CE recipients over the three years of the program.

DHA-CE hospitals in the Northeast, for example, on average performed 26.8 percent more coronary bypass surgeries on their Medicare patients than non-recipient hospitals in the region.

The differences are even more dramatic, as illustrated by the following table, for other procedures and diagnoses in other regions. In the Great Plains, DHA-CE hospitals treated 259.5 percent more community-acquired pneumonia cases than their non-DHA counterparts.

The following table presents ***average*** hospital volumes for each category of hospital (DHA-CE and non-recipient), by US region, and by procedure/diagnosis evaluated.

US Region	Coronary Bypass	Heart Attack*	Stroke	Pneumonia**
Northeast Region				
DHA-CE	569.6	928	587.7	864.3
Non-DHA	449.3	647	262.4	473
Difference	26.80%	43.40%	124%	82.70%
Great Lakes Region				
DHA-CE	507.5	883.6	627.3	861.8
Non-DHA	310.6	469.3	201	336.3
Difference	63.40%	82.20%	212%	156.30%
Sunbelt Region				
DHA-CE	674.8	895.8	607.4	782.9
Non-DHA	461.2	535.5	244	368.3
Difference	46.30%	67.30%	149%	112.60%
Great Plains Region				
DHA-CE	476	675.2	565.7	865.7
Non-DHA	259.2	380.5	172.2	240.8
Difference	83.60%	77.50%	228.50%	259.50%
West Coast Region				
DHA-CE	289.7	442.4	390.7	587.5
Non-DHA	227.5	310.2	183.5	267.8
Difference	27.30%	42.60%	112.90%	119.30%

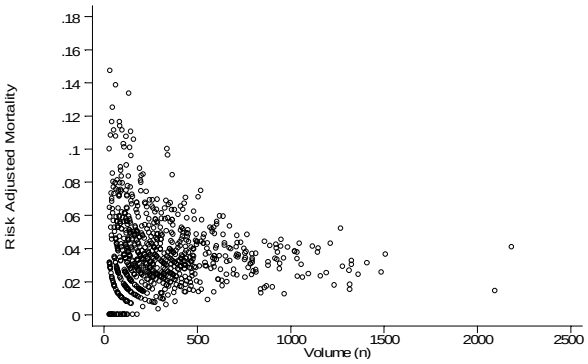
** Includes admissions at hospitals with angioplasty/stent available.*

*** Defined as Community Acquired Pneumonia.*

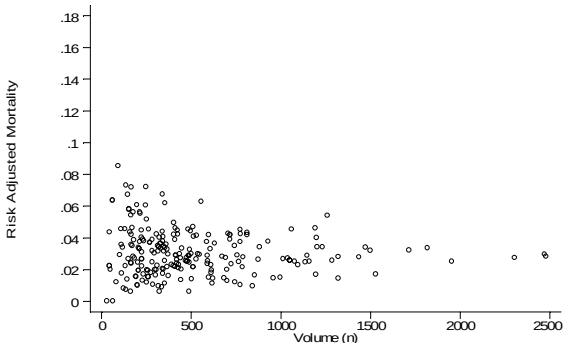
A common and ongoing dialogue in the academic and medical community involves the potential relationship between volume and quality outcomes, that is, whether hospitals that perform higher numbers of procedures and/or treat higher volumes of patients have demonstrably better quality. This topic has been a central theme in the Institute of Medicine analyses and the Leapfrog Group measures, for example.

While HealthGrades is not making a definitive statement, or drawing specific correlations, between volume and outcomes in its 2005 study, the evidence clearly indicates that recipients of the Distinguished Hospital Award for Clinical Excellence™ have quantitatively superior clinical outcomes and concomitant higher patient volumes.

Coronary Bypass Surgery—
Non-DHP Hospitals



Coronary Bypass Surgery—
DHP Hospitals



Specific illustrative examples are presented in the graphs immediately above, which track comparisons of risk-adjusted mortality rates vs. overall patient volumes for coronary bypass surgery in patients treated at DHA-CE hospitals vs. non-DHA facilities. Positive outcomes – e.g., lower risk-adjusted mortality on higher volumes treated – will trend the scatterplot more toward the central (middle) and southeastern (lower right) portions of the graphs.

As demonstrated, DHA-CE hospitals show a more frequent incidence of lower risk-adjusted mortality rates, especially at higher volume levels; conversely, the non-recipient hospitals display a cluster of data points at higher risk-adjusted mortality rates on lower volumes.

Similar patterns are evident (see Exhibit E) when the same comparative analysis is run on risk-adjusted mortality rates versus volume for treatment of heart attack, stroke and community-acquired pneumonia at DHA-CE and non-recipient hospitals by region.

III. HealthGrades Methodology, Ratings and Provider Analysis

In developing ratings designed to help consumers evaluate and compare hospital performance on an "apples to apples" basis nationwide, HealthGrades analyzed patient outcome data for virtually every hospital in the country. HealthGrades purchased the initial data from the U.S. Department of Health and Human Services' Centers for Medicare and Medicaid Services (CMS). The federal Medicare data (MedPAR file) from CMS contained the 2001 to 2003 (Federal Fiscal Year) in-patient records for Medicare patients, meaning that the data set includes patient billing records from October 1, 2000 through September 30, 2003.

Ratings were based upon two different risk-adjustment methodologies.

- For 26 medical issues, the risk adjustment was based upon the HealthGrades methodology described in the ***Multivariate Logistic Regression-Based Ratings*** section of this study (see page 14).

- For Gastrointestinal Procedures and Surgeries, the risk adjustment was based upon APR-DRG (All Patient Refined Diagnosis Related Group) methodology developed by 3M Corporation. This methodology is described in the ***APR-DRG-Based Ratings*** section of the study (see page 16).

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, for example, 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 were selected for several reasons. First, these data included virtually every hospital in the country, with the exception of military and Veterans Administration hospitals. Second, hospitals were required by law to submit complete and accurate information with substantial penalties for those that report inaccurate or incomplete data. Third, the Medicare population represented a majority of the patients for all of the clinical categories studied, with approximately 55 to 60 percent of all cardiac patients, for example, and 75 to 80 percent of all joint replacement surgeries.

For Multivariate Logistic Regression-Based Ratings (Section I below), HealthGrades conducted a series of data-quality checks to preserve the integrity of the ratings. Based on the results of these checks, HealthGrades 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 equal to or less than one day (except for Coronary Interventional Procedures, Heart Attack, Heart Failure, Carotid Endarterectomy, Back and Neck Surgery [Spinal Fusion], Back and Neck Surgery [except Spinal Fusion], Chronic Obstructive Pulmonary Disease, Community Acquired Pneumonia, Peripheral Vascular Bypass, and Atrial Fibrillation)
- Patients who were still in the hospital when the Medicare claim was filed
- Patients with an invalid gender

Methodology for HealthGrades' Ratings

HealthGrades' 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.

Specifics about the statistical methods used are provided here:

I. Multivariate Logistic Regression-Based Ratings

The Medicare in-hospital data on the HealthGrades web site represent three years of patient discharges, Federal Fiscal Years 2001 through 2003.

In the initial analysis, 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 Exhibit B 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, HealthGrades developed a list of specific procedures (e.g., quadruple bypass surgery), a list of risk factors (see Exhibit D), and a list of post-surgical complications. These latter two lists were developed in two steps:

(1) HealthGrades identified all diagnoses occurring in more than one percent of the patients for the current analysis and the previous analysis.
(2) HealthGrades used a team of clinical and coding experts to identify the complications in the list created in Step One.

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. See Exhibit C for a list of complications included in the quality measure "Major Complications." In cohorts where the quality measure is major

complications, mortality is considered a complication. See Exhibit D for a list of the top five risk factors for each procedure or diagnosis.

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, congestive 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., in-hospital mortality). First, the predicted value (e.g., predicted mortality) was obtained using logistic regression models discussed in the next section. Second, the predicted value was compared with the actual, or observed, value (e.g., actual mortality). 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. 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 relevant) were classified as potential risk factors. HealthGrades 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). A risk factor stayed in the model if it had an odds ratio greater than one and was also statistically significant ($p<0.05$) in explaining variation. Complications were ***not*** counted as risk factors as they were considered a result of care received during the admission.

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 to identify, by hospital, whether the actual and predicted rates were significantly different. HealthGrades used a binomial distribution to establish an approximate 90 percent confidence interval.

To test the fit of a binomial distribution to the data, HealthGrades performed tests on each model for 20 percent of the hospitals whereby the researchers included statistical significance, for each hospital individually, as an independent variable in the logistic regression model. HealthGrades subsequently used a two-tailed z-test to again determine statistical significance. The match between the binomial distribution results and the test sample within the logistic regression models themselves was nearly 100 percent.

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 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 to 15 percent were one-star hospitals and 10 to 15 percent were five-star hospitals. The data fell out in a fairly well structured bell shaped curve.

II. APR-DRG-Based Ratings

For Gastrointestinal Procedures and Surgeries and Respiratory Failure, the risk adjustment was based upon APR-DRGs, a methodology developed by 3M Corporation. APR-DRGs are an enhanced extension of the basic DRG (diagnosis related group) concept developed by 3M's Clinical Research Group, the National Association of Children's Hospitals and Research Institutes (NACHRI), and several physician groups.

While DRGs focus on the Medicare population, APR-DRGs describe a complete cross-section of acute care patients and are specifically designed to adjust data for severity of illness (How sick is the patient?) and risk of mortality (How likely is it that the patient will die?).

The fundamental principle of APR-DRGs is that the severity of illness and risk of mortality are both dependent on the patient's underlying condition. High severity of illness and risk of mortality are characterized by multiple serious diseases and the interactions between the disorders.

The 3M™ APR-DRG methodology is the most widely used severity-of-illness and risk-of-mortality adjustment tool available today. It has become the standard for adjusting large volumes of data to account for differences related to the individual's severity of illness or risk of

mortality. As a result, the focus can be on the differences in clinical care, thus providing equitable comparisons of quality and cost of care. APR-DRGs are also recognized as the tool of choice by commissions, state agencies and other entities that disseminate comparative performance data to regulators, payers and the general public.

Data Analysis

The output from the APR-DRG software was twofold: It revealed how many patients had Gastrointestinal Procedures or Surgeries in each hospital. It identified each patient as being in one of four subclasses of mortality risk: Minor, Moderate, Major or Extreme.

HealthGrades then took the above APR-DRG output and went through these steps:

1. Divided each subclass into two categories:
   - Patients who lived
   - Patients who died

2. Calculated a total number of patients with Gastrointestinal Procedures or Surgeries, for each subclass, for each hospital. This was the sum of those who lived and died within the subclass.

3. Calculated national levels by rolling up all the totals from the preceding step into a national average.

   National averages were not calculated for a subclass where:
   - There were fewer than five patients
   - Zero patients died

4. Calculated, on a national level, the percentage of patients with Gastrointestinal Procedures or Surgeries who died, for each subclass. This percentage was the national average for mortality, and provided the expected or predicted number of deaths for that subclass.

5. Applied the national percentage, at the hospital level, to calculate the predicted number of deaths for each subclass.

6. Aggregated the individual subclasses to a HealthGrades-determined medical issue level (e.g., one or more APR-DRGs).

7. Calculated chi-squared for each to determine statistical significance.

8. Removed hospitals with fewer than 30 cases in a HealthGrades-determined APR-DRG.

Assignment of Star Ratings

The following rating system was applied to the data for Gastrointestinal Procedures or Surgeries:

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.

Methodology for Selecting DHA-CE Hospitals

For the 2005 HealthGrades Distinguished Hospital Award for Clinical Excellence™ (DHA-CE), hospitals analyzed nationwide were divided into two groups: teaching and non-teaching.

A hospital was classified in the "teaching" category if it reported, on the billing and profile information submitted to Medicare, that it employed at least one resident or was affiliated with an approved medical teaching program in at least one year during the FFY 2001-03 data period.

To be considered eligible for the DHA-CE, a hospital had to meet the following criteria, according to its grouping:

- Teaching hospitals had to have in-hospital mortality or complication star ratings in at least 23 of the 28 HealthGrades cohorts using the MedPAR data.
- Non-teaching hospitals had to have in-hospital mortality or complication star ratings in at least 21 of the 28 HealthGrades cohorts using the MedPAR data.

