Who Pays for Poor Surgical Quality? Building a Business Case for Quality Improvement

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BACKGROUND: Both providers and payors bear the financial risk associated with complications of poor quality care. But the stakeholder who bears the largest burden of this risk has a strong incentive to support quality improvement activities. The goal of the present study was to determine whether hospitals or payors incur a larger burden of increased hospital costs associated with complications.

STUDY DESIGN: We merged clinical data for 1,008 surgical patients from the private sector National Surgical Quality Improvement Program to the internal cost-accounting database of a large university hospital. We then determined the marginal costs of surgical complications from the perspective of both hospitals (changes in profit and profit margin) and payors (increase in reimbursement paid to the hospital). In our analyses of cost and reimbursement, we adjusted for procedure complexity and patient characteristics using multivariate linear regression.

RESULTS: Reimbursement for patients without complications ($14,266) exceeded hospital costs ($10,978), generating an average hospital profit of $3,288 and a profit margin of 23%. When complications occurred, hospitals still received reimbursement in excess of their costs, but the profit margin declined: reimbursement ($21,911) exceeded hospital costs ($21,156), yielding an average profit of $755 and a profit margin of 3.4%. Complications were always associated with an increase in costs to health-care payors: complications were associated with an average increase in reimbursement of $7,645 (54%) per patient.

CONCLUSIONS: Hospitals and payors both suffer financial consequences from poor-quality health care, but the greater burden falls on health-care payors. Strong incentives exist for health-care payors to become more involved in supporting quality improvement activities. (J Am Coll Surg 2006; 202:933–937. © 2006 by the American College of Surgeons)

Widespread recognition of health-care quality problems continues to motivate efforts for measuring and improving performance.[1-3] Unfortunately, the prospective data collection needed for these quality improvement efforts is often expensive.[4,5] Although many would agree that these efforts are worthwhile, there is less agreement about who should pay for them.

The two most likely sources of funding for quality improvement programs are hospitals and health-care payors. Because poor-quality care can result in higher rates of complications and increased associated costs, both hospitals and payors stand to suffer financially. Hospitals use a larger amount of resources caring for patients with postoperative complications.[6,7] But these costs are, to some degree, passed on to the payor. To date, no information is available about how much of these costs are absorbed by each stakeholder.

Building a successful business case for quality improvement will depend on identifying who bears the greater burden of costs associated with poor quality.[8,9] We conducted the current study to determine the financial consequences of surgical complications for both

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hospitals and payors. We judged the impact on hospitals by determining how the profit and profit margin change when complications occur. We determined the impact on health-care payors by estimating the increase in reimbursement associated with complications.

METHODS

Study overview and data sources

We merged clinical information from the National Surgical Quality Improvement Program's private-sector database to the internal accounting data available at the University of Michigan hospital. Only patients enrolled in the National Surgical Quality Improvement Program at this single university center during a 2-year period between January 1, 2001, and December 31, 2002, were included. Consistent with published methodology, the sample of surgical patients included the first 40 consecutive adult patients undergoing a general or vascular operation during an 8-day period.[10-12] Trained nurse-clinicians contacted each patient after the procedure and performed recruitment.[13]

Hospital costs and reimbursement

We obtained information on total hospital costs and reimbursement for each patient from the cost-accounting database. The TSI system (Transitions Systems Inc) was used to identify total hospital costs and reimbursements (excluding professional physician fees). The TSI system tracks the use of all resources and assigns estimates of cost based on direct acquisition costs for supplies and time-and-motion studies for labor costs.[14] We assessed the financial impact on hospitals by determining how the profit (reimbursement less costs) and profit margin (profit divided by reimbursement) change when complications occur. We determined the financial impact on payors by estimating the increase in reimbursement associated with complications.

Postoperative complications

We used postoperative complications as a measure of poor-quality care. Complication rates are widely used in many ongoing efforts as measures of surgical quality.[13,15,16] To determine whether complications occurred, we used the definitions developed by the National Surgical Quality Improvement Program, which are prospectively assessed and recorded in a detailed clinical database.[10-13] For the purposes of the current study, we combined all complications (both major and minor) together to create a dichotomous variable. We used this approach to overcome the problem of small sample size, if each type of complication were studied alone. In addition, using a single-complication variable clarifies the presentation of our analysis.

