

Healthgrades 2015 Report to the Nation: Making Smart Choices

In healthcare, obtaining access to and using information to make a decision on where to receive care can be the difference between life and death; or a smooth recovery versus a lengthy one. For hospital leaders, information may be the difference between keeping a hospital's services available and accessible versus limiting service and care options.

Whether personal or operational, choices made through informed decision making can lead to better outcomes.

Healthgrades has provided analysis and access to objective, measurable data to inform decision making since 1998. This year, we further empower decision making by adding new capabilities that physicians themselves¹ say is important to receiving the best care: the experience a physician has in the specific procedure being provided, the quality of the hospital for the specific procedure being performed, and the experience other patients have had with the doctor and his or her staff.

Despite the continued drive to provide evidence-based clinical care, Healthgrades 2015 analysis shows there remains a performance gap among hospitals. The data indicates that wide variation in clinical outcomes for the same procedures and conditions at different hospitals persist at national and local levels. The implication is that consumers and physicians can't just assume the hospital down the street is the best choice for their procedure.

In addition, this year's analysis provides more insight on the connection between quality improvement and the cost of care, ultimately impacting patient access and care options.

Healthgrades 2015 Report to the Nation contributes more evidence that reveals focusing on quality improvement can improve not only patient outcomes, but also a hospital's bottom line. Hospital leaders committed to improving their organization's financial health can look to this year's annual report for data-driven insights on where to focus quality improvement efforts to impact both clinical and financial performance.

Buyer Beware:

Hospitals Do Not Perform Equally

Healthgrades 2015 analysis shows that clinical outcomes continue to differ dramatically between hospitals in the top and bottom Healthgrades hospital performance categories. Patients being treated at a hospital receiving 5 stars from 2011-2013 have a **lower risk of dying** or a **lower risk of complications** during a hospital stay than if they were treated at a hospital receiving a 1-star rating in that procedure or condition. Some specific examples include:

- From 2011-2013, patients having Coronary Artery Bypass Graft (CABG) Surgery in hospitals with 5 stars for in-hospital mortality, have, on average 85.2% lower risk of dying than if they were treated in hospitals with 1 star for in-hospital mortality*



Healthgrades
America's Best Hospitals

From 2011-2013, if all hospitals as a group, performed similarly to hospitals receiving 5 stars as a group, on average:



228,426 lives
could have potentially been saved*

169,298
complications
could potentially have been avoided*

*Statistics are based on Healthgrades analysis of MedPAR data for years 2011 through 2013 and represent 3-year estimates for Medicare patients only.

HOSPITAL PERFORMANCE CATEGORIES

Healthgrades groups hospital performance into three performance categories:

★★★★★ **5 stars**

Clinical outcomes are statistically significantly
better than expected

★★★ **3 stars**

Clinical outcomes are
as expected

★ **1 star**

Clinical outcomes are statistically significantly
worse than expected

From 2011-2013, patients having Total Knee Replacement Surgery in hospitals with 5 stars have, on average:

- 63.8% lower risk of experiencing a complication while in the hospital than if they were treated by hospitals with 1 star.*

*Statistics are based on Healthgrades analysis of MedPAR data for years 2011 through 2013 and represent 3-year estimates for Medicare patients only

Healthgrades 2015 quality achievement ratings evaluate hospital performance in 32 procedures and conditions—19 mortality-based cohorts and 13 complication-based cohorts (Table 3). To illustrate the differences between top and bottom hospital performance, we highlight additional findings from a subset of procedures and conditions.

Six key mortality-based procedures and conditions represent over half (51.8%) of all patient outcomes evaluated and also had the largest proportion of deaths observed (65.8%) in our study. Table 1 displays the risk difference for hospitals rated 5 stars and 1 star for these six key cohorts ranged from 42.1% to 81.1%.