After developing a list of hospitals that met the above criteria, HealthGrades took the following steps to determine the 2005 DHA-CE recipient list:

1. Calculated the average star rating for each hospital by averaging all of its MedPAR-based ratings for 2005.
2. Ranked hospitals in descending order by their average star rating. Ties were broken by total volume for all of the cohorts considered.
3. Selected the top 20 percent of hospitals from the list.
4. Excluded hospitals from the list based upon:
    a. Teaching hospitals with less than 5,000 cases in all of the HealthGrades-rated procedures and diagnoses, and whose average star rating was less than 3.30.
    b. Non-teaching hospitals with less than 4,000 cases in all of the HealthGrades-rated procedures and diagnoses, and whose average star rating was less than 3.30.
5. Designated the hospitals that remained on the list as the 2005 DHA-CE recipients.

As a result, of the nearly 5,000 hospitals evaluated nationwide by HealthGrades, the DHA-CE list represents the top five percent of hospitals in terms of overall clinical quality excellence.

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 were 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 HealthGrades 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 HealthGrades of a particular hospital; it means that the data associated with a particular hospital have 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.

Susan DesHarnais, Ph.D., a noted independent expert in the development of risk-adjustment methods, assisted HealthGrades in developing the methodology for the HealthGrades ratings and generating data for the HealthGrades service.

IV. Public Policy Considerations: Paying for Higher Quality

Recipients of the *2005 HealthGrades Distinguished Hospital Award for Clinical Excellence™* (DHA-CE) have demonstrably lower risk-adjusted mortality and complication rates than their non-DHA counterparts, both within regions and throughout the U.S. However, DHA-CE hospitals largely do not receive higher reimbursement rates that are linked directly to quality outcomes due to the structure of the capitated Medicare and Medicaid systems.

While hospitals in higher-wage-index regions (e.g., the Northeast and California) and those in regions that serve higher proportions of Medicare and Medicaid patients (through the Disproportionate Share Hospital program) receive higher payments based on these factors, there are generally no increases to the Medicare base rate to recognize and reward better quality outcomes directly. Since most third-party payer systems, such as private insurance, are patterned after Medicare in terms of reimbursement schedules, mechanisms to reward higher-quality providers with targeted reimbursement incentives have been largely non-existent in the U.S.

Hospitals that achieve superior clinical quality outcomes can be theorized to have a positive economic impact in the U.S., in terms of lives saved (and therefore, prolonged workforce productivity), the avoidance of financial costs associated with complications and hospital readmissions, and faster return to work. Such economic considerations are clearly material in a sector (e.g., healthcare) that currently comprises one-seventh of the massive U.S. Gross Domestic Product.

This begs continuation of the current debate: Should hospitals that have demonstrated superior quality outcomes be paid more for certain procedures and treatments as a direct result, reflecting the fact that those superior outcomes save lives and money for the healthcare system and payers? And, under the current reimbursement structure dominated by Medicare and Medicaid, are top-performing hospitals "donating" quality by virtue of not receiving specific quality premiums?

Study findings should serve to fuel and continue a vigorous debate over whether superior clinical quality outcomes should be directly rewarded with enhanced network inclusion and premium reimbursement. In fact, this will become increasingly important as consumer-driven health plans proliferate – i.e., should top-performing hospitals be rewarded for quality, and should patients be rewarded for choosing them, in the form of lower out-of-pocket payments through network "tiering" mechanisms.

"Pay for Performance" Innovations Are Emerging

Progress is clearly being made. As noted in the introductory section of this study, one example is CMS's partnership with Premier to launch a new quality incentive demonstration project.

Under the Hospital Quality Initiative pilot, which currently has 278 participants nationwide, CMS provides a two percent or one percent Medicare base rate increase for hospitals that perform in the top or second decile, respectively, on 34 process indicators across key clinical conditions, including heart attack, heart bypass, heart failure, community-acquired pneumonia,

and hip and knee replacement. The goal is to determine whether economic incentives are effective in terms of improving quality – i.e., do financial "carrots" really work.

Private health plans throughout the nation are also beginning to experiment more actively with report cards, "tiering," and other pay for performance systems. These are designed to complement consumer-driven health plans by educating patients about the quality of different physicians and other providers, then providing economic incentives, such as tiered co-pays, to steer patients in the direction of providers with better quality outcomes as defined by the health plan.

Examples include:

- Blue Shield of California has implemented cost and quality considerations as part of its Network Choice program. "The program tiers hospitals according to cost and some generally recognized quality measures" for the purposes of provider inclusion. Co-pays for enrollees range from zero for "choice" hospitals to between $100 and $300 for "affiliated" hospitals. Patient mix is also taken into account, giving hospitals "credit" for network inclusion status based on patient acuity level. *(Source: Contra Costa Times)*

- Blue Cross Blue Shield of Hawaii has launched a new physician-focused Quality and Service Recognition Program. Administrative data are used, similar to the HealthGrades process, "to measure physician performance on a number of indicators, including clinical, patient satisfaction, utilization and business operations." Bonuses are paid based on physician scores. *(Source: HMSA and HealthBenchmarks, Inc.)*

- Another physician-incentive program is Integrated Healthcare Association's Pay-For-Performance Initiative. PacifiCare Health Systems, Inc., one large participant, published a Quality Index Report Card for physicians, measuring breast and cervical cancer screening, childhood immunizations, and diabetes and heart disease management. Bonuses for improved performance on these process measures are paid directly to physician groups in California from a $14 million pool. *(Source: Managed Care Outlook, Offering Physicians Incentives Helps Boost Clinical Indicators, 8/1/03)*

- The Buyers Health Care Action Group in Minnesota now pays "Gold" and "Silver" monetary awards to care systems that implement system-wide improvement projects, and Empire BCBS increases hospital payments by four percent for implementing various patient safety improvement measures. *(Source: Profiles of Organizations Using Incentives.)*

Financial incentives to improve quality and reduce mortality, complications and hospital readmission rates have tremendous potential to contribute significant economic and quality-of-life benefits.

However, a number of challenges remain in order to find the right mix of incentives, performance and economic measures to demonstrably drive quality improvement.

As noted by Mays, Claxton and Strunk of the Center for Studying Health System Change *(Issue Brief: Tiered-Provider Networks: Patients Face Cost-Choice Trade-Off)*:

> "Because health plan experimentation with tiered networks is still in the early stages, the effects of these arrangements on the health care marketplace will depend on how they mature and evolve over time in relation to other health plan design elements. If the movement toward consumer-driven health plans continues to progress, tiered-network designs could become important mechanisms for helping consumers make informed choices among providers based on the cost and quality of care offered.
>
> "Continued progress in improving both quality and cost measurement is needed to ensure that the use of tiered networks does not limit consumer access to high-quality care and undermine incentives for providers to improve quality."

V. Questions for Future Research

It is clear, from the evidence presented in this study, that a select group of hospitals in the U.S. is far out-performing its peers in terms of risk-adjusted mortality rates – those hospitals are achieving better outcomes while treating more and sicker patients with complex conditions.

It is also clear, from the current federal government (and largely, private pay as well) systems of reimbursement that top-performing hospitals are not being rewarded or paid for their quality outcomes. That is, by being reimbursed on largely the same financial level as all other facilities, hospitals with the best clinical outcomes may, in effect, be "donating" quality.

In the interest of building momentum for continued experimentation with "pay-for-performance" mechanisms that reward and encourage quality performance and improvement – and, perhaps, encouraging the federal and state governments to take the a more visible leadership role in that process – the following items are suggested for further industry-wide research:

- Specifically, which measures (process and/or outcome) should be developed and utilized as clinical benchmarks (for hospitals and physicians) in defining and rewarding quality?

  Should the emphasis be placed more on process measures, outcomes measures, or some balance of the two categories? A wealth of resources are available to guide this debate, including the HealthGrades methodology and evaluation system; work by the Leapfrog Group, National Quality Foundation, Institute of Medicine, Joint Commission on the Accreditation of HealthCare Organizations, and substantial academic research.

- What specific level of financial incentives (in terms of dollars) is needed to incentivize meaningful and sustainable quality improvement initiatives by hospitals and physicians?

  Should the incentives be directed more toward hospitals or physicians, or is a balance of the two more appropriate? How much is "enough" to incentivize behavior change?

- Can a more definitive link be made in terms of quantifying the impact on reduced length of stay and/or hospital complications on job productivity and resulting economic benefit?

- Can the U.S. Congress and State Legislatures make meaningful and incentive-oriented change to the current Medicare and Medicaid reimbursement systems, given the perennial debates over tax cuts and fiscal shortfalls? Will the aging of the U.S. population strain Medicare resources to the point where reimbursement overhaul is not feasible?

- Which is a more powerful incentive, paying more for high performance, or less for poor performance? Year three of the CMS/Premier project includes payment reductions for hospitals who have not met minimum levels of performance.

EXHIBIT A

Listing of 2005 HealthGrades Distinguished Hospitals for Clinical Excellence

Riverview Regional Medical Center	Gadsden	AL
Del E Webb Memorial Hospital	Sun City West	AZ
Mayo Clinic Hospital **	Phoenix	AZ
Scottsdale Healthcare Shea	Scottsdale	AZ
Cedars Sinai Medical Center **	Los Angeles	CA
Good Samaritan Hospital **	Los Angeles	CA
Glendale Adventist Medical Center *	Glendale	CA
St Johns Hospital Health Center **	Santa Monica	CA
Los Robles Regional Medical Center *	Thousand Oaks	CA
Scripps Mercy Hospital **	San Diego	CA
Methodist Hospital Of Southern California **	Arcadia	CA
Encino Tarzana Regional Medical Center - Tarzana Campus *	Tarzana	CA
Sharp Chula Vista Medical Center *	Chula Vista	CA
Huntington Memorial Hospital *	Pasadena	CA
El Camino Hospital	Mountain View	CA
Glendale Memorial Hospital And Health Center **	Glendale	CA
Centura Health Porter Adventist Hospital	Denver	CO
Penrose - St Francis Health Services *	Colorado Springs	CO
Danbury Hospital	Danbury	CT
Hartford Hospital *	Hartford	CT
Middlesex Hospital	Middletown	CT
William W Backus Hospital	Norwich	CT
Sibley Memorial Hospital	Washington	DC
Delray Medical Center **	Delray Beach	FL
Central Florida Regional Hospital *	Sanford	FL
Flagler Hospital	Saint Augustine	FL
Sarasota Memorial Hospital **	Sarasota	FL
University Hospital And Medical Center	Tamarac	FL
Martin Memorial Medical Center	Stuart	FL
Mount Sinai Medical Center **	Miami Beach	FL
St Joseph Hospital Port Charlotte	Port Charlotte	FL
Holmes Regional Medical Center **	Melbourne	FL
Morton Plant Hospital **	Clearwater	FL
Ocala Regional Medical Center **	Ocala	FL
Mease Hospital Countryside	Safety Harbor	FL
Lawnwood Regional Medical Center **	Fort Pierce	FL
Brandon Regional Hospital	Brandon	FL
Regional Medical Center Bayonet Point **	Hudson	FL
Cedars Medical Center Inc **	Miami	FL
Holy Cross Hospital **	Fort Lauderdale	FL
Lakeland Regional Medical Center *	Lakeland	FL
Bethesda Memorial Hospital	Boynton Beach	FL

Jupiter Medical Center Inc	Jupiter	FL
Florida Hospital - Ormond Memorial/Oceanside *	Ormond Beach	FL
Oak Hill Hospital	Spring Hill	FL
Halifax Medical Center **	Daytona Beach	FL
Baptist Hospital Of Miami Inc **	Miami	FL
Florida Hospital Heartland Division	Sebring	FL
Community Hospital Of New Port Richey	New Port Richey	FL
Doctors Hospital Of Sarasota	Sarasota	FL
Bay Medical Center *	Panama City	FL
Northside Hospital	Saint Petersburg	FL
Palm Beach Gardens Medical Center **	Palm Beach Gardens	FL
St Josephs Hospital	Tampa	FL
Helen Ellis Memorial Hospital	Tarpon Springs	FL
Saint Lucie Medical Center	Port Saint Lucie	FL
Munroe Regional Medical Center **	Ocala	FL
St Vincents Medical Center Inc	Jacksonville	FL
Charlotte Regional Medical Center	Punta Gorda	FL
Naples Community Hospital Inc	Naples	FL
Boca Raton Community Hospital Inc	Boca Raton	FL
Fawcett Memorial Hospital	Port Charlotte	FL
Blake Medical Center *	Bradenton	FL
Jfk Medical Center *	Atlantis	FL
Westside Regional Medical Center	Plantation	FL
Putnam Community Medical Center	Palatka	FL
Mease Hospital Dunedin	Dunedin	FL
Florida Medical Center	Lauderdale Lakes	FL
South Bay Hospital	Sun City Center	FL
Saint Josephs Hospital Of Atlanta **	Atlanta	GA
St Lukes Hospital	Cedar Rapids	IA
Mercy Medical Center North Iowa **	Mason City	IA
Mercy Medical Center - Des Moines	Des Moines	IA
Rush North Shore Medical Center **	Skokie	IL
St Francis Hospital And Health Center *	Blue Island	IL
Alexian Brothers Medical Center *	Elk Grove Village	IL
Advocate South Suburban Hospital	Hazel Crest	IL
Advocate Christ Medical Center *	Oak Lawn	IL
Advocate Lutheran General Hospital **	Park Ridge	IL
Memorial Hospital *	Belleville	IL
Evanston Northwestern Healthcare **	Evanston	IL
Little Company Of Mary Hospital	Evergreen Park	IL
Ingalls Memorial Hospital	Harvey	IL
St Francis Hospital Of Evanston	Evanston	IL
Northwest Community Hospital	Arlington Heights	IL
Rockford Memorial Hospital	Rockford	IL
Sherman Hospital	Elgin	IL
Saint Johns Health System	Anderson	IN
Community Hospital East/ North	Indianapolis	IN
Community Hospital *	Munster	IN
St Vincent Hospital And Health Services	Indianapolis	IN

