7-2 Brookwood Medical Center[1]

"In 1990, a major insurer asked us to bid on performing all of their open-heart surgeries in the Southeast United States. We prepared a bid by pulling charges on all (not just Medicare) patients we had treated in the four diagnostic related groups (DRGs) and applying the hospital-wide cost-to-charge ratio. We did not get the bid and had *no idea* whether to be disappointed or relieved. From talks with third-party payers and major employers, we believed that by the mid-1990s we would be bidding for portions of business, like open-heart surgeries, on a regular basis. We realized that we needed a much better understanding of costs at the DRG and individual patient levels if we're to be able to compete effectively."

—Carolyn Johnson, Vice President of finance

INTRODUCTION

By the end of the 1980s, cost management had become one of the most important issues faced by Brookwood Medical Center (BMC) administrators. BMC faced pressure from managed care providers such as health maintenance organizations (HMOs) and preferred provider organizations (PPOs) to keep medical costs low while continuing to provide high-quality health care services. For the first time, BMC was asked to bid on specific health care services for members of managed care insurance plans. To provide bids that were competitive yet profitable, hospital administrators needed detailed cost information about specific health care procedures. In addition, Medicare and other insurance providers moved to fixed fee reimbursement schedules, paying a defined fixed rate depending on a patient's diagnostic related group (DRG) and severity level. The use of fixed payment rates provided incentives for BMC to identify costs associated with providing health care to specific patients in each DRG. Health care providers realized that reductions in the average length of stay (ALOS) as a result of shorter inpatient hospital stays and increased outpatient services could decrease costs without decreasing the quality of care.

THE NEW COST SYSTEM

As more payers moved to a fixed fee form of reimbursement, BMC administrators determined the existing cost system was not providing sufficiently accurate or detailed cost information. The old methodology provided aggregated cost data by department; but no reliable method existed to trace costs to individual patients or diagnostic groups. The new health care environment required hospitals to compete for managed care contracts and to make strategic decisions based on a solid understanding of costs.

Jan Kelly, Director of cost accounting, identified the following issues to support the need for a new cost management system:

- *Unexplained variation in practice patterns.* Physicians largely drove the health care delivery process through treatment protocols and medical orders that determined patient charges and length of stay. A new cost system could help identify costs associated with specific physician practice patterns.
- *Concern with costs and more appropriate care.* BMC recognized the opportunity to reduce tests and procedures for patients (e.g., ordering a component test rather than a whole profile on blood work). Some inpatient testing and care could be effectively done on an outpatient basis due to advances in medications and other technology. Many diagnostic tests and longer inpatient stays may not result in better patient outcomes.
- *Questions regarding effectiveness.* Questions concerning the effectiveness of care, especially when evaluating new technology or treatments, were becoming increasingly commonplace. Thus, BMC required more sophisticated cost management tools.
- *Beliefs regarding cost vs. value of care.* Balancing the quality of care with the costs of providing care was a fundamental concern for BMC. For example, if a new surgical procedure allows early discharge or little

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scarring but costs 10 times more than an old procedure, is it necessary for the hospital to offer the new procedure and incur additional costs? Executives had to identify a strategy for new technology and the existing methodology, management began to explore alternatives to the old cost accounting methodology. They required a cost system that would provide a product-line focus, i.e., open heart surgery, diabetes care, rehabilitation, or respiratory therapy, and that would permit segmentation of the patient population. Details of Mason's oncological study were reviewed, and the results reinforced the belief that costs calculated on a facility-wide basis were not helpful for making decisions that were DRG-specific.

In March 1991, BMC executives hired an Atlanta-based CPA firm to work with Kelly to gain an understanding of departmental operating costs and to build cost standards. They backloaded cost data for 20 months and identified two types of costs, direct and indirect. Meetings were held twice a week with key hospital administrators and clinicians to determine activities that caused costs.