Table 1. Difference in Risk of Mortality Between Hospitals Receiving 5 Stars Versus 1 Star

Mortality-Based Cohort	5-Star Versus 1-Star Performance	
	Average Mortality Rate	Lower Risk of Mortality
Heart Attack	5.4% vs. 10.3%	47.5%
COPD	0.6% vs. 3.1%	81.8%
Pneumonia	2.6% vs. 7.8%	67.2%
Stroke	4.5% vs. 9.9%	54.6%
Colorectal Surgeries	2.6% vs. 8.7%	70.7%
Sepsis	13.4% vs. 23.1%	42.1%

Four key complication-based conditions and procedures represent over half (51.7%) of all patients and a large proportion (40.3%) of in-hospital complications studied by Healthgrades. Table 2 shows the risk difference for hospitals rated 5 stars and 1 star for these four key cohorts ranged from 51.8% to 69.9%.

Table 2. Difference in Risk of Complication Between Hospitals Receiving 5 Stars Versus 1 Star

Complication-Based Cohort	5 Star Versus 1 Star Performance	
	Average Complication Rate	Lower Risk of Complication
Total Knee Replacement	4.2% vs. 11.5%	63.8%
Hip Replacement	3.8% vs. 12.5%	69.5%
Carotid Surgery	4.4% vs. 14.4%	69.6%
Gallbladder Removal Surgery	14.2% vs. 29.2%	51.8%

MORTALITY AND COMPLICATION COHORTS

Table 3. Mortality and Complication Cohorts

Mortality Cohorts	
<ul style="list-style-type: none"> • Bowel Obstruction • Chronic Obstructive Pulmonary Disease (COPD) • Colorectal Surgeries • Coronary Artery Bypass Graft (CABG) Surgery • Coronary Interventional Procedures • Diabetic Emergencies • Esophageal/Stomach Surgeries 	<ul style="list-style-type: none"> • Gastrointestinal Bleed • Heart Attack • Heart Failure • Neurosurgery • Pancreatitis • Pneumonia • Pulmonary Embolism • Respiratory Failure • Sepsis • Small Intestine Surgeries • Stroke • Valve Surgery
Complication Cohorts	
<ul style="list-style-type: none"> • Abdominal Aortic Aneurysm Repair • Back and Neck Surgeries (Without Spinal Fusion) • Carotid Surgery • Defibrillator Procedures • Gallbladder Removal Surgery • Hip Fracture Treatment 	<ul style="list-style-type: none"> • Hip Replacement • Pacemaker Procedures • Peripheral Vascular Bypass • Prostate Removal Surgery • Spinal Fusion • Total Knee Replacement • Transurethral Prostate Resection Surgery

Why Quality Matters



85.2% Lower Risk of Dying
Patients having Coronary Artery Bypass Graft (CABG) Surgery in hospitals with 5 stars for in-hospital mortality had a lower risk of dying than in hospitals with 1 star, from 2011-2013.



63.8% Lower Risk of Complications
Patients having Knee Replacement Surgery in hospitals with 5 stars for complications had a lower risk of complications than in hospitals with 1 star, from 2011-2013.

Complications and Mortalities Increase Costs

Healthgrades developed a third-party reviewed methodology to measure the financial impact of complications and mortality on hospitals' direct costs. We started with a convenience sample of 1.4 million patient records from 131 hospitals across 13 states. Using this sample, we analyzed the relationship between patient outcomes for 32 mortality- and complications-based conditions and procedures and direct hospital costs—what the hospital spends to care for the patient. From this analysis, we derived cost measures that show the magnitude of impact from adverse outcomes (complications and mortality) and length of stay.

Our findings show a direct correlation between adverse patient outcomes and higher direct costs frequently as a result of longer lengths of stay. Longer length of stay erodes a hospital's profit margin by increasing costs—some of which are not reimbursed—and reduces its capacity to serve additional patients.