Clarian Health Partners Inc	Indianapolis	IN
Lutheran Hospital Of Indiana	Fort Wayne	IN
St Francis Hospital And Health Centers	Beech Grove	IN
Baptist Hospital East *	Louisville	KY
St Elizabeth Medical Center **	Covington	KY
Jewish Hospital *	Louisville	KY
Caritas Medical Center	Louisville	KY
St Francis Medical Center **	Monroe	LA
Willis Knighton Bossier Health Center	Bossier City	LA
Rapides Regional Medical Center	Alexandria	LA
Glenwood Regional Medical Center	West Monroe	LA
Lahey Clinic Medical Center **	Burlington	MA
Good Samaritan Hospital	Baltimore	MD
Franklin Square Hospital	Baltimore	MD
Washington Adventist Hospital *	Takoma Park	MD
Greater Baltimore Medical Center	Baltimore	MD
Suburban Hospital Association	Bethesda	MD
Sinai Hospital	Baltimore	MD
Washington County Hospital	Hagerstown	MD
Northwest Hospital Center	Randallstown	MD
Doctor's Community Hospital	Lanham	MD
Montgomery General Hospital Inc	Olney	MD
William Beaumont Hospital **	Royal Oak	MI
Oakwood Hospital And Medical Center **	Dearborn	MI
Bon Secours Hospital	Grosse Pointe	MI
Munson Medical Center **	Traverse City	MI
St Mary Mercy Hospital	Livonia	MI
St Joseph Mercy Oakland *	Pontiac	MI
St Josephs Mercy Hospital And Health Services *	Clinton Township	MI
Henry Ford Wyandotte Hospital	Wyandotte	MI
Genesys Regional Medical Center **	Grand Blanc	MI
Spectrum Health Hospitals **	Grand Rapids	MI
St John Macomb Hospital	Warren	MI
Harper University Hospital *	Detroit	MI
St John Hospital And Medical Center **	Detroit	MI
MidMichigan Medical Center-Midland	Midland	MI
Crittenton Hospital	Rochester Hills	MI
Abbott Northwestern Hospital Inc **	Minneapolis	MN
St Marys Hospital **	Rochester	MN
St Marys Medical Center	Duluth	MN
United Hospitals Inc *	Saint Paul	MN
Mercy Hospital **	Coon Rapids	MN
Healtheast St John's Hospital	Maplewood	MN
St Luke's Episcopal-Presbyterian Hospital **	Chesterfield	MO
Heartland Regional Medical Center **	Saint Joseph	MO
St Lukes Hospital Of Kansas City	Kansas City	MO
St Joseph Health Center	Saint Charles	MO
S S M Depaul Health Center	Bridgeton	MO
Deaconess Billings Clinic *	Billings	MT

Benefis Healthcare	Great Falls	MT
Lenoir Memorial Hospital	Kinston	NC
Rex Hospital	Raleigh	NC
Mission St. Joseph's Health System - Mission Campus **	Asheville	NC
Firsthealth Moore Regional Hospital	Pinehurst	NC
BryanLGH Medical Center East **	Lincoln	NE
Kimball Medical Center	Lakewood	NJ
Community Medical Center	Toms River	NJ
Robert Wood Johnson University Hospital	New Brunswick	NJ
Hackensack University Medical **	Hackensack	NJ
Centrastate Medical Center	Freehold	NJ
Holy Name Hospital	Teaneck	NJ
Maimonides Medical Center **	Brooklyn	NY
Ellis Hospital	Schenectady	NY
Winthrop University Hospital **	Mineola	NY
Beth Israel Medical Center **	New York	NY
Christ Hospital **	Cincinnati	OH
Hillcrest Hospital *	Mayfield Heights	OH
Summa Health System **	Akron	OH
Akron General Medical Center **	Akron	OH
Marymount Hospital	Garfield Heights	OH
Deaconess Hospital **	Cincinnati	OH
Parma Community General Hospital *	Parma	OH
E M H Regional Medical Center **	Elyria	OH
Southwest General Health Center **	Middleburg Heights	OH
Meridia Euclid Hospital	Euclid	OH
University Hospitals Of Cleveland *	Cleveland	OH
Community Health Partners Of Oh West	Lorain	OH
Cleveland Clinic Foundation **	Cleveland	OH
Fort Hamilton Hughes Memorial Hospital	Hamilton	OH
Riverside Methodist Hospital *	Columbus	OH
Fairview Hospital **	Cleveland	OH
St John West Shore Hospital *	Westlake	OH
Grandview Hospital And Medical Center *	Dayton	OH
St Elizabeth Health Center *	Youngstown	OH
Mercy Medical Center Of Springfield *	Springfield	OH
Jewish Hospital The	Cincinnati	OH
Good Samaritan Hospital *	Dayton	OH
Mercy Hospital Anderson	Cincinnati	OH
Deaconess Hospital *	Oklahoma City	OK
Mercy Medical Center Inc	Roseburg	OR
Mercy Hospital **	Scranton	PA
Lehigh Valley Hospital **	Allentown	PA
Hamot Medical Center **	Erie	PA
Lancaster General Hospital **	Lancaster	PA
York Hospital *	York	PA
St Lukes Hospital **	Bethlehem	PA
Main Line Hospitals Inc Lankenau **	Wynnewood	PA
Easton Hospital **	Easton	PA

Pennsylvania Hospital The *	Philadelphia	PA
Doylestown Hospital *	Doylestown	PA
Sioux Valley Hospital	Sioux Falls	SD
Memorial Hospital **	Chattanooga	TN
Good Shepherd Medical Center **	Longview	TX
Mc Allen Heart Hospital	Mc Allen	TX
Baylor University Medical Center *	Dallas	TX
Christus Santa Rosa Hospital *	San Antonio	TX
Memorial Medical Center Of East Texas	Lufkin	TX
Memorial Hospital System	Houston	TX
St Davids Hospital	Austin	TX
Bayshore Medical In Pasadena *	Pasadena	TX
Covenant Health System **	Lubbock	TX
Rio Grande Regional Hospital **	Mc Allen	TX
Seton Medical Center *	Austin	TX
St Lukes Episcopal Hospital	Houston	TX
South Austin Hospital	Austin	TX
Texoma Medical Center	Denison	TX
Christus Spohn Hospital Memorial	Corpus Christi	TX
Laredo Medical Center *	Laredo	TX
Lds Hospital *	Salt Lake City	UT
St Marks Hospital	Salt Lake City	UT
Inova Fairfax Hospital *	Falls Church	VA
Rockingham Memorial Hospital	Harrisonburg	VA
Sentara Norfolk General Hospital **	Norfolk	VA
Virginia Baptist Hospital And Lynchburg General *	Lynchburg	VA
Chesapeake General Hospital	Chesapeake	VA
Sentara Leigh Hospital	Norfolk	VA
C J W Medical Center **	Richmond	VA
Winchester Medical Center Inc	Winchester	VA
Inova Alexandria Hospital *	Alexandria	VA
Lewis-Gale Medical Center *	Salem	VA
Henrico Doctors Hospital Forest Campus/ Parham Campus **	Richmond	VA
Augusta Medical Center	Fishersville	VA
Bon Secours Memorial Regional Medical **	Mechanicsville	VA
Virginia Mason Medical Center *	Seattle	WA
Theda Clark Memorial Hospital **	Neenah	WI
Wausau Hospital *	Wausau	WI
Charleston Area Medical Center	Charleston	WV
United Hospital Center	Clarksburg	WV

* Indicates hospital received Distinguished Hospital Award for Clinical Excellence in 2004 and 2005.
** Indicates hospital received Distinguished Hospital Award for Clinical Excellence in 2003, 2004 and 2005.

EXHIBIT B

Patient Cohorts and Related ICD-9-CM Codes

Patient Cohort	ICD-9-CM Procedure/Diagnosis Codes and Criteria
Aspiration Pneumonia	**Principal Diagnoses – Inclusions:** 507.0, 507.1, 507.8 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54 **Diagnoses – Exclusions:** 480.3
Atrial Fibrillation	**Principal Diagnoses – Inclusions:** 427.31 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54 **Diagnoses – Exclusions:** 414.06, 414.07
Back and Neck Surgery (Spinal Fusion)	**Principal Procedures – Inclusions:** 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 **Procedures – Exclusions:** 03.02, 37.5, 37.51, 37.52, 37.53, 37.54, 81.3, 81.30, 81.31, 81.32, 81.33, 81.34, 81.35, 81.36, 81.37, 81.38, 81.39 **Diagnoses – Exclusions:** 722.80, 722.81, 722.82, 722.83, V45.4
Back and Neck Surgery (except Spinal Fusion)	**Principal Procedures – Inclusions:** 03.09, 03.53, 80.50, 80.51, 80.59 **Procedures – Exclusions:** 03.02, 37.5, 37.51, 37.52, 37.53, 37.54, 81.00, 81.01, 81.02, 81.03, 81.04, 81.05, 81.06, 81.07, 81.08, 81.09, 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 **Diagnoses – Exclusions:** 722.80, 722.81, 722.82, 722.83, V45.4
Bowel Obstruction	**Principal Diagnoses – Inclusions:** 277.01, 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, 557.0, 560.0, 560.1, 560.2, 560.30, 560.31, 560.39, 560.81, 560.89, 560.9, 751.1, 751.2, 777.1, 777.2, 777.4, 936, 937 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54
Carotid Endarterectomy	**Principal Procedures – Inclusions:** 38.12, 39.72 **Procedures – Exclusions:** 36.1, 36.10, 36.11, 36.12, 36.13, 36.14, 36.15, 36.16, 36.17, 36.19, 37.5, 37.51, 37.52, 37.53, 37.54, 38.08, 38.16, 38.18, 38.36, 39.24, 39.25, 39.29, 39.50, 39.59
Cholecystectomy	**Principal Procedures – Inclusions:** 51.21, 51.22, 51.23, 51.24 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54
Chronic Obstructive Pulmonary Disease (COPD)	**Principal Diagnoses – Inclusions:** 491.1, 491.20, 491.21, 491.8, 491.9, 492.8, 493.20, 493.21, 493.22, 494, 494.0, 494.1, 496 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54 **Diagnoses – Exclusions:** 480.3
Community Acquired Pneumonia	**Principal Diagnoses – Inclusions:** 480.0, 480.1, 480.2, 480.8, 480.9, 481, 482.2, 482.30, 482.31, 482.32, 482.39, 482.9, 483.0, 483.1, 483.8, 485, 486, 487.0 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54 **Diagnoses – Exclusions:** 480.3
Coronary Bypass Surgery	**Principal Procedures – Inclusions:** 36.10, 36.11, 36.12, 36.13, 36.14, 36.15, 36.16, 36.19 **Procedures – Exclusions:** 35.1, 35.10, 35.11, 35.12, 35.13, 35.14, 35.2, 35.20, 35.21, 35.22, 35.23, 35.24, 35.25, 35.26, 35.27, 35.28, 37.5, 37.51, 37.52, 37.53, 37.54, 38.12 **Diagnoses – Exclusions:** 414.06, 414.07

