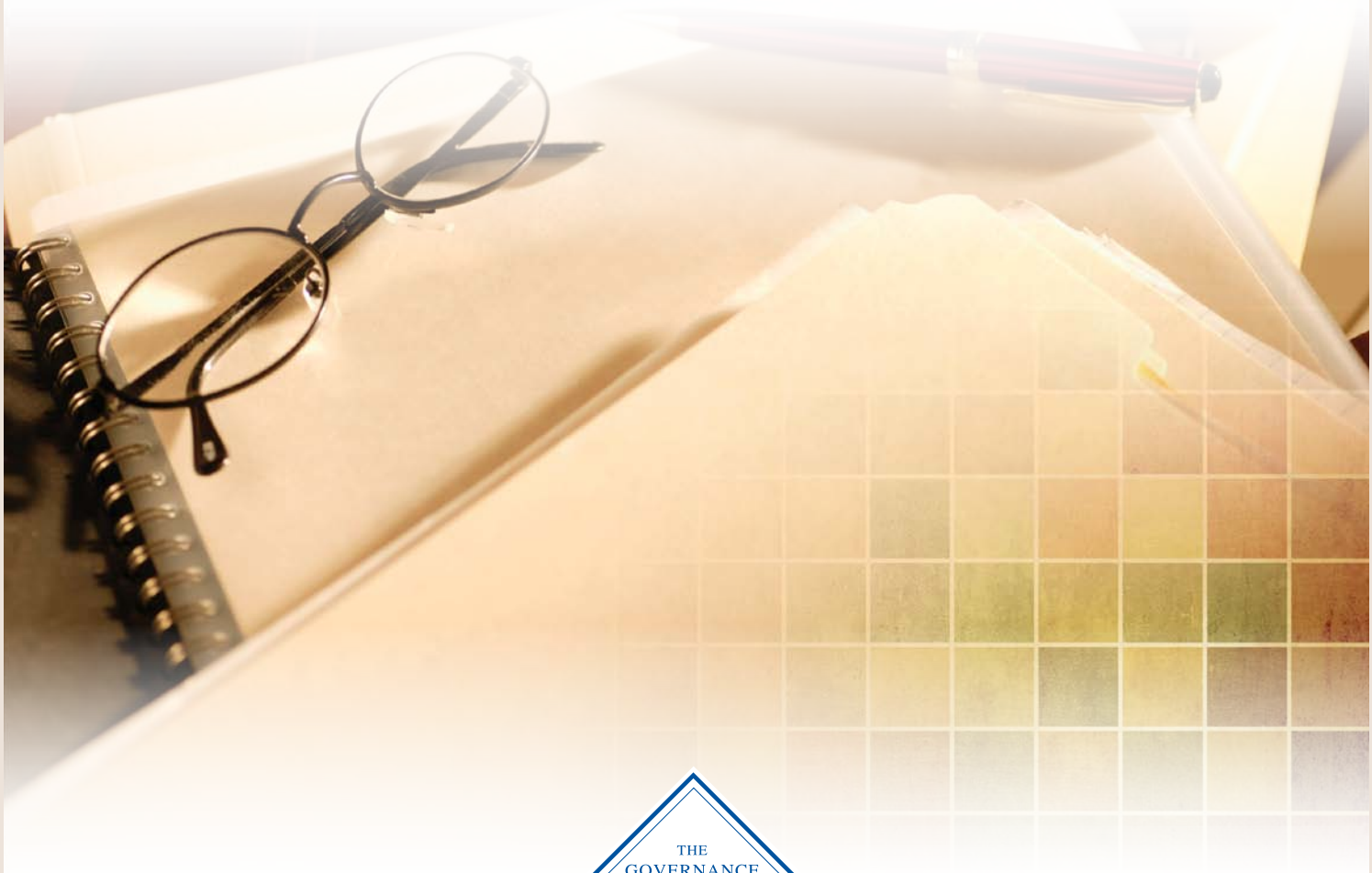
EMPLOYMENT OF CARDIAC SURGEONS

A Study Analyzing the Cost and Quality Outcomes at Hospitals That Employ Cardiac Surgeons

A GOVERNANCE INSTITUTE SPECIAL PUBLICATION FOR MEDICAL LEADERS



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Overview of the Issue

Many studies have focused on healthcare quality and healthcare costs in the United States; however, few studies have isolated and evaluated the effect the structure between hospitals and members of their medical staffs has on the outcomes of quality and cost. The goal of this study was to evaluate the effects of the structure of the relationship between hospitals and cardiac surgeons—specifically, employed versus independent cardiac surgeons—on quality and cost in the outcomes of coronary artery bypass graft surgery (CABG).