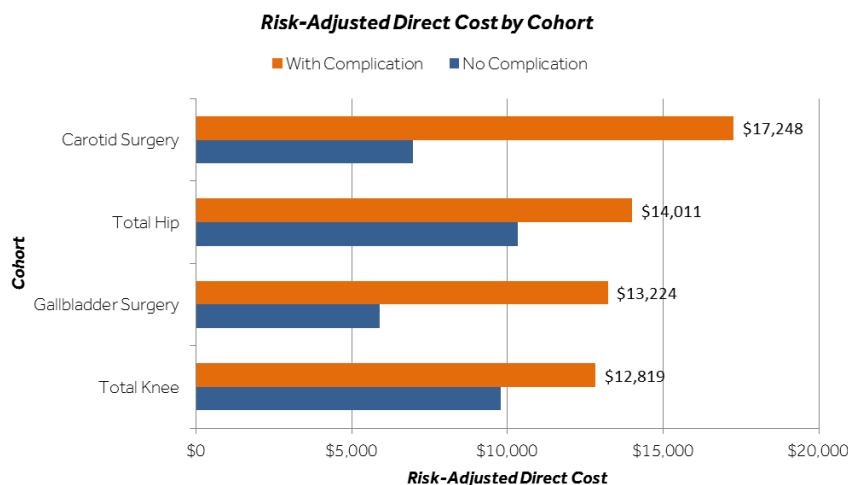
Findings from our study identified that multiple factors should be considered when evaluating areas in which hospitals should concentrate their improvement efforts.

We found that across the 131 hospitals evaluated from 2010 through 2012, complications increased the total direct cost, on average, by 80% across the four key complication-based procedures.

The range of increased direct costs for patient cases occurring with complications was 31% to 124% higher than the cost without complications. The largest difference was observed in Carotid Surgery, which had an average direct cost of \$6,969 without complications. For cases where the patient experienced one or more complications, the average cost increased to \$17,248 (Figure 1).

Complications and Length of Stay: Inherently Connected

Figure 1. Complications - Proportion of Increase on Risk-Adjusted Direct Costs Based on 2010-2012 Data from Convenience Sample of 131 Facilities



DEVELOPING A MODEL FOR LENGTH OF STAY

To understand the relationship between a patient's characteristics and the resulting length of stay, each model utilized an identical set of factors (co-morbidities, demographic factors, and procedure or condition of treatment) used to model the likelihood of experiencing a complication or death.

Given length of stay is an integer ranging from one to some unknown maximum, a different modeling strategy needed to be used. While mortality and complications fit into a logistic regression model—because at the patient level they are binary (presence or absence of outcome)—length of stay follows a more complex distribution.

Key points of Risk-Adjusted Length of Stay model:

- Removed all patients who died as their length of stay was not representative of the majority of patients.
- Removed observations with length of stay greater than 60 days. This cut off was developed from statistical outlier evaluation of each model.
- Evaluated six distribution families for model fit, which pointed to an exponential regression model.
- Developed patient-level predicted values for length of stay, which can then be used to calculate a risk-adjusted length of stay.

THE IMPACT OF COMPLICATIONS ON COST AND LENGTH OF STAY

In order to evaluate the impact specific complications have on length of stay, patients who experienced only one complication were isolated. This allowed for the calculation of a risk-adjusted length of stay by complication.

Not All Complications Impact Equally

It is intuitive that the occurrence of one or more complications may increase the length of stay and cost associated with a patient's care. However, the detail behind this natural assumption is that not all complications have the same effect on length of stay or the associated increase in cost.

For example, the Healthgrades study of length of stay suggests the complication of Cerebral Embolism with Infarction has one of the greatest impacts to length of stay in Total Knee Replacement and Hip Replacement. Patients who experience only this complication have, on average, a risk-adjusted length of stay of 6.5 and 7.0 days for knee and hip procedures, respectively. The result is a length of stay nearly three times that of a patient who did not experience any complication.