Because more complex operations are both more expensive and have a higher risk of complications, we used two approaches to ensure that our findings were not a result of confounding by differences in procedures mix. The two approaches we used were stratification of the results by type of surgical procedure and detailed risk adjustment of costs and reimbursements using multiple linear regression. Each of these methods addresses confounding, but in separate ways. Stratification takes case-mix out of the equation by presenting the results for only one procedure at a time. Risk adjustment uses mathematical techniques to account for differences in case-mix between the two groups (those with and without complications).

We present results stratified by the three most common operations, including elective (nonruptured) abdominal aortic aneurysm repair; colon resection for benign and malignant disease; and ventral incisional hernia repair (without evidence of bowel obstruction). We then present the overall analysis fully risk adjusted using detailed clinical data on patient demographics (age, gender, and race), coexisting diseases, procedure complexity, physical functioning, and severity of illness.

Statistical analysis

To adjust our estimates for patient characteristics and procedure-mix, we created a separate linear regression model for both hospital costs and reimbursement. Covariates were included in the model if they were statistically significant at the $p < 0.10$ level. Because of the right-skewed distribution of both dependent variables (costs and revenue), we used log-transformed variables for the regression analyses. Regression coefficients were exponentiated to determine the proportional change associated with each independent variable of interest. All analyses were conducted using STATA statistical software (Stata Corp).

RESULTS

The financial burden absorbed by the hospital is best represented by changes in profits and profit margins when complications occur (Table 1). Mean reimbursement for patients without complications ($14,266) ex-

Table 1. Hospital Costs and Reimbursement for Surgical Patients With and Without Complications

	Costs: resources used by the hospital ($)	Reimbursement: amount paid to the hospital ($)	Hospital profit (profit margin) ($)
No complications	10,978	14,266	3,288 (23)
With complications	21,156	21,911	755 (3.4)
Increase in reimbursement		7,645 (54)	

Values in parentheses are percentages.

ceeded hospital costs ($10,978), generating an average hospital profit of $3,288 (23% profit margin). When complications occurred, hospitals still received enough reimbursement to cover their costs. Mean reimbursement for patients with complications ($21,911) exceeded mean hospital costs ($21,156), although by a smaller margin (3.4%), yielding an average profit of only $755.

Table 2 shows the change in hospital profit and profit margin for three different operations. The largest change was for colon resection, with an average profit of $6,889 without complications, compared with a $1,460 loss with complications. Table 3 shows the change in hospital profit stratified by different payors. Although the decline in hospital profits varied across payors, the general findings were similar: cases with complications were usually still profitable, but much less so.

Financial consequences of complications to a payor are best represented by the increase in reimbursement to the hospitals. The average increase in reimbursement when complications occurred was $7,645 (Table 1). The increase in reimbursement varies dramatically, depending on the operation, from $42,198 for abdominal aneurysm repair (137% increase) compared with $12,137 for colon resection (54% increase) (Table 2).

DISCUSSION

Although payors and hospitals both suffer financial consequences relating to poor-quality care, payors appear to bear a larger burden of the costs. When surgical complications occur, hospitals experience a decline in profits and profit margin per case, but reimbursement usually covers their costs. In contrast, payors always lose money with complications: reimbursement increases an average of 54% when complications occur. Health-care payors clearly have a large stake in ensuring the success of quality improvement activities in surgery.

Previous studies estimate the costs attributable to surgical complications, but none goes the next step to determine who actually incurs these increased costs. These studies document dramatic increases in length of stay and hospital costs when patients sustain complications.[6,7,17] If hospitals were reimbursed in a fee-for-service manner for all of these services, complications could actually be profitable to a hospital. But the bundling of costs (eg, Diagnosis Related Groups) and other

Table 2. Changes in Hospital Profit and Reimbursement for Three Common Operations