BMC used a computerized information system known as Transition I (TSI) to assist with standard costing, financial modeling, and forecasting. The software allowed cost managers at BMC to identify activities, link activities to costs, and categorize costs based on predetermined or specific allocation bases. The system also generated simultaneous algebraic equations used to allocate indirect costs to revenue-generating departments. TSI allowed the creation of a database with cost and demographic information that could be sorted by both traditional and nontraditional demographic elements. Detailed information allowed BMC to obtain more accurate measurements of costs to provide care and to monitor and improve the quality of care provided to patients. For example, the patient number, length of stay, total charges, direct costs, and indirect costs for all appendectomy patients treated during a specific time period were summarized by the TSI system (see Table 1).

DIRECT COSTS

Direct costs could be traced to a patient or procedure and included resources consumed in providing testing services, supplies, pharmaceuticals, and nursing care. Costs for patient testing and procedures (including X-ray, laboratory services, operating room costs, labor and delivery room costs) were associated with each patient, using the internally calculated direct cost for each test or procedure. Major supplies and pharmaceuticals were individually assigned to the patient based on the actual cost of the supply or drug.

Nursing care costs were driven to the patient level through daily patient classification and room rate charges. These charges were based on the nursing skill level required to care for patients in each specialty area, as well as the average acuity levels in each specialty area. Nursing staff skill levels were divided into three classifications as follows: registered nurse (RN), licensed practical nurse (LPN), and aide. Examples of specialty areas were obstetrics, surgical, psychiatric, and cardiovascular. BMC divided six acuity levels according to the level of clinical attention required by the patient. For example, a direct cost of $123 per day was incurred in the Nursing-MED/SURG department acuity level 1 (see Table 2).

The cost system produced departmental reports identifying the daily rate by acuity level and the underlying assumptions of the allocation routine (see Table 3). Because the number of minutes required to attend patients varied across acuity levels, the estimated (budgeted) volume of patient days was adjusted for daily service levels, expressed in minutes. The department's budgeted cost was allocated to each acuity level as a percentage of total budgeted minutes. Finally, a daily rate for each acuity level was calculated by dividing the allocated costs by the budgeted volume of days within each acuity level.

INDIRECT COSTS

Indirect costs such as depreciation, administrative, and general were allocated to revenue-producing activities using simultaneous algebraic equations. The calculations were performed by BMC's computerized accounting system using allocation percentages based on the amount of services provided to other departments. The system allocated costs among several departments with reciprocal service relationships. For example, assume an organization has two support departments, housekeeping, information systems (IS), and two revenue-producing departments, operating room (OR) and emergency room (ER). The IS department manager estimated the housekeeping department consumed 10% of the IS department's activities, while the ER and OR required 40% and 50%, respectively. Thus, the IS department's direct costs of $100,000 were allocated to housekeeping, OR, and ER consistent with the resources demanded (see Table 4). Next, the housekeeping department's direct ($60,000) and allocated ($10,000) costs of $70,000 were allocated to IS, OR, and ER using 30%, 40%, and 30%, respectively. Though the IS depart-

ment had allocated all costs total $100,000 in the first step, the housekeeping department transferred costs ($21,000) back into the department that had to be reallocated in the second iteration. Iterations continued until the costs remaining in the support departments were too small to be significant. Thus, after multiple iterations, all support department costs were transferred to the OR and ER (see Table 4).

The cost system used by BMC simultaneously allocated costs associated with all indirect activities to revenue-producing activities based on cost drivers identified by BMC. For example, the education department allocated its costs to various departments including pain management, diabetic services, and emergency room using the percentage of paid hours within each department as the allocation base. Though the process required multiple iterations (see Table 4), the cost management system produced reports after each allocation iteration (see Table 5). When the allocation procedure had completed the final iteration, all costs for support-related departments were contained in the accounts of revenue-producing departments. Thus, education costs were included in the emergency room indirect cost per hour of $142 (see Table 2).