Hypotheses

- Hospitals that employ cardiac surgeons achieve better clinical outcomes, as measured by risk-adjusted mortality and severity-adjusted average length of stay, compared to hospitals where cardiac surgeons are not employed.
- Hospitals that employ cardiac surgeons achieve better financial outcomes measured by severity and wage-adjusted cost per case compared to hospitals where cardiac surgeons are not employed.

This study compared the clinical and financial performance of two groups of hospitals that perform cardiac surgery. The *study group* of hospitals consisted of 13 hospitals that employ cardiac surgeons and the *comparison group* consisted of 39 hospitals that do not employ cardiac surgeons.

The fifty-two hospitals in this study are not-for profit, 501(c)(3) organizations and were selected using a multi-step process. Because of the limited sample size, the analysis of employment and comparison hospitals did not control for hospital characteristic. To control for hospital characteristics, risk adjusted outcomes measures were used. For more detail, refer to Appendix A: Study Description and Findings.

(This publication is based on an academic research study conducted by Greg Carlson to complete his Ph.D. dissertation.)

Discussion, Conclusions, and Recommendations

Discussion

Cardiac surgery has been extensively studied by many organizations, including the Society of Thoracic Surgeons, which has accumulated detailed perioperative data on over one million patients to determine which factors contribute to delivering the safest and the most effective care. In spite of all the research conducted on all aspects of cardiac surgery, there has been little research published that evaluates the structure of the relationship between hospitals and physicians and its impact on cost and quality.

This study found that hospitals that employed their cardiac surgeons reported a mortality ratio (index) 22.89% lower than the mortality ratio (index) achieved by hospitals that did not employ their cardiac surgeons.

In this study, mortality index is a ratio of an observed number of deaths to an expected number of deaths in a particular hospital, or group of hospitals. The index is used to make normative comparisons between hospitals or groups of hospitals. The index is calculated by taking the number of observed events (deaths) divided by the number of expected events (deaths). This study compared the mortality index of the comparison group hospitals (39) to the employment group hospitals (13).

In addition to lower mortality rates, *hospitals that employ their cardiac surgeons achieved a positive variance in their cost ratio (11.86%) compared to hospitals that do not employ their cardiac surgeons.*

Projecting the savings (lower cost per case) achieved by the 13 employment group hospitals to just the 39 comparison group hospitals would realize savings of $12,584,462.

Additional studies are needed to determine if the employment model for physicians is a variable that can consistently achieve better cost and mortality outcomes compared to the appointment model.

Length of stay for coronary artery bypass graft (CABG) patients treated did not differ by whether cardiac surgeons were employed by the hospital. Several reasons may be suggested to explain the lack of difference in the length of stay between the hospitals with employed physicians compared to the hospitals that did not employ their cardiac surgeons.

First, the observed lengths of stay for the employment group and the comparison group were *both* lower than predicted, indicating the possibility that all hospitals in the study may have performed better than expected by the model.

Second, one can theorize that reducing a patient's length of stay provides diminishing returns for cardiac surgeons, whereas lower mortality rates and lower costs are outcomes that reflect favorably on the surgeon and the hospital. In fact, surgeons could argue that reducing the length of stay below a certain number of days could have a negative effect on the 30-day post-discharge mortality for which they are evaluated.

Costs and length of stay do not have the same effect on surgeons as does the surgeon's mortality rate. Unless cardiac surgeons benefit from lower costs and a reduced length of stay it is unlikely that hospitals, or cardiac surgeons, will commit the resources required to further reduce the costs associated with a reduction in the length of stay of their patients. This study documented cost per case to be lower among employed physicians even though the variance in the length of stay was not statistically significant. Because mortality rates are viewed as the best indicator to determine the quality of a cardiac surgeon, or hospital, mortality rates will continue to receive more attention than cost or length of stay outcomes.

Limitations of the Study

Limitations of this study that need to be assessed in future studies include the following:

- **Number and location of hospitals in the study**. The employment of physicians by hospitals (as an independent variable) is a relatively new concept with few studies. This study was limited to 52 hospitals within a limited geographic region, due to the fact that mortality rates vary by region of the country. By limiting the geography, the potential for regional variations as a contributing variable was minimized.
- **Cause of mortality**. The cause of a patient's mortality, regardless of whether the patient died during the operation, in the cardiac intensive care unit, or within 30 days of surgery, was not differentiated.
- **Other specialties**. This study was limited to patients undergoing cardiac bypass surgery. If subsequent studies conclude that "employment of cardiac surgeons" by a hospital is a predictor of outcomes, then it

would be appropriate to evaluate "employment of physicians" by hospitals in other specialties.