This complication occurs, on average, in less than 3% of patients who experience a complication during Hip Replacement, but the costs of even infrequent complications can be substantial. Table 4 shows the five individual complications that increased risk-adjusted length of stay the most for four key complications-based cohorts.

Depending on the rate of occurrence for a specific facility, reductions in the higher impact complications could provide opportunities for meaningful savings. Understanding the cause and any steps that could be taken to reduce the risk of complications is an actionable step for quality teams.

Similar to the direct correlation between complications and higher direct costs resulting primarily from longer length of stay, we found increased costs associated with mortality as well.

Out of Healthgrades 19 mortality-based cohorts, we found the largest increase in direct hospital cost associated with mortality in Colorectal Surgeries. A patient surviving Colorectal Surgery had, on average, a direct cost of \$10,772. When a patient having Colorectal Surgery unfortunately dies in the hospital, the hospital direct cost, on average, was \$24,346. Mortality in Colorectal Surgeries resulted in a 130% increase in direct cost (Figure 2).

Table 4. Complications and Added Risk-Adjusted Length of Stay (RA-LOS)

Complication	Added RA-LOS
Total Knee Replacement	
Intestinal Infection Due to C. Diff	3.9
Cerebral Embolism With Infarction	3.3
Iatrogenic Pulmonary Embolism With Infarction	3.1
Pulmonary Embolism and Infarction	2.9
Anterior/Lateral Wall AMI	2.8
Carotid Surgery	
Infarction of Cerebral Artery	4.9
Unspecified Cerebral Artery Occlusion With Infarction	4.5
Intestinal Infection Due to C. Diff	3.4
Cerebral Embolism With Infarction	3.2
Peripheral Vascular Complications	2.8
Hip Replacement	
Cerebral Embolism With Infarction	3.7
Intestinal Infection Due to C. Diff	3.4
Iatrogenic Pulmonary Embolism With Infarction	3.0
Digestive System Complications	2.9
AMI, Subendocardial Infarction Initial Episode of Care (IEOC)	2.6
Gallbladder Surgery	
Disruption of External Operation Wound	6.2
Peritoneal Abscess	6.1
Pulmonary Embolism and Infarction	5.9
Acute Venous Embolism and Thrombosis	5.4
Postoperative Infection	4.6

SPECIFIC COMPLICATIONS IMPACT DIRECT COSTS

Specific complications, such as Sepsis in Gallbladder Removal Surgery can increase the risk-adjusted direct cost by 130%.

Additionally, the risk-adjusted direct cost for Gallbladder Removal Surgery cases with Sepsis resulting in mortality is 390% higher than cases that do not result in mortality.

Source: Convenience sample of data from 131 hospital locations (2010-2012).

Prioritizing Where to Focus

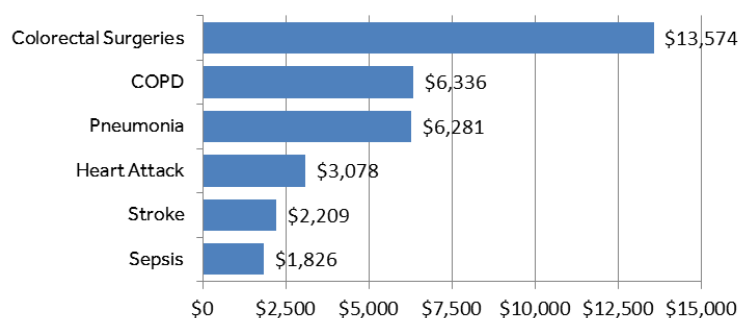
Cost x Rate x Volume = Overall Impact

An understandable approach to planning improvement efforts includes focusing solely on reducing rates of mortality and complications. However, findings from our study identified that multiple factors should be considered when evaluating areas for positive impact via an improvement in quality performance.