	Costs: resources used by the hospital ($)	Reimbursement: amount paid to the hospital		Hospital profit (profit margin)	
		$	%	$	%
Colon resection for benign or malignant disease					
No complications	15,464	22,353		6,889	31
With complications	35,950	34,490		−1,460	−4.2
Increase in reimbursement		12,137	54		
Abdominal aortic aneurysm repair					
No complications	22,822	30,735		7,913	26
With complications	64,762	72,933		8,171	11
Increase in reimbursement		42,198	137		
Ventral incisional hernia repair					
No complications	6,321	7,711		1,390	18
With complications	11,189	11,914		725	6
Increase in reimbursement		4,203	55		

Table 3. Changes in Hospital Profit and Reimbursement Stratified by Payor

	Costs: resources used by the hospital ($)	Reimbursement: amount paid to the hospital		Hospital profit (profit margin)	
		$	%	$	%
Payor 1					
No complications	8,414	10,294		1,880	18
With complications	15,674	15,510		−164	−1
Increase in reimbursement		5,216	51		
Payor 2					
No complications	11,179	14,770		3,591	17
With complications	14,131	16,935		2,804	15
Increase in reimbursement		2,165	15		
Payor 3					
No complications	14,437	19,340		4,903	25
With complications	32,267	33,542		1,275	3.8
Increase in reimbursement		14,202	73		
Payor 4					
No complications	7,561	10,320		2,759	27
With complications	19,060	20,012		952	4.7
Increase in reimbursement		9,692	94		

cost-control mechanisms (eg, capitation) help minimize this potential conflict of interest. For the most part, these efforts to control costs helped create an environment in which hospitals were supportive of quality improvement. Our data clearly show that strong incentives exist for health-care payors to get involved in supporting these efforts.

Although our findings provide valuable information to help build the business case for quality improvement, several caveats of our study should be noted. This study is largely based on the assumption that quality improvement efforts will reduce the number of complications after operation. There is ample observational data to support this notion.[2,3,5,10] Some suggest the changes over time are related to secular trends rather than the direct influence of quality improvement efforts. An appropriate response to this challenge would be to support ongoing studies of these efforts to ensure they truly reduce the occurrence of postoperative complications.

It can also be argued that we overestimate the financial burden of poor quality because improvement will not completely eliminate surgical complications. Although it is true that complication rates will never be reduced to zero, given the large cost to both hospitals and payors, reducing the existing rates by a small fraction could result in a large amount of averted costs.

Some might argue that our results have limited external validity because they come from a single large academic center. The relationship shown in our study was remarkably consistent across different procedures and various payors. The major differences across hospitals are case-mix (different profiles of operations) and differences in payor-mix. Given the consistency across these groups of procedures and payors seen in our study, there is very little reason to believe that the relationship between complications, costs, and reimbursement would be dramatically different across hospitals.

Finally, our study also did not include the opportunity costs incurred by the hospital. We calculated the change in hospital profit assuming the expected profit for a complicated case was the same as an uncomplicated case. Some might not agree with this assumption. Patients with complications tend to use about twice as many resources compared with patients without complications. If a hospital expects profit to be proportional to the amount of resources used, it is reasonable to expect a higher profit for complicated cases. The costs of caring for complicated cases should include the lost "opportunity" to care for more profitable, uncomplicated cases. Considering these opportunity costs would make a stronger case for hospitals to engage in quality improvement, but it would not impact the case for payors to get involved.

We only considered two perspectives in this analysis—the hospital and the payor. We did not account for costs to society and patients. Surgical complications result in pro-

longed absences from work and a large toll in lost productivity. Although these additional costs to society are important, our research question only required an analysis of direct hospital costs. We also recognize the largest costs of surgical complications are not financial: the true cost of poor quality is the threatened health of our patients. Acknowledging this cost is not a limitation but rather an additional motivation to support quality improvement. In addition to this motivation, our study found that hospitals, and especially payors, have a strong financial incentive to invest in activities that help improve the quality of care.

Author Contributions

Study conception and design: Dimick, Weeks, Campbell
Acquisition of data: Dimick, Campbell
Analysis and interpretation of data: Dimick, Weeks, Karia, Das, Campbell
Drafting of manuscript: Dimick, Weeks, Karia, Das, Campbell
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Statistical expertise: Dimick, Weeks, Das
Obtaining funding: Weeks, Campbell
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