- **Compensation**. The amount and method of compensation was not known or evaluated in this study. There is little information available regarding whether cardiac surgeons prefer to be employed or prefer to work independently. This study did not research the motivation of the hospitals to employ cardiac surgeons or the motivation of the surgeons to be employed.

Impact of the Physician

While this study documented the benefits that can be realized when hospitals employ their cardiac surgeons, it is critically important to recognize that a hospital's performance is the aggregated performance of all of the surgeons that practice at any hospital. The State of New York Department of Health has reported the mortality rates of hospitals and cardiac surgeons since 1989, concluding that the cardiac surgeon is a bigger determinant of mortality than is the hospital.[1]

The desired goal should be to determine whether an employment model creates the opportunity for a cardiac surgeon to achieve his or her best performance. Donabedian has repeatedly made the case that the knowledge, skill, and judgment of physicians are the biggest determinants of quality.[2]

Conclusions

Analyzing CABG surgery outcomes at 52 hospitals documented that 13 hospitals that employ cardiac surgeons achieved a risk-adjusted mortality ratio that was 22.89% lower than the mortality ratio achieved by 39 hospitals that do not employ their cardiac surgeons. The risk-adjusted cost ratio was 11.86% lower for hospitals in the employment group compared to the hospitals in the comparison group.

This study documented one approach, with a single variable (employment of cardiac surgeons), that has the potential to improve quality and reduce the cost of CABG surgery. If subsequent studies replicate the findings of this study, the employment model for physicians may help to improve the quality of care provided for this procedure.[3]

Hospitals cannot achieve the best possible outcomes when the primary decision makers—administrators and physicians—are not aligned. This study has documented that the hospital employment model for cardiac surgeons is a variable that contributes to alignment and may have a positive impact on quality and costs.

Recommendations

The findings from this study suggest that employment of cardiac surgeons by hospitals may provide better outcomes (mortality and cost) for cardiac surgery patients. If, after additional research, the employment model proves to be a valid and reliable improvement to the more conventional independent practice model, employment should be evaluated further to determine if it can be generalized to other specialties.

Some researchers have reported that employing cardiac surgeons appears to create alignment between hospitals and surgeons, allowing hospitals to develop standardized systems and processes, which contribute to improved quality and cost outcomes.[4] In the traditional system (appointment model), each surgeon has a preferred way to perform a procedure, using different techniques, different instruments, and different supplies, requiring each surgical nurse or technician to learn the preferences and the various techniques of each surgeon. It has been suggested that when hospitals employ cardiac surgeons there is a greater potential for consistency, resulting in less variation and better outcomes. When cardiac surgeons consistently work with the same staff, use the same processes, work in the same system, use the same equipment and supplies, where the team is more important than any individual, the outcome is an increase in overall quality that benefits patients clinically and financially.[5] It makes intuitive sense that physicians who work in an integrated group, with centralized decision making, closer physician affiliations, and common goals, achieve outcomes of higher quality.[6]

1 New York State Department of Health, 2006.
2 Enthoven and Vorhaus, 1997; Shuster et al., 1998.
3 Becher & Chassin, 2001.
4 Budetti et al., 2002.
5 Shortell et al., 2001.
6 Mehrota et al., 2006.

Appendix A: Study Description and Findings

Study Design and Selection of Hospitals

This study compared the clinical and financial performance of two groups of hospitals that perform cardiac surgery. The *study group* of hospitals consisted of 13 hospitals that employ cardiac surgeons and the *comparison group* consisted of 39 hospitals that do not employ cardiac surgeons.

The 52 hospitals in this study are not-for-profit, 501(c)(3) organizations and were selected using a multi-step process. Because of the limited sample size, the analysis of employment and comparison hospitals did not control for hospital characteristics. To control for hospital characteristics, risk-adjusted outcomes measures were used.

