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Short Commentary Open Access

What does an MRI Cost?

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Short Commentary

As the U.S. healthcare system evolves under the Accountable Care Act, providers can be expected to assume increasing amounts of risk in the delivery of care. The formation of accountable-care organizations, the use of bundled prices, the presence of re-admission penalties for hospitals, and the movement toward sub-capitation all will change the risk profiles of both hospitals and physicians. Department of Radiology, which historically have been able to operate relatively independently, no longer will be able to do so. They will need to become integrated into a hospital's overall operations.

One question that is bound to emerge as this transformation takes place is how to compute the cost of various tests and procedures. Hospitals historically have computed the full cost of a test or procedure by using a ratio of cost to charges (RCC), but such an approach provides reasonably accurate information only when patients are grouped into, say, service lines or DRGs, and, even then, it provides, at best, a good estimate of the cost of caring for a group of patients [1,2]. It does not even approximate the cost of any given test or procedure, such as a chest X-ray, a CT scan, or an MRI [3-5], As a result, departments of radiology are particularly susceptible to the misleading cost information that emerges from use of an RCC methodology. If these departments are to play an active role in their hospital's cost containment strategy, they will need better information.

To determine the full cost of its procedures, a radiology department needs to employ a technique known as activity-based costing, or ABC [2]. An ABC methodology is necessary if the department is to attach its non-direct costs to each of its procedures. To understand why this is so, let's use the example of an MRI.

There are three categories of costs that a radiology department incurs in providing an MRI:

(1) Direct costs, such as the time of the technician who conducts the procedure or any

disposables used by the patient;

(2) Departmental overhead, such as the salary of the department's administrator or other personnel, such as schedulers; and

(3) Allocated overhead, such as housekeeping or plant maintenance, which are costs incurred in the hospital's service centers and allocated to each mission center (such as radiology) on the basis of some pre-determined metric (such as square feet).

Computing the full cost of an MRI procedure requires including not only its direct costs, which are relatively easy to determine, but also its "fair share" of the other two categories of costs. This is where ABC comes into play.

To illustrate the distinction between an RCC approach and an ABC methodology, consider the example of Owen Hospital, for which a simplified full cost report is shown in Table 1. As this exhibit indicates, the radiology department had $1,750,000 in direct costs. These costs include those that are easily traceable to the department, such as physician salaries (if appropriate), nursing and technician salaries, administrative salaries, machine depreciation, the cost of medical and administrative supplies, and expenditures for purchased services.

	Direct Costs 1	Allocated Costs	Costs to be Allocated	Allocations				
				Depreciation (Sq Ft)	Maintenance (Hours)	Housekeeping (Sq Ft)	A&G (Salary $)	Full cost
		2=4+5+6+7	3=1+2	4	5	6	7	8=1+2
Support Centers								
Building depreciation	1,200,000	0	1,200,000					
Building maintenance	950,000	105,000	1,055,000	105,000	59,555			
Housekeeping services	300,000	154,555	454,555	95,000	158,250			
Admin & General	1,300,000	381,605	1,681,605	156,000		67,355		
Mission Center								
Radiology	1,750,000	688,321		140,000	147,700	64,300	336,321	2,438,321

Laboratory	2,000,000	788,814		160,000	172,545	69,500	386,769	2,788,814
Dialysis Unit	1,250,000	423,930		50,000	116,050	22,455	235,425	1,673,930
Inpatient Care	7,000,000	959,723		350,000	158,250	165,600	285,873	7,959,723
Outpatient Department	2,250,000	889,212		144,000	242,650	65,345	437,217	3,139,212
Total cost	18,000,000			1,200,000	1,055,000	454,555	1,681,605	18,000,000

Table 1: An additional $688,321 was allocated to the radiology department. These costs came from the hospital building's depreciation (a total of $1,200,000 of which radiology's share, based on its square feet of space, was $140,000), building maintenance (a total of $1,055,000, of which radiology's share, based on maintenance hours, was $147,700), housekeeping (a total of $454,555, of which radiology's share was $64,300), and administration and general (a total of $1,681,605, of which radiology's share was $336,321).

Medicare requires that all hospitals receiving its payments prepare such a report. Of course, the actual report for any given hospital is much more extensive and complex than this. But the basic structure is the same for all hospitals.

There are many debatable elements in the report, but, in general a department of radiology(or any other hospital mission center) will not be able to exert much, if any, influence over these elements. Thus, it would be of little use to engage in a debate about the report's accuracy. Instead, the department of radiology must accept the costs that are allocated to it. This means that, in the case of Owen Hospital, the total cost for the radiology department is $2,438,321 ($1,750,000+ $688,321). The more important challenge is to find a way to attach a portion of this total to each of the procedures that took place in the department during the time period in question. This is where ABC can be helpful.

To illustrate how the ABC process works, assume that the radiology department conducted only two procedures during the time period of the report: simple chest X-rays and MRIs. As Table 2 indicates, the labor and material costs per procedure were $40 for a chest X-ray and $70 for an MRI. (Actual labor and material costs would be relatively easy to determine with time and motion studies).