Coronary Interventional Procedures	**Principal or Secondary Procedures – Inclusions:** 36.01, 36.02, 36.05, 36.06, 36.07, 36.09 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54 **Diagnoses – Exclusions:** 414.06, 414.07
Gastrointestinal Bleed	**Principal Diagnoses – Inclusions:** 456.0, 456.20, 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, 569.85, 569.86, 578, 578.1, 578.9, 751.0, 772.4 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54
Gastrointestinal Procedures & Surgeries	Not available.
Heart Attack	**Principal Diagnoses – Inclusions:** 410.01, 410.01, 410.11, 410.11, 410.21,410.21, 410.31, 410.31, 410.41, 410.41, 410.51, 410.51, 410.61, 410.61, 410.71, 410.71, 410.81, 410.81, 410.91, 410.91 **Diagnoses – Exclusions:** 414.06, 414.06, 414.07, 414.07
Heart Failure	**Principal Diagnoses – Inclusions:** 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 **Diagnoses – Exclusions:** 414.06,414.07
Hip Fracture Repair (ORIF)	**Principal Procedures – Inclusions:** 79.05, 79.15, 79.25, 79.35 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54
Pancreatitis	**Principal Diagnoses – Inclusions:** 577.0, 577.1, 072.3, 095.8 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54
Partial Hip Replacement	**Principal Procedures – Inclusions:** 81.52 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54
Peripheral Vascular Bypass	**Principal or Secondary Procedures – Inclusions:** 39.29 **Principal Diagnoses – Inclusions:** 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, 445.01, 445.02, 447.1, 681.10, 682.2, 682.4, 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, 904.0, 904.41, 904.7, 904.8 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54, 39.25, 39.49 **Diagnoses – Exclusions:** 440.31
Prostatectomy	**Principal Procedures – Inclusions:** 60.21, 60.29, 60.3, 60.4, 60.5, 60.61, 60.62, 60.69 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54
Pulmonary Embolism	**Principal Diagnoses – Inclusions:** 415.11, 415.19 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54
Resection / Replacement of Abdominal Aorta	**Principal or Secondary Procedures – Inclusions:** 38.34, 38.44, 38.45, 38.64, 39.71 **Procedures – Exclusions:** 36.1, 36.10, 36.11, 36.12, 36.13, 36.14, 36.15, 36.16, 36.17, 36.19, 37.5, 37.51, 37.52, 37.53, 37.54, 38.08, 38.16, 38.18, 38.36, 39.24, 39.25, 39.29, 39.50, 39.59 **Diagnoses – Exclusions:** 441.00, 441.01, 441.02, 441.03, 441.1, 441.2, 441.6, 441.7, 441.9

Respiratory Failure	Not available
Sepsis	**Principal Diagnoses – Inclusions:** 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, 771.81, 785.52, 785.59, 995.90, 995.91, 995.92, 995.93, 995.94, 999.3 **Procedures – Exclusions**: 37.5, 37.51, 37.52, 37.53, 37.54
Stroke	**Principal Diagnoses – Inclusions:** 430, 431, 432.0, 432.1, 432.9, 433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.11, 434.91, 436 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54
Total Hip Replacement	**Principal Procedures – Inclusions:** 81.51 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54, 81.53 **Diagnoses – Exclusions:** 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
Total Knee Replacement	**Principal Procedures – Inclusions:** 81.54 **Procedures – Exclusions:** 37.5, 37.51, 37.52, 37.53, 37.54
Valve Replacement Surgery	**Principal or Secondary Procedures – Inclusions:** 35.20, 35.21, 35.22, 35.23, 35.24, 35.25, 35.26, 35.27, 35.28 **Procedures – Exclusions:** 35.1, 35.10, 35.11, 35.12, 35.13, 35.14, 35.33, 37.5, 37.51, 37.52, 37.53, 37.54, 38.12 **Diagnoses – Exclusions:** 414.06, 414.07, 441.2

EXHIBIT C

Major Complications

Major Complications – Back and Neck Surgery (Spinal Fusion)			
427.31	ATRIAL FIBRILLATION	482.41	STAPH AUREUS PNEUMONIA
427.89	CARDIAC DYSRYTHMIAS NEC	482.49	STAPH PNEUMONIA NEC
428.0	CONGESTIVE HEART FAILURE	482.8	PNEUMONIA-BACTERIA NEC
428.1	LEFT HEART FAILURE	482.81	PNEUMONIA DT ANAEROBES
428.2	SYSTOLIC HEART FAILURE	482.82	PNEUMONIA-E. COLI
428.20	SYSTOLC HEART FAILUR NOS	482.83	PNEUMONIA-GRM NG BAC NEC
428.21	AC SYSTOLC HEART FAILURE	482.84	LEGIONNAIRES' DISEASE
428.23	AC ON CHR SYSTOL HT FAIL	482.89	PNEUMONIA-BACTERIA NEC
428.3	DIASTOLIC HEART FAILURE	482.9	BACTERIAL PNEUMONIA, NOS
428.30	DIASTOLC HEART FAILR NOS	483	PNEUMONIA-OTHER ORGANISM
428.31	AC DIASTOL HEART FAILURE	483.0	PNEUMONIA-M. PNEUMONIAE
428.33	AC ON CHR DIASTL HT FAIL	483.1	PNEUMONIA DT CHLAMYDIA
428.4	CMB SYST & DIAST HT FAIL	483.8	PNEUMONIA DT ORGANSM NEC
428.40	CMB SYS/DIAS HT FAIL NOS	484	PNEUMONIA-OTH INFECT DIS
428.41	AC COMB SYS/DIAS HT FAIL	484.1	PNEUMONIA-CM INCLUSN DIS
428.43	AC ON CH SYS/DIA HT FAIL	484.3	PNEUMONIA-WHOOPING COUGH
428.9	HEART FAILURE, NOS	484.5	PNEUMONIA IN ANTHRAX
480	VIRAL PNEUMONIA	484.6	PNEUMONIA-ASPERGILLOSIS
480.0	PNEUMONIA DT ADENOVIRUS	484.7	PNEUMON-SYST MYCOSES NEC
480.1	PNEUMONIA DUE TO RSV	484.8	PNEUMON IN INFCT DIS NEC
480.2	PNEUMON-PARAINFLUENZA VR	485	BRONCHOPNEUM-ORGNISM NOS
480.3	PNEUMONIA DT SARS	486	PNEUMONIA-ORGANISM NOS
480.8	PNEUMONIA DT VIRUS NEC	518.0	PULMONARY COLLAPSE
480.9	VIRAL PNEUMONIA, NOS	518.5	PULM INSUF PST TRAUM/SRG
481	PNEUMOCOCCAL PNEUMONIA	560.1	PARALYTIC ILEUS
482	OTHR BACTERIAL PNEUMONIA	996.4	MECH COMPL-INT ORTHO DEV
482.0	PNEUMONIA-K. PNEUMONIAE	996.77	COMP NEC-INTRN JT PROSTH
482.1	PNEUMONIA DT PSEUDOMONAS	996.78	COMP NEC-ORTHOPD DEV NEC
482.2	PNEUMONIA-H. INFLUENZAE	997.1	CARDIAC COMPLICATION NEC
482.3	PNEUMONIA-STREPTOCOCCUS	997.3	RESPIR COMPLICATIONS NEC
482.30	PNEUMONIA-STREPTOCOC NOS	997.4	DIGESTIVE SYST COMPL NEC
482.31	PNEUMONIA-GROUP A STREP	997.5	URINARY COMPLICATION NEC
482.32	PNEUMONIA-GROUP B STREP	998.11	HEMORRHAGE COMPLIC PROC
482.39	PNEUMONIA DT STREP NEC	998.2	ACC PUNCTUR/LAC-PROC NEC
482.4	PNEUMONIA-STAPHYLOCOCCUS	998.59	POSTOPERATIV INFECTN NEC
482.40	STAPH PNEUMONIA NOS	998.89	COMP NEC, PROCEDURE NEC

Major Complications – Back and Neck Surgery (except Spinal Fusion)			
427.31	ATRIAL FIBRILLATION	518.0	PULMONARY COLLAPSE
427.89	CARDIAC DYSRYTHMIAS NEC	518.5	PULM INSUF PST TRAUM/SRG
428.0	CONGESTIVE HEART FAILURE	593.9	KIDNEY & URETER DIS NOS
428.1	LEFT HEART FAILURE	996.4	MECH COMPL-INT ORTHO DEV
428.2	SYSTOLIC HEART FAILURE	996.77	COMP NEC-INTRN JT PROSTH
428.20	SYSTOLC HEART FAILUR NOS	996.78	COMP NEC-ORTHOPD DEV NEC
428.21	AC SYSTOLC HEART FAILURE	997.00	NERVOUS SYST COMPLIC NOS
428.23	AC ON CHR SYSTOL HT FAIL	997.02	IATROGN C-VSC INFRCT/HEM
428.3	DIASTOLIC HEART FAILURE	997.09	NERVOUS SYST COMPLIC NEC
428.30	DIASTOLC HEART FAILR NOS	997.1	CARDIAC COMPLICATION NEC
428.31	AC DIASTOL HEART FAILURE	997.3	RESPIR COMPLICATIONS NEC
428.33	AC ON CHR DIASTL HT FAIL	997.4	DIGESTIVE SYST COMPL NEC
428.4	CMB SYST & DIAST HT FAIL	997.5	URINARY COMPLICATION NEC
428.40	CMB SYS/DIAS HT FAIL NOS	998.11	HEMORRHAGE COMPLIC PROC
428.41	AC COMB SYS/DIAS HT FAIL	998.2	ACC PUNCTUR/LAC-PROC NEC
428.43	AC ON CH SYS/DIA HT FAIL	998.59	POSTOPERATIV INFECTN NEC
428.9	HEART FAILURE, NOS		

Major Complications – Carotid Endarterectomy			
427.31	ATRIAL FIBRILLATION	428.41	AC COMB SYS/DIAS HT FAIL
427.89	CARDIAC DYSRYTHMIAS NEC	428.43	AC ON CH SYS/DIA HT FAIL
428.0	CONGESTIVE HEART FAILURE	428.9	HEART FAILURE, NOS
428.1	LEFT HEART FAILURE	458.2	IATROGENIC HYPOTENSION
428.2	SYSTOLIC HEART FAILURE	997.00	NERVOUS SYST COMPLIC NOS
428.20	SYSTOLC HEART FAILUR NOS	997.01	CENTRL NERV SYST COMPLIC
428.21	AC SYSTOLC HEART FAILURE	997.02	IATROGN C-VSC INFRCT/HEM
428.23	AC ON CHR SYSTOL HT FAIL	997.09	NERVOUS SYST COMPLIC NEC
428.3	DIASTOLIC HEART FAILURE	997.1	CARDIAC COMPLICATION NEC
428.30	DIASTOLC HEART FAILR NOS	997.3	RESPIR COMPLICATIONS NEC
428.31	AC DIASTOL HEART FAILURE	997.4	DIGESTIVE SYST COMPL NEC
428.33	AC ON CHR DIASTL HT FAIL	998.11	HEMORRHAGE COMPLIC PROC
428.4	CMB SYST & DIAST HT FAIL	998.2	ACC PUNCTUR/LAC-PROC NEC
428.40	CMB SYS/DIAS HT FAIL NOS	998.59	POSTOPERATIV INFECTN NEC