A total of 10,392 coronary artery bypass graft (CABG) procedures were performed; 3,249 at employment group hospitals and 7,143 at the comparison group hospitals. The study population was limited to Medicare patients admitted for the treatment of diseases and disorders of the circulatory system in major disease category (MDC) 5 for the following three diagnostic related groups (DRG's): DRG 106, coronary bypass with percutaneous transluminal coronary angioplasty (PTCA); DRG 107, coronary bypass with a cardiac catheterization; and DRG 109, coronary bypass without a PTCA or cardiac catheterization.

To adjust for the fact that all hospitals perform different numbers of CABG procedures, the means for the outcome variables (mortality, cost, and length of stay) were weighted based on the number of procedures performed. Without weighting, results in a hospital that performs 80 CABG procedures would be counted the same as results from a hospital performing 325 CABG procedures.

Measures and Variables

The three dependent variables: 1) mortality; 2) length of stay; and 3) cost were case mix- and risk-adjusted. The methodology to assess hospital mortality rates and cost data uses administrative claims data developed under the direction of CMS. CMS's model has been validated using clinical data that takes into account medical care received during the year prior to each patient's hospital admission, as well as the number of admissions at each hospital.

Each hospital's patients were case mix- and risk-adjusted to account for differences in the age, sex, and acuity of patients. Adjusting for case mix and risk assures that hospitals that treat sicker patients, or hospitals that avoid complex cases, can be compared to one another.[7] The independent and dependent variables are defined below, including a detailed description of the methodology used to measure the outcomes of the analysis.

Independent variable: The independent variable is a dichotomous measure identifying whether cardiac surgeons are employed, or not employed, by a hospital.

7 CMS, 2007.

Dependent variables: This study focuses on the following three dependent variables.

1. *Risk-Adjusted Surgical (CABG) Patient Mortality Index* (RSMRs). This index measure, provided by Thompson Reuters, was used to report hospital-specific, risk-adjusted mortality, including the following three components:
   - » Observed (or crude) number of deaths
   - » Predicted number of deaths based on risk factors, estimated from the regression model
   - » Crude national mortality rate

   CMS mortality measures take into account patient risk factors, including a hospital-specific effect. The hospital-specific effect is an estimate of the average impact of being treated in a particular hospital has on the likelihood of dying.[8] The ratio of observed deaths to expected deaths (referred to as the O/E ratio) is used to assess whether the hospital had more deaths than expected (ratio > 1.0), the same number of deaths as expected (ratio = 1.0), or fewer deaths than expected (ratio < 1.0). This number is then multiplied by the national mortality rate, so that the hospital's adjusted death rate may be compared to the national rate.[9]

2. *Severity-Adjusted Average Length of Stay:* The observed average length of stay (ALOS) for a hospital is calculated by taking the total inpatient days for all patients and dividing this total by the total number of cases.[10]

3. *Severity- and Wage-Adjusted Cost per Case:* Cost data for the study were also obtained from Thomson Reuters. The severity and wage adjusted cost per case are based on Medicare's predetermined acute Inpatient Prospective Payment System (IPPS) and are calculated as follows: A standardized amount (dollar figure) is divided into labor and non-labor related portions and the labor portion is adjusted by a wage index to reflect area differences in the cost of labor; the wage-adjusted labor share is added to the non-labor share of the standardized amount; and finally the wage-adjusted standardized amount is multiplied by a relative weight for the DRG.[11]

Results

Overall findings for mortality, cost, and length of stay have been stratified and presented by employed versus comparison group and by hospital volume.

8 CMS, 2007.
9 Thomson Reuters, 2008.
10 *Ibid.*
11 *Ibid.*

The three dependent variables (mortality, cost, and length of stay) were analyzed to compare the performance of hospitals performing CABG procedures. Results documented that employment group hospitals outperformed the comparison group hospitals in all three measures. Findings were significant at alpha = 0.10 for mortality and for cost. Details are presented below.

Mortality

Table 1 presents observed, expected, and observed/expected mortality ratios for both hospital groups. The overall observed/expected ratio was 0.97 in the employment group hospitals (i.e., mortality lower than predicted) compared to 1.17 in the comparison group hospitals (i.e., mortality higher than predicted).

Comparing the risk-adjusted expected mortality of the employment group to the comparison group, the 13 employment group hospitals had a mortality ratio of 0.9912 (p = 0.0136), which was 22.89% lower than the mean mortality ratio of 1.2181 for the 39 comparison group hospitals.

Employment group hospitals had an actual mortality of 2.74% compared to an expected risk-adjusted mortality of 2.84%. The lowest observed mortality rate among the employment group hospitals was 1.17% and the highest observed mortality was 4.16%. Nine out of the 13 hospitals (69.2%) in the employment group achieved mortality rates that were lower than the expected risk-adjusted mortality rates.