	Labor and Material Cost/Unit 1	**Number of Units 2**	**%of Space Occupied 3**	**% of Maint. Hours 4**	**% Salary Dollars 5**	$400,000
Radiology	40.00	25,000	40%	20%	80%	
Chest X-ray	70.00	5,000	60%	80%	20%	
MRI Total	30,000					
Department Administrative Cost						

Table 2: The department conducted 25,000 chest X-rays and 5,000 MRIs. The X-ray unit occupied 40 percent of the department's space and the MRI unit occupied 60 percent. The chest X-ray equipment required 20 percent of the maintenance hours, whereas the MRI equipment required 80 percent of those hours. Of the total administrative costs in the department, analysts determined that 80 percent were associated with chest X-rays and 20 percent with MRIs. The department's total administrative costs were $400,000.

In practice, of course, the data in any given radiology department would be more complex than these. Nevertheless, this information can be used to illustrate how ABC can affect a department's knowledge of its costs.

Assume now that

(a) The hospital is using an RCC approach to determine its per unit costs,

(b) The charge for a chest X-ray is $300, and

(c) The charge for an MRI is $2,000. As Table 3 indicates, the RCC-based cost would be $41.80 for the chest X-ray and $278.67 for the MRI. That is, since the total charges were $17,500,000 and total costs (from Exhibit 1) were $2,438,321, the ratio of costs to charges is 0.139. When this ratio is applied to the charge for each type of procedure, the above cost amounts result.

	Charge per unit	**# units**	**Total charges**	**Total costs (from Exh 1)**	**Ratio of costs to charges**	**RCC based cost**
Radiology						
Chest X-ray	**$300**	25,000	$7,500,000			$41.80

MRI	**$2,000**	5,000	10,000,000			$278.67
Total		30,000	$17,500,000	$2,438,321	0.139	

Table 3: Computing cost per Procedure using the RCC. Now, let's apply an ABC approach to the cost computations.

	Labor and Material Cost/ Unit	**Number of Units**	**Directly Attachable Direct Cost**	**Computing Full Cost Per Unit Using an ABC Approach**									
				Dept. Admin Cost	**% of Space**	**Depreciation Cost**	**House-keeping Cost**	**% of Maint. Hours**	**Maintenance Cost**	**% of Salary Dollars**	**A and G Cost**	**Total Cost**	**Cost per Unit**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Radiology													
Chest X-ray	40	25,000	$1,000,000	$333,333	40%	$56,000	$25,720	20%	$29,540	80%	$269,057	$1,713,650	$68.55
MRI	70	5,000	350,000	66,667	60%	84,000	38,580	80%	118,160	20%	67,264	724,671	$144.93
Total		30,000	$1,350,000	$400,000		$140,000	$64,300		$147,700		$336,321	$2,438,321	

Table 4: Now, let's apply an ABC approach to the cost computations. The approach is shown in Table 4. The columns are numbered and explained below.

Column! Explanation

1!From Exhibit 2

2!From Exhibit 2

3!Column 1 multiplied by column 2.

4!Total department administrative costs shown in Exhibit 2 divided between the two procedures based on the proportion of units. Since MRIs were only 16.7 percent of total procedures, they received 16.7 percent of the $400,000, or a total of $66,667.

5!From Exhibit 2

6!Allocated hospital depreciation of $140,000 (see Exhibit 1) is distributed between the two types of procedures based on percent of space.

7!Allocated housekeeping of $64,300 is also distributed based on percent of space 8!From Exhibit 2

9!Allocated maintenance costs of $147,700 is distributed based on percent of maintenance hours

10!From Exhibit 2

11!Allocated administrative and general costs of $336,321 is distributed based on percent of salary dollars

12!Sum of columns 3, 4, 6, 7, 9, and 11

13!Column 12 divided by column 2, i.e., the full cost per procedure.

Procedure	**RCC-based Cost**	**ABC-based Cost**	**Difference**	**Percent Change**
Chest X-ray	41.8	68.55	26.75	64%
MRI	278.67	$144.93	133.74	48%

Table 5: We now can compare the cost per procedure based on the RCC approach with that using ABC.

Of course, there is no guarantee that the numbers will always move in the same direction or by the same magnitude as those shown above. Rather this simplified example only illustrates that an RCC-based approach to costing of individual procedures in a department of radiology can produce misleading information (Table 5).

In other industries, ABC has led to a complete rethinking of an organizations pricing structure [1]. In health care, the implications are a bit different. In an era where cost control has become an important strategic consideration, an organization that does not understand its costs effectively is flying blind.

Clearly, ABC is more difficult to implement than shown here, but it can and has been done with success in other industries as well as in some healthcare organizations. Most importantly, it is an important consideration for hospitals that wish to survive in an era of increasing buyer sensitivity to costs.

References

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