Major Complications – Cholecystectomy			
038	SEPTICEMIA	482.2	PNEUMONIA-H. INFLUENZAE
038.0	STREPTOCOCCAL SEPTICEMIA	482.3	PNEUMONIA-STREPTOCOCCUS
038.1	STAPHYLOCOCCL SEPTICEMIA	482.30	PNEUMONIA-STREPTOCOC NOS
038.10	STAPHLOCOCC SEPTICEM NOS	482.31	PNEUMONIA-GROUP A STREP
038.11	SEPTICEMIA-STAPH AUREUS	482.32	PNEUMONIA-GROUP B STREP
038.19	STAPHLOCOCC SEPTICEM NEC	482.39	PNEUMONIA DT STREP NEC
038.2	PNEUMOCOCCAL SEPTICEMIA	482.4	PNEUMONIA-STAPHYLOCOCCUS
038.3	SEPTICEMIA DT ANAEROBES	482.40	STAPH PNEUMONIA NOS
038.4	SEPTICEMIA GRAM-NEGS NEC	482.41	STAPH AUREUS PNEUMONIA
038.40	SEPTICEMIA GRAM-NEGS NOS	482.49	STAPH PNEUMONIA NEC
038.41	SEPTICEMIA-H. INFLUENZAE	482.8	PNEUMONIA-BACTERIA NEC
038.42	SEPTICEMIA DT E. COLI	482.81	PNEUMONIA DT ANAEROBES
038.43	SEPTICEMIA - PSEUDOMONAS	482.82	PNEUMONIA-E. COLI
038.44	SEPTICMIA DT SERRATIA	482.83	PNEUMONIA-GRM NG BAC NEC
038.49	SEPTICEMIA GRAM-NEG NEC	482.84	LEGIONNAIRES' DISEASE
038.8	OTH SPECIFIED SEPTICEMIA	482.89	PNEUMONIA-BACTERIA NEC
038.9	UNSPECIFIED SEPTICEMIA	482.9	BACTERIAL PNEUMONIA, NOS
427.31	ATRIAL FIBRILLATION	483	PNEUMONIA-OTHER ORGANISM
427.89	CARDIAC DYSRYTHMIAS NEC	483.0	PNEUMONIA-M. PNEUMONIAE
428.0	CONGESTIVE HEART FAILURE	483.1	PNEUMONIA DT CHLAMYDIA
428.1	LEFT HEART FAILURE	483.8	PNEUMONIA DT ORGANSM NEC
428.2	SYSTOLIC HEART FAILURE	484	PNEUMONIA-OTH INFECT DIS
428.20	SYSTOLC HEART FAILUR NOS	484.1	PNEUMONIA-CM INCLUSN DIS
428.21	AC SYSTOLC HEART FAILURE	484.3	PNEUMONIA-WHOOPING COUGH
428.23	AC ON CHR SYSTOL HT FAIL	484.5	PNEUMONIA IN ANTHRAX
428.3	DIASTOLIC HEART FAILURE	484.6	PNEUMONIA-ASPERGILLOSIS
428.30	DIASTOLC HEART FAILR NOS	484.7	PNEUMON-SYST MYCOSES NEC
428.31	AC DIASTOL HEART FAILURE	484.8	PNEUMON IN INFCT DIS NEC
428.33	AC ON CHR DIASTL HT FAIL	485	BRONCHOPNEUM-ORGNISM NOS
428.4	CMB SYST & DIAST HT FAIL	486	PNEUMONIA-ORGANISM NOS
428.40	CMB SYS/DIAS HT FAIL NOS	511.9	PLEURAL EFFUSION, NOS
428.41	AC COMB SYS/DIAS HT FAIL	518.0	PULMONARY COLLAPSE
428.43	AC ON CH SYS/DIA HT FAIL	518.5	PULM INSUF PST TRAUM/SRG
428.9	HEART FAILURE, NOS	518.81	RESPIRATORY FAILURE
480	VIRAL PNEUMONIA	560.1	PARALYTIC ILEUS
480.0	PNEUMONIA DT ADENOVIRUS	584.9	ACUTE RENAL FAILURE, NOS
480.1	PNEUMONIA DUE TO RSV	997.1	CARDIAC COMPLICATION NEC
480.2	PNEUMON-PARAINFLUENZA VR	997.3	RESPIR COMPLICATIONS NEC
480.3	PNEUMONIA DT SARS	997.4	DIGESTIVE SYST COMPL NEC
480.8	PNEUMONIA DT VIRUS NEC	997.5	URINARY COMPLICATION NEC
480.9	VIRAL PNEUMONIA, NOS	998.11	HEMORRHAGE COMPLIC PROC
481	PNEUMOCOCCAL PNEUMONIA	998.2	ACC PUNCTUR/LAC-PROC NEC
482	OTHR BACTERIAL PNEUMONIA	998.59	POSTOPERATIV INFECTN NEC
482.0	PNEUMONIA-K. PNEUMONIAE	998.89	COMP NEC, PROCEDURE NEC
482.1	PNEUMONIA DT PSEUDOMONAS		

Major Complications – Hip Fracture Repair (ORIF)			
410.71	AMI-SUBEND INFRCT-INIT'L	482.41	STAPH AUREUS PNEUMONIA
427.31	ATRIAL FIBRILLATION	482.49	STAPH PNEUMONIA NEC
427.89	CARDIAC DYSRYTHMIAS NEC	482.8	PNEUMONIA-BACTERIA NEC
428.0	CONGESTIVE HEART FAILURE	482.81	PNEUMONIA DT ANAEROBES
428.1	LEFT HEART FAILURE	482.82	PNEUMONIA-E. COLI
428.2	SYSTOLIC HEART FAILURE	482.83	PNEUMONIA-GRM NG BAC NEC
428.20	SYSTOLC HEART FAILUR NOS	482.84	LEGIONNAIRES' DISEASE
428.21	AC SYSTOLC HEART FAILURE	482.89	PNEUMONIA-BACTERIA NEC
428.23	AC ON CHR SYSTOL HT FAIL	482.9	BACTERIAL PNEUMONIA, NOS
428.3	DIASTOLIC HEART FAILURE	483	PNEUMONIA-OTHER ORGANISM
428.30	DIASTOLC HEART FAILR NOS	483.0	PNEUMONIA-M. PNEUMONIAE
428.31	AC DIASTOL HEART FAILURE	483.1	PNEUMONIA DT CHLAMYDIA
428.33	AC ON CHR DIASTL HT FAIL	483.8	PNEUMONIA DT ORGANSM NEC
428.4	CMB SYST & DIAST HT FAIL	484	PNEUMONIA-OTH INFECT DIS
428.40	CMB SYS/DIAS HT FAIL NOS	484.1	PNEUMONIA-CM INCLUSN DIS
428.41	AC COMB SYS/DIAS HT FAIL	484.3	PNEUMONIA-WHOOPING COUGH
428.43	AC ON CH SYS/DIA HT FAIL	484.5	PNEUMONIA IN ANTHRAX
428.9	HEART FAILURE, NOS	484.6	PNEUMONIA-ASPERGILLOSIS
453.8	EMBOLI/THROMBO-VEIN NEC	484.7	PNEUMON-SYST MYCOSES NEC
480	VIRAL PNEUMONIA	484.8	PNEUMON IN INFCT DIS NEC
480.0	PNEUMONIA DT ADENOVIRUS	485	BRONCHOPNEUM-ORGNISM NOS
480.1	PNEUMONIA DUE TO RSV	486	PNEUMONIA-ORGANISM NOS
480.2	PNEUMON-PARAINFLUENZA VR	507.0	PNEUMONIT-INH FOOD/VOMIT
480.3	PNEUMONIA DT SARS	518.0	PULMONARY COLLAPSE
480.8	PNEUMONIA DT VIRUS NEC	518.5	PULM INSUF PST TRAUM/SRG
480.9	VIRAL PNEUMONIA, NOS	518.81	RESPIRATORY FAILURE
481	PNEUMOCOCCAL PNEUMONIA	560.1	PARALYTIC ILEUS
482	OTHR BACTERIAL PNEUMONIA	584.9	ACUTE RENAL FAILURE, NOS
482.0	PNEUMONIA-K. PNEUMONIAE	593.9	KIDNEY & URETER DIS NOS
482.1	PNEUMONIA DT PSEUDOMONAS	996.4	MECH COMPL-INT ORTHO DEV
482.2	PNEUMONIA-H. INFLUENZAE	996.77	COMP NEC-INTRN JT PROSTH
482.3	PNEUMONIA-STREPTOCOCCUS	996.78	COMP NEC-ORTHOPD DEV NEC
482.30	PNEUMONIA-STREPTOCOC NOS	997.02	IATROGN C-VSC INFRCT/HEM
482.31	PNEUMONIA-GROUP A STREP	997.1	CARDIAC COMPLICATION NEC
482.32	PNEUMONIA-GROUP B STREP	997.3	RESPIR COMPLICATIONS NEC
482.39	PNEUMONIA DT STREP NEC	998.11	HEMORRHAGE COMPLIC PROC
482.4	PNEUMONIA-STAPHYLOCOCCUS	998.59	POSTOPERATIV INFECTN NEC
482.40	STAPH PNEUMONIA NOS	998.89	COMP NEC, PROCEDURE NEC

Major Complications – Partial Hip Replacement			
292.81	DRUG-INDUCED DELIRIUM	482.40	STAPH PNEUMONIA NOS
293.0	ACUTE DELIRIUM 4	482.41	STAPH AUREUS PNEUMONIA
410.71	AMI-SUBEND INFRCT-INIT'L	482.49	STAPH PNEUMONIA NEC
427.31	ATRIAL FIBRILLATION	482.8	PNEUMONIA-BACTERIA NEC
427.89	CARDIAC DYSRYTHMIAS NEC	482.81	PNEUMONIA DT ANAEROBES
428.0	CONGESTIVE HEART FAILURE	482.82	PNEUMONIA-E. COLI
428.1	LEFT HEART FAILURE	482.83	PNEUMONIA-GRM NG BAC NEC
428.2	SYSTOLIC HEART FAILURE	482.84	LEGIONNAIRES' DISEASE
428.20	SYSTOLC HEART FAILUR NOS	482.89	PNEUMONIA-BACTERIA NEC
428.21	AC SYSTOLC HEART FAILURE	482.9	BACTERIAL PNEUMONIA, NOS
428.23	AC ON CHR SYSTOL HT FAIL	483	PNEUMONIA-OTHER ORGANISM
428.3	DIASTOLIC HEART FAILURE	483.0	PNEUMONIA-M. PNEUMONIAE
428.30	DIASTOLC HEART FAILR NOS	483.1	PNEUMONIA DT CHLAMYDIA
428.31	AC DIASTOL HEART FAILURE	483.8	PNEUMONIA DT ORGANSM NEC
428.33	AC ON CHR DIASTL HT FAIL	484	PNEUMONIA-OTH INFECT DIS
428.4	CMB SYST & DIAST HT FAIL	484.1	PNEUMONIA-CM INCLUSN DIS
428.40	CMB SYS/DIAS HT FAIL NOS	484.3	PNEUMONIA-WHOOPING COUGH
428.41	AC COMB SYS/DIAS HT FAIL	484.5	PNEUMONIA IN ANTHRAX
428.43	AC ON CH SYS/DIA HT FAIL	484.6	PNEUMONIA-ASPERGILLOSIS
428.9	HEART FAILURE, NOS	484.7	PNEUMON-SYST MYCOSES NEC
453.8	EMBOLI/THROMBO-VEIN NEC	484.8	PNEUMON IN INFCT DIS NEC
480	VIRAL PNEUMONIA	485	BRONCHOPNEUM-ORGNISM NOS
480.0	PNEUMONIA DT ADENOVIRUS	486	PNEUMONIA-ORGANISM NOS
480.1	PNEUMONIA DUE TO RSV	507.0	PNEUMONIT-INH FOOD/VOMIT
480.2	PNEUMON-PARAINFLUENZA VR	518.0	PULMONARY COLLAPSE
480.3	PNEUMONIA DT SARS	518.5	PULM INSUF PST TRAUM/SRG
480.8	PNEUMONIA DT VIRUS NEC	518.81	RESPIRATORY FAILURE
480.9	VIRAL PNEUMONIA, NOS	560.1	PARALYTIC ILEUS
481	PNEUMOCOCCAL PNEUMONIA	584.9	ACUTE RENAL FAILURE, NOS
482	OTHR BACTERIAL PNEUMONIA	593.9	KIDNEY & URETER DIS NOS
482.0	PNEUMONIA-K. PNEUMONIAE	996.4	MECH COMPL-INT ORTHO DEV
482.1	PNEUMONIA DT PSEUDOMONAS	996.77	COMP NEC-INTRN JT PROSTH
482.2	PNEUMONIA-H. INFLUENZAE	996.78	COMP NEC-ORTHOPD DEV NEC
482.3	PNEUMONIA-STREPTOCOCCUS	997.02	IATROGN C-VSC INFRCT/HEM
482.30	PNEUMONIA-STREPTOCOC NOS	997.1	CARDIAC COMPLICATION NEC
482.31	PNEUMONIA-GROUP A STREP	997.3	RESPIR COMPLICATIONS NEC
482.32	PNEUMONIA-GROUP B STREP	998.11	HEMORRHAGE COMPLIC PROC
482.39	PNEUMONIA DT STREP NEC	998.59	POSTOPERATIV INFECTN NEC
482.4	PNEUMONIA-STAPHYLOCOCCUS	998.89	COMP NEC, PROCEDURE NEC