As shown, the largest increase in direct cost associated with mortality was seen in Colorectal Surgeries, where the risk-adjusted direct cost increased from \$10,772 to \$24,346 (a 130% increase in direct cost) if the patient, unfortunately, dies during the hospital stay (Figure 2).

In comparison, the smallest impact to direct cost from mortality was seen in Sepsis. A patient who survived a case of Sepsis had, on average, a risk-adjusted direct cost of \$10,716; while a patient who unfortunately died in the hospital had an average risk-adjusted direct cost of \$12,542. This is a 20% increase in direct cost (Figure 2).

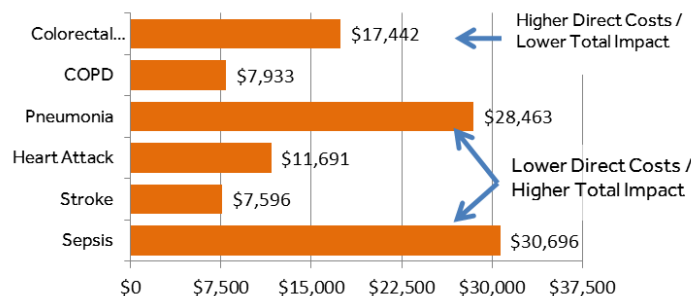
Figure 2. Average Direct Cost Increase per Mortality for Six Key Cohorts (2011-2013)*



While the effect for Sepsis seems small, its relatively high mortality rate and overall higher patient volume makes the overall improvement difference substantial.

Figure 3 shows the relative difference in cost for an average hospital performing at the 5-star level for each cohort vs. 1-star level. Because the average hospital saw nearly four times as many patients for Sepsis per year (97.8 cases) compared to Colorectal Surgeries (27.3 cases), the impact of Sepsis is substantially larger.

Figure 3. Estimated Direct Cost Increase per Year for Average Hospital for Six Key Cohorts (2011-2013)*



WHAT ARE DIRECT HOSPITAL COSTS?

The hospital direct cost is a combination of consumable goods, such as bandages, medication, non-reusable devices, needles, and IVs the hospital uses to treat a patient. It also includes a pre-determined amount for other categories, such as staff salaries, testing (MRI, CT, X-ray), and room charges.

Source: OMB Circular A-21, Section D.1 and E.1 FAR Cost principles Guide (January 2013).

WHAT ARE RISK-ADJUSTED AND MARGINAL DIRECT COSTS?

Risk-Adjusted Direct Cost

Risk-adjusted direct cost represents an estimate of cost when all other patient factors are controlled for.

Risk-adjusted direct cost is calculated using the actual patient cost and the predicted patient cost estimates for cost (when patient risk is accounted for can be calculated).

Marginal Increase in Direct Costs

The marginal increase in direct costs represents mean differences in cost as measured by the coefficient in a statistical model. For example, the presence of a complication was excluded from the model for proper risk adjustment. However, length of stay was included in the model.

Estimates for the impact of length of stay are based in the mean effect (marginal effect) of length of stay across all patients.

DEVELOPING A MODEL FOR HOSPITAL DIRECT COSTS

To understand the relationship between hospital direct costs and medical outcomes, each model utilized patients in diagnostically and procedurally similar groups or cohorts.

The resulting models suggested strong statistical fits. The Indiana Statistical Consulting Center (ISCC) independently evaluated the Healthgrades methodology for statistical validity.

*Cost estimates were derived from cost study data (2010-2012 convenience sample of 131 facilities) and applied to hospital volume and mortality outcome data available in the 2011-2013 MEDPAR data.

Which cohort, then, should a hospital focus on improving to have a benefit to all goals – inclusive of outcomes and financial improvement?

To evaluate the impact that quality improvement can have, it is important for a hospital to consider the mortality rate for the specific condition, the volume of patients seen, as well as the additional cost associated with mortality, in order to decide which cohort to focus improvement efforts on and in what order.