Hospitals in the comparison group had an overall observed mortality of 3.01% compared to an expected risk-adjusted mortality of 2.57%. The lowest mortality among comparison group hospitals was 1.21% and the highest mortality was 5.19%. Only five hospitals (12.82%) out of the 39 in the comparison group achieved mortality rates that were lower than their predicted risk-adjusted mortality.

Calculating a hospital's overall CABG mortality was not possible because the data in this study was limited to Medicare patients.

Cost

The overall cost ratio was lower in the employed group (0.97) than in the comparison group (1.09). In the employment group hospitals, observed costs were lower than predicted while in the comparison group hospitals the observed costs were higher than predicted. (See Table 2.)

The 13 employment group hospitals had a risk-adjusted expected cost ratio of 0.9809, which was 11.86% lower than the cost ratio of 1.0888 for the 39 comparison group hospitals (p = 0.0691).

Actual costs for the employment group hospitals were $1,049 lower per case than the costs experienced by the comparison group hospitals. Costs for the employment group were 2.64% ($375/case) lower than the risk-adjusted predicted costs and 7.06% lower than the mean cost of the comparison group hospitals. The actual costs for the comparison group hospitals were 8.65% ($1,284/case) higher than expected.

Table 1: Mortality in the Employed Group and Comparison Group Hospitals, by Hospital Volume

Range of Volume per Medicare CABG[1] Cases[2]	Employed Group Mortality			Comparison Group Mortality		
	Observed	Expected	O/E[3] Ratio	Observed	Expected	O/E[3] Ratio
≤ 125	7	6.90	1.02	35	25.83	1.36
>125 & ≤ 250	21	22.12	0.95	122	107.77	1.13
>250	61	63.25	0.96	55	48.01	1.15
Total	**89**	**92.26**	**0.97**	**212**	**181.64**	**1.17**

1 Coronary artery bypass graft.

2 Case numbers are limited to Medicare patients; total hospital volumes are higher.

3 Observed versus expected.

Length of Stay

Table 3 presents observed, expected, and observed/expected LOS ratios for both hospital groups. The overall actual LOS was lower than predicted in both hospital groups. Observed/expected ratios were 0.94 in the employment group hospitals, and 0.99 in the comparison group hospitals.

Length of Stay Outcomes

Observed LOS was lower than the model predicted for both the employment group and the comparison group. Employment group hospitals had a risk-adjusted expected LOS ratio of 0.9354 compared to 0.9852 for the comparison group. The difference was not statistically significant ($p = 0.3608$). The actual average LOS for the employment group was 4.16 days compared to a predicted LOS of 4.44. The actual average LOS for the comparison group was 4.17 days compared to a predicted length of stay of 4.23 days.

Table 2: Cost in the Employed Group and Comparison Group Hospitals, by Hospital Volume

Range of Volume per Medicare CABG[1] Cases[2]	Employed Group Cost (in $1,000)			Comparison Group Cost (in $1,000)		
	Observed	Expected	O/E[3] Ratio	Observed	Expected	O/E[3] Ratio
≤ 125	4,739	3,862	1.23	16,691	13,869	1.20
>125 & ≤ 250	9,579	10,467	0.92	59,402	53,903	1.10
>250	30,539	31,744	0.96	28,923	28,266	1.02
Total	**44,855**	**46,073**	**0.97**	**105,016**	**96,038**	**1.09**

1 Coronary artery bypass graft.

2 Case numbers are limited to Medicare patients; total hospital volumes are higher.

3 Observed versus expected.

Table 3: Length of Stay in the Employed Group and Comparison Group Hospitals, by Hospital Volume

Range of Volume per Medicare CABG[1] Cases[2]	Employed Group Length of Stay			Comparison Group Length of Stay		
	Observed	Expected	O/E[3] Ratio	Observed	Expected	O/E[3] Ratio
≤ 125	1,130	1,210	0.93	4,533	4,348	1.05
>125 & ≤ 250	3,120	3,256	0.96	16,396	17,079	0.96
>250	9,252	9,968	0.93	8,854	8,804	1.01
Total	**13,502**	**14,434**	**0.94**	**29,783**	**30,231**	**0.99**

1 Coronary artery bypass graft.

2 Case numbers are limited to Medicare patients; total hospital volumes are higher.

3 Observed versus expected.

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