Major Complications – Peripheral Vascular Bypass			
038	SEPTICEMIA	481	PNEUMOCOCCAL PNEUMONIA
038.0	STREPTOCOCCAL SEPTICEMIA	482	OTHR BACTERIAL PNEUMONIA
038.1	STAPHYLOCOCCL SEPTICEMIA	482.0	PNEUMONIA-K. PNEUMONIAE
038.10	STAPHLOCOCC SEPTICEM NOS	482.1	PNEUMONIA DT PSEUDOMONAS
038.11	SEPTICEMIA-STAPH AUREUS	482.2	PNEUMONIA-H. INFLUENZAE
038.19	STAPHLOCOCC SEPTICEM NEC	482.3	PNEUMONIA-STREPTOCOCCUS
038.2	PNEUMOCOCCAL SEPTICEMIA	482.30	PNEUMONIA-STREPTOCOC NOS
038.3	SEPTICEMIA DT ANAEROBES	482.31	PNEUMONIA-GROUP A STREP
038.4	SEPTICEMIA GRAM-NEGS NEC	482.32	PNEUMONIA-GROUP B STREP
038.40	SEPTICEMIA GRAM-NEGS NOS	482.39	PNEUMONIA DT STREP NEC
038.41	SEPTICEMIA-H. INFLUENZAE	482.4	PNEUMONIA-STAPHYLOCOCCUS
038.42	SEPTICEMIA DT E. COLI	482.40	STAPH PNEUMONIA NOS
038.43	SEPTICEMIA - PSEUDOMONAS	482.41	STAPH AUREUS PNEUMONIA
038.44	SEPTICMIA DT SERRATIA	482.49	STAPH PNEUMONIA NEC
038.49	SEPTICEMIA GRAM-NEG NEC	482.8	PNEUMONIA-BACTERIA NEC
038.8	OTH SPECIFIED SEPTICEMIA	482.81	PNEUMONIA DT ANAEROBES
038.9	UNSPECIFIED SEPTICEMIA	482.82	PNEUMONIA-E. COLI
041.04	BACTR INF DT GRP D STREP	482.83	PNEUMONIA-GRM NG BAC NEC
041.11	BACTERL INF DT S. AUREUS	482.84	LEGIONNAIRES' DISEASE
041.7	PSEUDOMONAS IN OTHER DIS	482.89	PNEUMONIA-BACTERIA NEC
427.31	ATRIAL FIBRILLATION	482.9	BACTERIAL PNEUMONIA, NOS
427.89	CARDIAC DYSRYTHMIAS NEC	483	PNEUMONIA-OTHER ORGANISM
428.0	CONGESTIVE HEART FAILURE	483.0	PNEUMONIA-M. PNEUMONIAE
428.1	LEFT HEART FAILURE	483.1	PNEUMONIA DT CHLAMYDIA
428.2	SYSTOLIC HEART FAILURE	483.8	PNEUMONIA DT ORGANSM NEC
428.20	SYSTOLC HEART FAILUR NOS	484	PNEUMONIA-OTH INFECT DIS
428.21	AC SYSTOLC HEART FAILURE	484.1	PNEUMONIA-CM INCLUSN DIS
428.23	AC ON CHR SYSTOL HT FAIL	484.3	PNEUMONIA-WHOOPING COUGH
428.3	DIASTOLIC HEART FAILURE	484.5	PNEUMONIA IN ANTHRAX
428.30	DIASTOLC HEART FAILR NOS	484.6	PNEUMONIA-ASPERGILLOSIS
428.31	AC DIASTOL HEART FAILURE	484.7	PNEUMON-SYST MYCOSES NEC
428.33	AC ON CHR DIASTL HT FAIL	484.8	PNEUMON IN INFCT DIS NEC
428.4	CMB SYST & DIAST HT FAIL	485	BRONCHOPNEUM-ORGNISM NOS
428.40	CMB SYS/DIAS HT FAIL NOS	486	PNEUMONIA-ORGANISM NOS
428.41	AC COMB SYS/DIAS HT FAIL	518.5	PULM INSUF PST TRAUM/SRG
428.43	AC ON CH SYS/DIA HT FAIL	584.9	ACUTE RENAL FAILURE, NOS
428.9	HEART FAILURE, NOS	593.9	KIDNEY & URETER DIS NOS
480	VIRAL PNEUMONIA	996.74	COMP NEC-VASC DEV/GRAFT
480.0	PNEUMONIA DT ADENOVIRUS	997.1	CARDIAC COMPLICATION NEC
480.1	PNEUMONIA DUE TO RSV	997.3	RESPIR COMPLICATIONS NEC
480.2	PNEUMON-PARAINFLUENZA VR	998.11	HEMORRHAGE COMPLIC PROC
480.3	PNEUMONIA DT SARS	998.2	ACC PUNCTUR/LAC-PROC NEC
480.8	PNEUMONIA DT VIRUS NEC	998.59	POSTOPERATIV INFECTN NEC
480.9	VIRAL PNEUMONIA, NOS		

Major Complications – Prostatectomy			
427.31	ATRIAL FIBRILLATION	428.4	CMB SYST & DIAST HT FAIL
427.89	CARDIAC DYSRYTHMIAS NEC	428.40	CMB SYS/DIAS HT FAIL NOS
428.0	CONGESTIVE HEART FAILURE	428.41	AC COMB SYS/DIAS HT FAIL
428.1	LEFT HEART FAILURE	428.43	AC ON CH SYS/DIA HT FAIL
428.2	SYSTOLIC HEART FAILURE	428.9	HEART FAILURE, NOS
428.20	SYSTOLC HEART FAILUR NOS	518.5	PULM INSUF PST TRAUM/SRG
428.21	AC SYSTOLC HEART FAILURE	560.1	PARALYTIC ILEUS
428.23	AC ON CHR SYSTOL HT FAIL	584.9	ACUTE RENAL FAILURE, NOS
428.3	DIASTOLIC HEART FAILURE	997.1	CARDIAC COMPLICATION NEC
428.30	DIASTOLC HEART FAILR NOS	997.4	DIGESTIVE SYST COMPL NEC
428.31	AC DIASTOL HEART FAILURE	997.5	URINARY COMPLICATION NEC
428.33	AC ON CHR DIASTL HT FAIL	998.11	HEMORRHAGE COMPLIC PROC

Major Complications – Total Hip Replacement			
427.31	ATRIAL FIBRILLATION	453.8	EMBOLI/THROMBO-VEIN NEC
428.0	CONGESTIVE HEART FAILURE	518.0	PULMONARY COLLAPSE
428.1	LEFT HEART FAILURE	518.5	PULM INSUF PST TRAUM/SRG
428.2	SYSTOLIC HEART FAILURE	560.1	PARALYTIC ILEUS
428.20	SYSTOLC HEART FAILUR NOS	593.9	KIDNEY & URETER DIS NOS
428.21	AC SYSTOLC HEART FAILURE	996.4	MECH COMPL-INT ORTHO DEV
428.23	AC ON CHR SYSTOL HT FAIL	996.77	COMP NEC-INTRN JT PROSTH
428.3	DIASTOLIC HEART FAILURE	996.78	COMP NEC-ORTHOPD DEV NEC
428.30	DIASTOLC HEART FAILR NOS	997.1	CARDIAC COMPLICATION NEC
428.31	AC DIASTOL HEART FAILURE	997.3	RESPIR COMPLICATIONS NEC
428.33	AC ON CHR DIASTL HT FAIL	997.4	DIGESTIVE SYST COMPL NEC
428.4	CMB SYST & DIAST HT FAIL	997.5	URINARY COMPLICATION NEC
428.40	CMB SYS/DIAS HT FAIL NOS	998.11	HEMORRHAGE COMPLIC PROC
428.41	AC COMB SYS/DIAS HT FAIL	998.59	POSTOPERATIV INFECTN NEC
428.43	AC ON CH SYS/DIA HT FAIL	998.89	COMP NEC, PROCEDURE NEC
428.9	HEART FAILURE, NOS		

Major Complications – Total Knee Replacement			
427.31	ATRIAL FIBRILLATION	428.43	AC ON CH SYS/DIA HT FAIL
427.89	CARDIAC DYSRYTHMIAS NEC	428.9	HEART FAILURE, NOS
428.0	CONGESTIVE HEART FAILURE	453.8	EMBOLI/THROMBO-VEIN NEC
428.1	LEFT HEART FAILURE	518.0	PULMONARY COLLAPSE
428.2	SYSTOLIC HEART FAILURE	518.5	PULM INSUF PST TRAUM/SRG
428.20	SYSTOLC HEART FAILUR NOS	593.9	KIDNEY & URETER DIS NOS
428.21	AC SYSTOLC HEART FAILURE	996.4	MECH COMPL-INT ORTHO DEV
428.23	AC ON CHR SYSTOL HT FAIL	996.77	COMP NEC-INTRN JT PROSTH
428.3	DIASTOLIC HEART FAILURE	996.78	COMP NEC-ORTHOPD DEV NEC
428.30	DIASTOLC HEART FAILR NOS	997.1	CARDIAC COMPLICATION NEC
428.31	AC DIASTOL HEART FAILURE	997.3	RESPIR COMPLICATIONS NEC
428.33	AC ON CHR DIASTL HT FAIL	997.4	DIGESTIVE SYST COMPL NEC
428.4	CMB SYST & DIAST HT FAIL	998.11	HEMORRHAGE COMPLIC PROC
428.40	CMB SYS/DIAS HT FAIL NOS	998.59	POSTOPERATIV INFECTN NEC
428.41	AC COMB SYS/DIAS HT FAIL	998.89	COMP NEC, PROCEDURE NEC

EXHIBIT D

Top Five Risk Factors by Procedure or Diagnosis

Proc = Procedure Code
Diag = Diagnosis Code

Aspiration Pneumonia		
Diag	427.5	CARDIAC ARREST
Diag	436	AC/ILL-DEF CERBROVSC DIS
Diag	518.81	RESPIRATORY FAILURE
Diag	518.82	OTH PULMONARY INSUFF NEC
Diag	785.59	SHOCK NEC-NO MENT TRAUMA
Atrial Fibrillation		
Diag	276.5	VOLUME DEPLETION
Diag	458.9	HYPOTENSION, UNSPECIFIED
Diag	584.9	ACUTE RENAL FAILURE, NOS
Diag	780.39	OTHER CONVULSIONS
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
Back and Neck Surgery (Except Spinal Fusion)		
Diag	276.1	HYPOSMOLALITY/NATREMIA
Diag	276.8	HYPOPOTASSEMIA
Diag	428.0	CONGESTIVE HEART FAILURE
Diag	724.02	SPINAL STENOSIS-LUMBAR
Diag	600, 600.0, 600.2, 600.20, 600.21, 600.3, 600.9, 600.90, 600.91	HYPERPLASIA OF PROSTATE
Back and Neck Surgery (Spinal Fusion)		
Diag	276.5	VOLUME DEPLETION
Proc	81.04	ANT DORSAL/DORSOLUMB FUS
Proc	81.05	POST DORSL/DORSOLUMB FUS
Proc	81.06	ANTERIOR LUMBAR/L-S FUSN
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

Bowel Obstruction	
Diag 276.2	ACIDOSIS
Diag 518.5	PULM INSUF PST TRAUM/SRG
Diag 518.81	RESPIRATORY FAILURE
Diag 557.0	AC VASC INSUFF-INTESTINE
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
Carotid Endarterectomy	
Diag 276.8	HYPOPOTASSEMIA
Diag 424.0	MITRAL VALVE DISORDERS
Diag 424.1	AORTIC VALVE DISORDERS
Diag 780.39	OTHER CONVULSIONS
Diag 403.11, 403.91	NON-MALIGNANT RENAL DISEASE WITH FAILURE
Cholecystectomy	
Proc 51.21	OTH PART CHOLECYSTECTOMY
Proc 51.22	CHOLECYSTECTOMY
Diag 518.81	RESPIRATORY FAILURE
Diag 576.8	BILIARY TRACT DISORD NEC
Diag 584.9	ACUTE RENAL FAILURE, NOS
Chronic Obstructive Pulmonary Disease (COPD)	
Diag 162.9	MAL NEOPLASM OF LUNG NOS
Diag 518.81	RESPIRATORY FAILURE
Diag 584.9	ACUTE RENAL FAILURE, NOS
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
Community Acquired Pneumonia	
Diag 162.9	MAL NEOPLASM OF LUNG NOS
Diag 276.2	ACIDOSIS
Diag 518.81	RESPIRATORY FAILURE
Diag 584.9	ACUTE RENAL FAILURE, NOS
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

Coronary Bypass Surgery	
Proc 37.61	IMPLANT PULSATN BALLOON
Diag 518.81	RESPIRATORY FAILURE
Diag 584.5	AC REN FAIL-LES TUBL NEC
Diag 584.9	ACUTE RENAL FAILURE, NOS
Diag 785.51	CARDIOGENIC SHOCK
Coronary Interventional Procedures	
Diag 410.11	AMI-ANT WALL NEC-INITIAL
Diag 410.91	AMI-SITE NOS-INITIAL EPI
Diag 518.81	RESPIRATORY FAILURE
Diag 584.9	ACUTE RENAL FAILURE, NOS
Diag 785.51	CARDIOGENIC SHOCK
Gastrointestinal Bleed	
Diag 276.2	ACIDOSIS
Diag 458.9	HYPOTENSION, UNSPECIFIED
Diag 507.0	PNEUMONIT-INH FOOD/VOMIT
Diag 518.81	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
Heart Attack	
Diag 348.1	ANOXIC BRAIN DAMAGE
Diag 410.91	AMI-SITE NOS-INITIAL EPI
Diag 427.5	CARDIAC ARREST
Diag 785.51	CARDIOGENIC SHOCK
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
Heart Failure	
Diag 276.2	ACIDOSIS
Proc 37.62	IMPLNT HRT ASSIST SY NEC
Diag 458.9	HYPOTENSION, UNSPECIFIED
Diag 518.81	RESPIRATORY FAILURE
Diag 584.9	ACUTE RENAL FAILURE, NOS
Hip Fracture Repair (ORIF)	
Diag 507.0	PNEUMONIT-INH FOOD/VOMIT
Diag 518.81	RESPIRATORY FAILURE
Diag 584.9	ACUTE RENAL FAILURE, NOS
Proc 79.25	OP FX RED NO INT FIX-FEM
Proc 79.35	ORIF OF FEMORAL FRACTURE