Determine a Plan of Action

Hospitals can make meaningful improvement to both patient outcomes and their financial performance by identifying specific areas where performance is worse than expected. Prioritizing efforts is a critical step to making the largest positive impacts to your improvement goals.

Addressing margin erosion caused by excessive complications and mortalities requires acknowledging your facility's performance and understanding the variation that exists across conditions and procedures.

The Healthgrades risk-adjusted performance model provides a readily available framework to identify improvement opportunities. Identifying the current mortality and complication rates, resulting increases in costs and the volume of cases seen for each, provides the insight needed to prioritize your quality improvement efforts for both clinical and financial benefits.

Summary

The Healthgrades 2015 report on American Hospital Quality contributes additional data to a growing set of evidence that focusing on improving quality can both improve outcomes and lower the costs associated in delivering that care.

Identifying where a hospital has variation in performance from the desired goal, in this case exceeding targeted mortality and complication rates, can provide measurable cost reduction opportunities as well as improvements in patient outcomes. The magnitude of the improvement is directly related to the number of complications involved and the increase in length of stay.

Understanding and removing sources of variation, as well as proactively reducing the risks of complications are actions quality improvement leaders can take to positively impact both patients and their organizations.

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REFERENCES

- 1 Stax Research completed for Healthgrades 2015

About Healthgrades

Nearly one million people a day use the Healthgrades family of web properties for objective, comprehensive, consistent, and credible consumer healthcare information. Since 1998, the company has provided consumers critical information at the time they need it most: when selecting a physician or hospital to care for themselves or family members.

Healthgrades consumer information includes:

- Risk-adjusted hospital quality outcomes based upon analysis of the Centers for Medicare and Medicaid Services (CMS) MedPAR data.
- Hospital readmission rates and timely and effective care measures based on the CMS Hospital Compare Report.
- Hospital patient experience metrics based on Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) data.
- Hospital patient safety performance outcomes for 13 indicators of patient safety developed by the Agency for Healthcare Research and Quality.
- Information on more than 900,000 physicians in all 50 states and the District of Columbia.

How Healthgrades Measures Hospital Performance

Every year, Healthgrades analyzes three years of Medicare Provider Analysis and Review (MedPAR) data to produce a detailed report on mortality and complication rates in America's hospitals. Healthgrades findings empower consumers to evaluate and compare hospital performance. Healthgrades analyzed approximately 40 million Medicare-patient records for nearly 4,500 short-term, acute care hospitals nationwide, assessing hospital performance relative to in-hospital common conditions and procedures.

The Healthgrades methodology uses multivariate logistic regression to adjust for patient demographic and clinical risk factors that influence patient outcomes in significant and systematic ways. Risk factors may include age, gender, specific procedure performed, and co-morbid conditions, such as high blood pressure and diabetes. Individual risk models are constructed and tailored for each of the 32 conditions or procedures relative to each specific outcome (Table 3).

Model outcomes reflect clinical-based measures of patient disposition during and after care and include in-hospital complications, or in-hospital and 30-day post-admission mortality. Detailed information regarding our methodology, data sources, inclusion and exclusion criteria, risk-adjustment model design, model statistics, and odds ratios may be found at [Healthgrades Mortality and Complications Outcomes 2015 Methodology](#).

Healthgrades groups hospital quality performance into three categories:

- **5 stars** reflect hospital performance that is statistically significantly better than expected in treating a condition or conducting a procedure, as measured by clinical outcome rates for risk-adjusted mortality and complications.
- **3 stars** reflect hospital performance that is as expected in treating a condition or conducting a procedure, as measured by clinical outcome rates for risk-adjusted mortality and complications.
- **1 star** reflects hospital performance that is statistically significantly worse than expected in treating a condition or conducting a procedure, as measured by clinical outcome rates for risk-adjusted mortality and complications.

Detailed performance information, such as cohort-specific outcomes data and quality achievements for individual hospitals may be found at www.healthgrades.com/find-a-hospital.