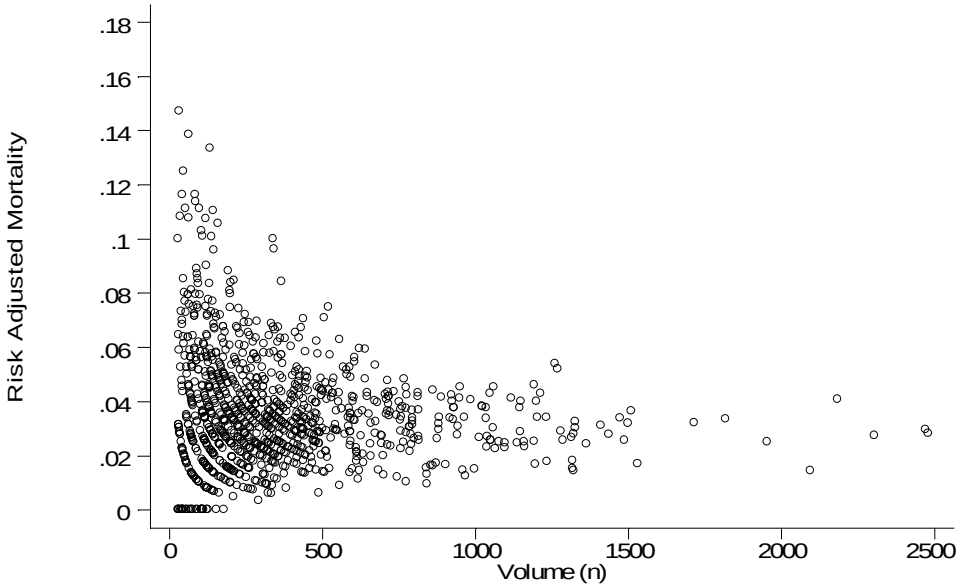
Pancreatitis	
Diag 518.81	RESPIRATORY FAILURE
Diag 038, 038.0, 038.1, 038.10, 038.11, 038.19, 038.2, 038.3, 038.4, 038.40, 038.41, 038.42, 038.43, 038.44, 038.49, 038.8, 038.9	SEPSIS
Diag 276.2	ACIDOSIS
Diag 584.9	ACUTE RENAL FAILURE, NOS
Diag 789.5	ASCITES
Partial Hip Replacement	
Diag 491.21	OBST CHR BRONCH-AC EXACR
Diag 507.0	PNEUMONIT-INH FOOD/VOMIT
Diag 518.81	RESPIRATORY FAILURE
Diag 584.9	ACUTE RENAL FAILURE, NOS
Diag 733.82	NONUNION OF FRACTURE
Peripheral Vascular Bypass	
Diag 276.5	VOLUME DEPLETION
Diag 584.9	ACUTE RENAL FAILURE, NOS
Diag 682.6	CELLULITIS/ABSCSS OF LEG
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
Prostatectomy	
Proc 60.3	SUPRAPUBIC PROSTATECTOMY
Proc 60.4	RETROPUBIC PROSTATECTOMY
Proc 60.5	RADICAL PROSTATECTOMY
Proc 60.62	PERINEAL PROSTATECTOMY
Proc 60.69	OTHER PROSTATECTOMY
Pulmonary Embolism	
Diag 276.2	ACIDOSIS
Diag 427.5	CARDIAC ARREST
Diag 458.9	HYPOTENSION, UNSPECIFIED
Diag 518.81	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

Resection/Replacement of Abdominal Aorta	
Diag 441.3	ABDOMINAL ANEURYSM-RUPTR
Diag 557.0	AC VASC INSUFF-INTESTINE
Diag 584.9	ACUTE RENAL FAILURE, NOS
Diag 584.5	AC REN FAIL-LES TUBL NEC
Diag 785.59	SHOCK NEC-NO MENT TRAUMA
Sepsis	
Diag 197.7	2NDRY MAL NEOPLASM-LIVER
Diag 276.2	ACIDOSIS
Diag 427.5	CARDIAC ARREST
Diag 518.81	RESPIRATORY FAILURE
Diag 785.59	SHOCK NEC-NO MENT TRAUMA
Stroke	
Diag 430	SUBARACHNOID HEMORRHAGE
Diag 431	INTRACEREBRAL HEMORRHAGE
Diag 518.81	RESPIRATORY FAILURE
Diag 780.01	COMA
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
Total Hip Replacement	
Diag 276.1	HYPOSMOLALITY/NATREMIA
Diag 276.5	VOLUME DEPLETION
Diag 276.8	HYPOPOTASSEMIA
Diag 427.89	CARDIAC DYSRYTHMIAS NEC
Proc 81.51	TOTAL HIP REPLACEMENT
Total Knee Replacement	
Diag 276.1	HYPOSMOLALITY/NATREMIA
Diag 276.8	HYPOPOTASSEMIA
Diag 424.1	AORTIC VALVE DISORDERS
Diag 496	CHR AIRWAY OBSTRUCT NEC
Proc 81.54	TOTAL KNEE REPLACEMENT
Valve Replacement Surgery	
Diag 286.9	COAGULATN DEFECT NEC/NOS
Proc 35.20	REPLACE HEART VALVE NOS
Diag 584.5	AC REN FAIL-LES TUBL NEC
Diag 584.9	ACUTE RENAL FAILURE, NOS
Diag 785.51	CARDIOGENIC SHOCK

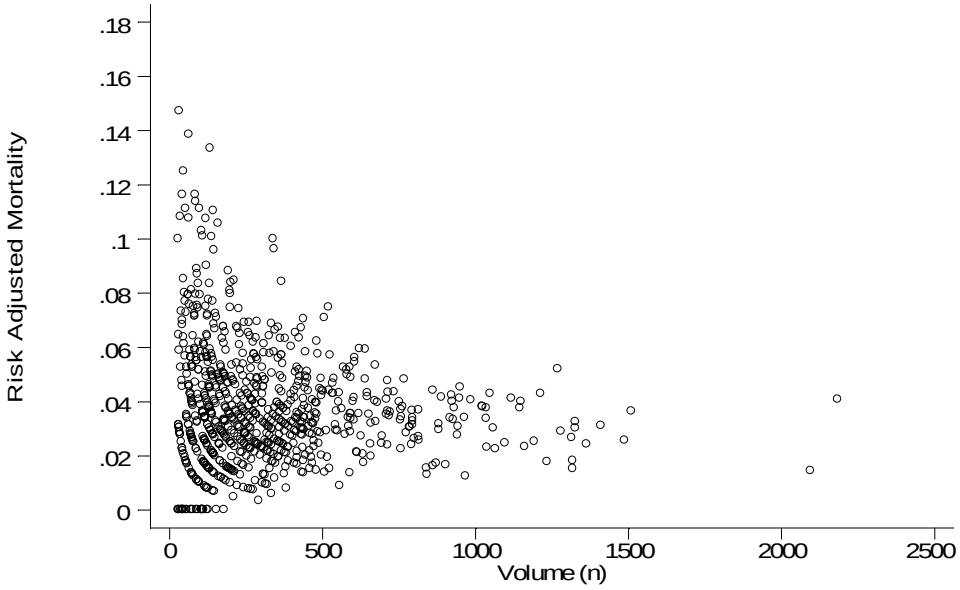
EXHIBIT E

Risk Adjusted Mortality Rates vs. Hospital Volume

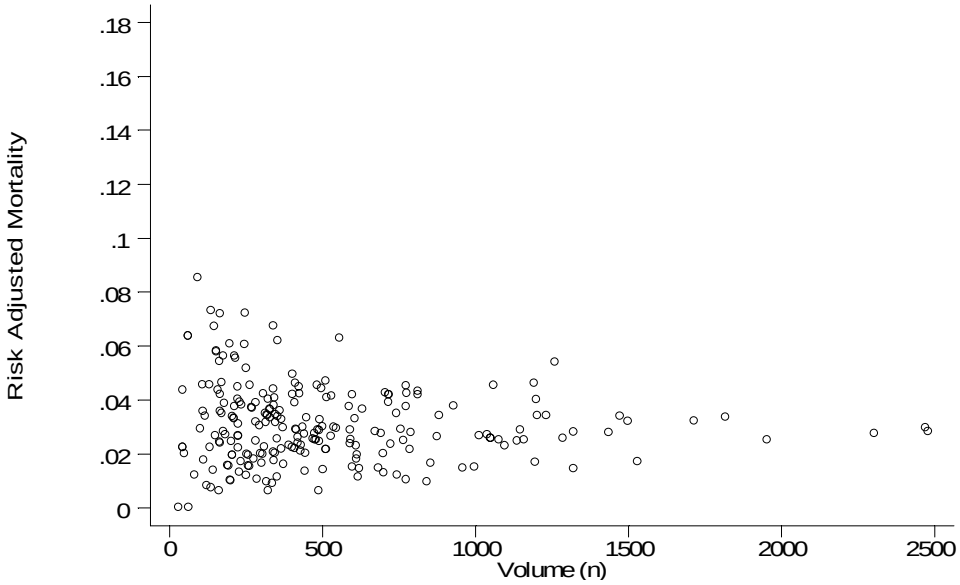
Coronary Bypass Surgery—All Hospitals



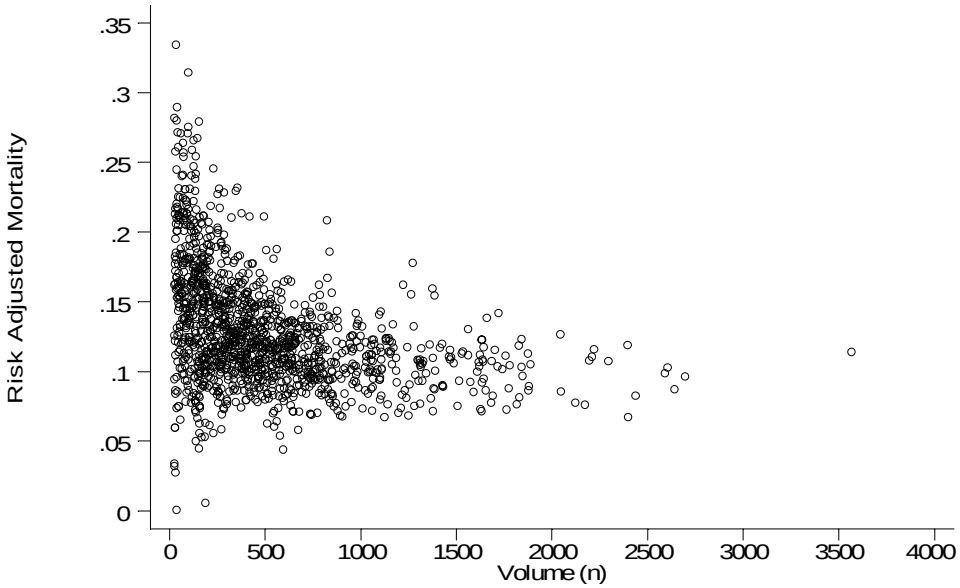
Coronary Bypass Surgery—Non-DHP Hospitals



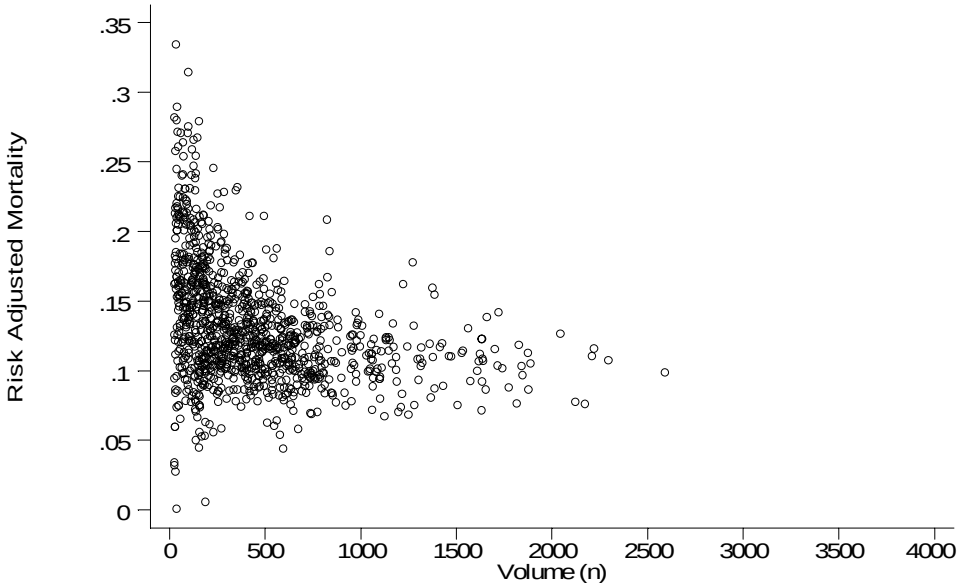
Coronary Bypass Surgery—DHP Hospitals



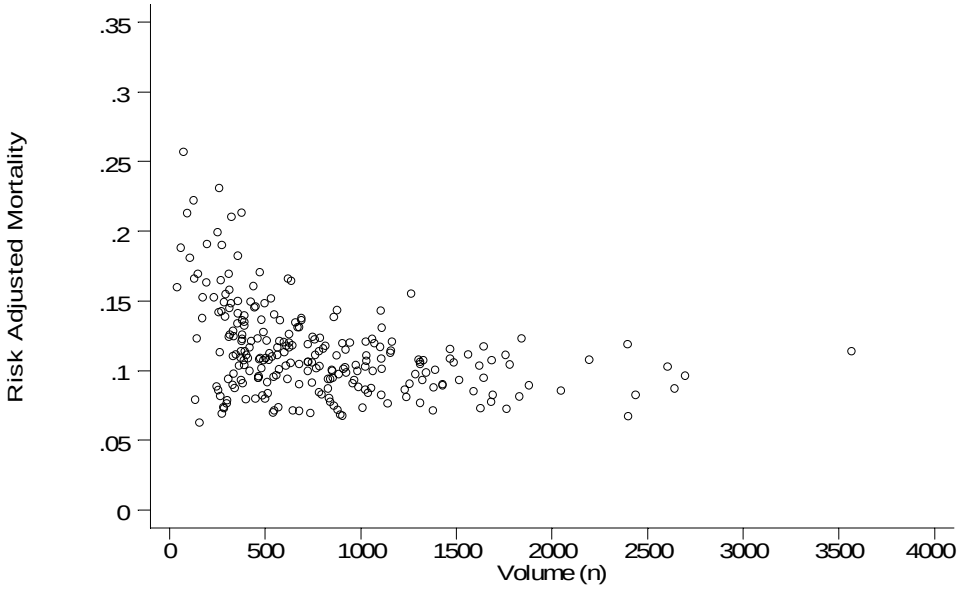
Acute Myocardial Infarction—All Hospitals



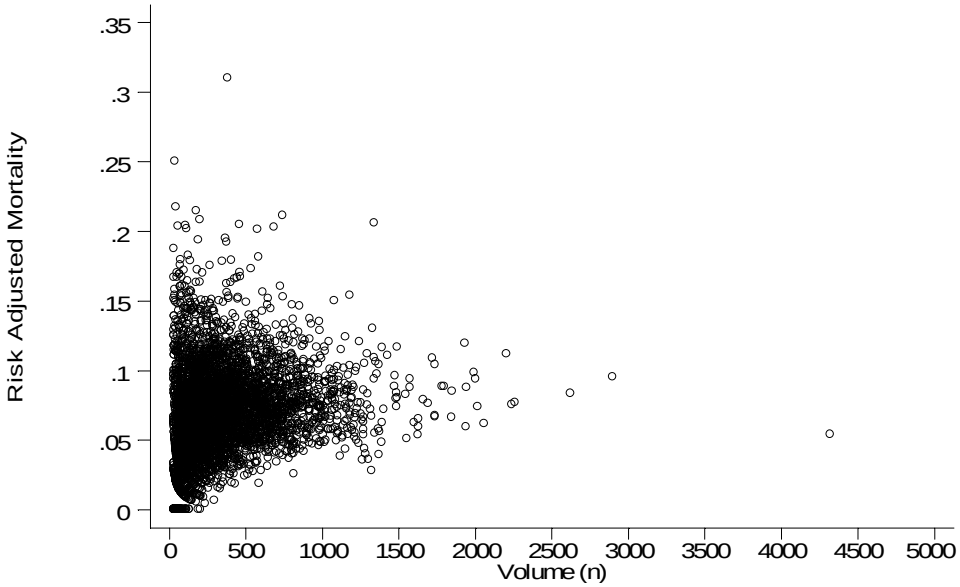
Acute Myocardial Infarction—Non-DHP Hospitals



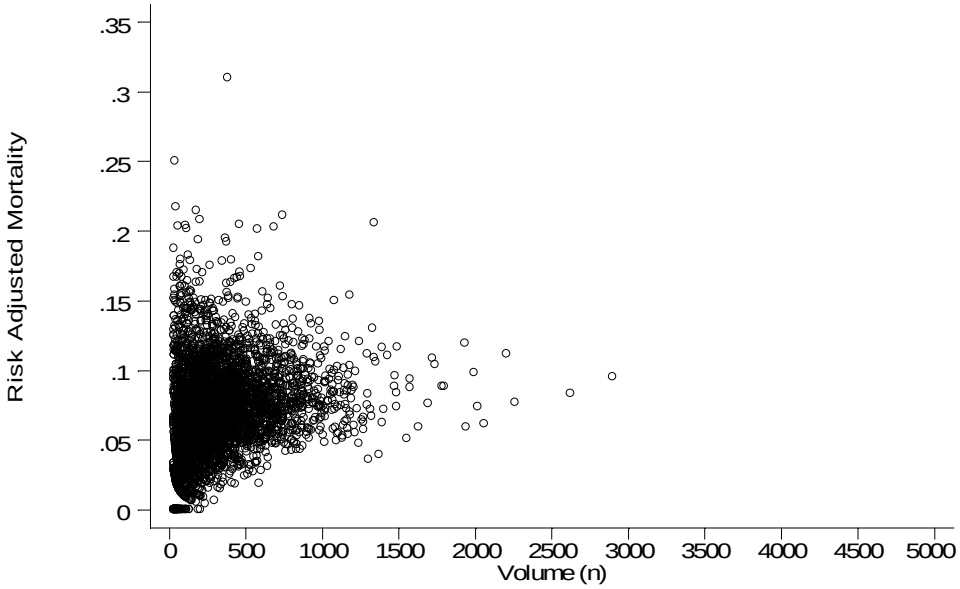
Acute Myocardial Infarction—DHP Hospitals



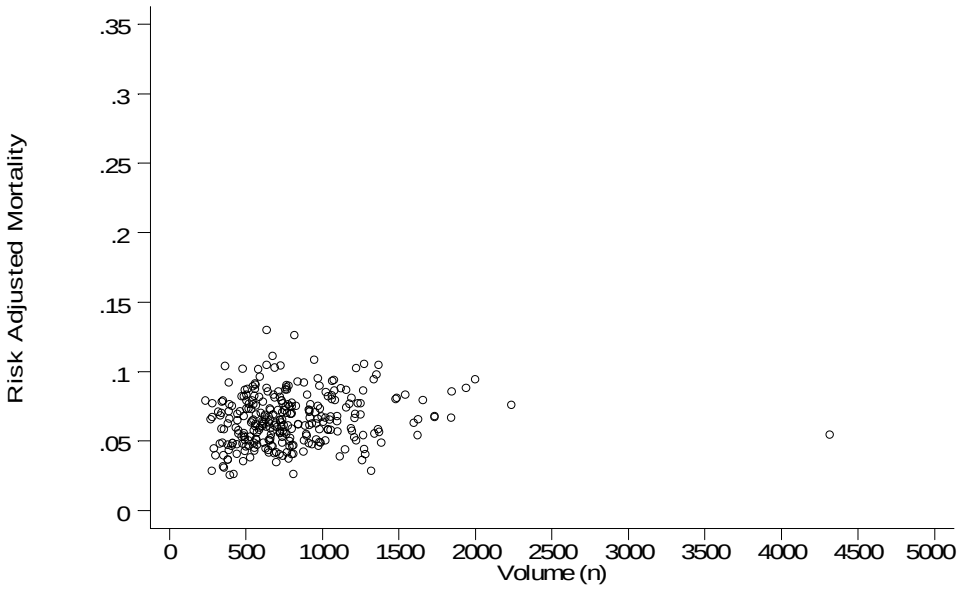
Community Acquired Pneumonia—All Hospitals



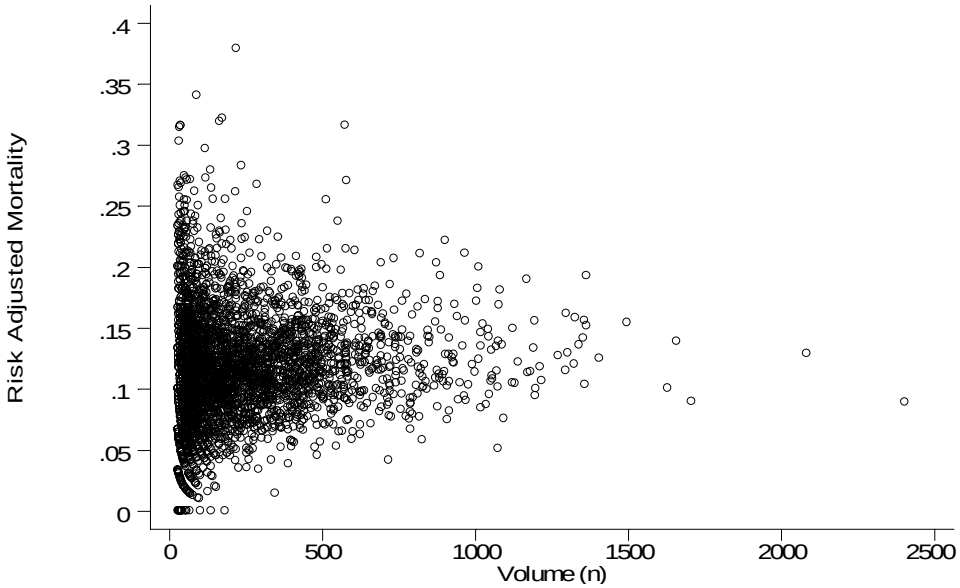
Community Acquired Pneumonia—Non-DHP Hospitals



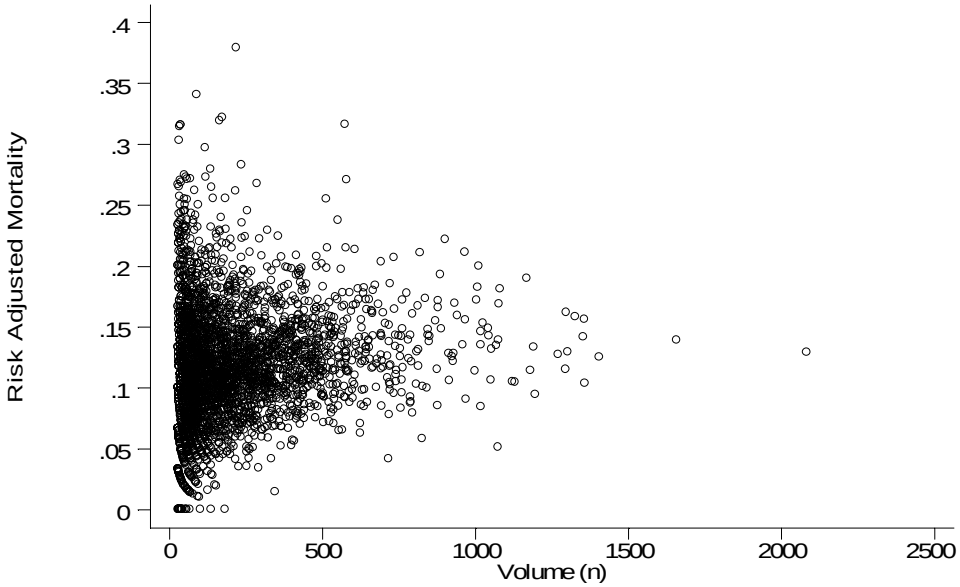
Community Acquired Pneumonia—DHP Hospitals



Stroke—All Hospitals



Stroke—Non-DHP Hospitals



Stroke—DHP Hospitals