As the health care environment changed, new information demands were placed on the cost reporting system. The Mason study (discussed in the BMC Introduction) added length of stay as well as direct costs within DRG categories to the cost-to-charge ratio. According to Kelly, "TSI represented a significant step toward understanding and managing the costs of delivering health care services at BMC."

REQUIRED:

1. Why didn't the cost data make any sense?
2. What motivated the managers to build a new cost system?
3. How does the TSI system attach costs to a patient or procedure? What are the major design issues?
4. How is the daily rate determined for the Nursing Med/Surg department acuity level 1?
5. How does the reciprocal method allocate indirect costs to revenue-producing departments?
6. Given your understanding of the manner in which TSI allocates costs to patients, would you classify Brookwood's cost system as activity based?

Table 1 Brookwood Medical Center: Appendectomy Patient Listing

Patient Number	Length of Stay	Total Charges	Direct Cost Variable	Direct Cost Fixed	Indirect Cost	Total Cost
			Direct Cost			
1	3	$8,486	751	164	1,187	2,102
2	4	18,394	2,960	566	3,106	6,631
3	2	7,297	926	245	1,280	2,451
4	2	12,350	2,069	258	1,556	3,884
5	2	5,854	765	210	1,152	2,126
6	3	14,574	1,966	395	2,160	4,522
7	2	14,289	2,440	332	1,577	4,349
8	1	5,772	856	102	661	1,619
9	2	11,589	1,404	325	1,553	3,282
10	2	8,398	1,192	365	2,045	3,601
11	2	8,771	1,033	225	901	2,159
12	3	14,920	2,626	295	2,546	5,466
13	3	10,320	1,751	487	2,644	4,882
14	3	8,871	1,097	178	1,460	2,735
15	1	9,103	1,998	221	1,647	3,865
16	2	8,365	1,563	168	1,050	2,781
17	5	13,355	2,195	687	3,237	6,119
18	2	11,235	2,414	258	2,195	4,867
19	1	8,976	1,170	201	1,067	2,438
20	5	18,033	3,123	563	3,457	7,143
21	4	11,756	1,739	229	1,279	3,247
22	1	8,068	1,698	210	1,350	3,258
23	1	8,133	1,669	247	1,257	3,174
24	1	7,396	1,232	160	825	2,217
25	1	6,926	911	147	637	1,695
26	1	7,558	1,268	188	1,141	2,598
27	5	20,140	3,151	468	3,419	7,037
28	2	6,211	718	167	843	1,728
29	2	8,740	1,324	189	1,212	2,724
30	1	6,931	779	140	736	1,656
31	1	8,493	1,345	152	1,013	2,510
32	1	6,580	1,041	153	863	2,056
33	2	8,646	1,328	195	1,200	2,723
34	2	11,319	1,214	247	1,424	2,885
35	1	7,435	1,042	161	817	2,020
36	2	11,765	1,564	267	1,647	3,478
37	1	9,822	1,443	165	1,143	2,752
38	2	10,354	1,929	184	1,669	3,782
39	3	9,117	1,117	126	1,309	2,552
40	1	11,097	1,623	348	1,847	3,818
41	1	9,030	900	141	859	1,901
42	1	7,659	1,558	112	1,045	2,716
43	2	9,943	1,619	174	1,217	3,010
44	2	11,238	1,177	202	1,273	2,651
Total	91	$443,309	67,688	11,017	66,506	145,210

Source: sample of appendectomy patients from TSI data.

Table 2. DRG 470 - Appendectomy Utilization Report

Department Description	*Product Description*	*Direct Cost*	*Indirect Cost*	*Quantity*	*Total Cost*
NURSING - MED/SURG	Acuity level 1 -- daily rate	$123.00	$190.00	1	$313.00
	Acuity level 2 -- daily rate	140.00	229.00	2	738.00
OPERATING ROOM	Major surgery -- 1 hour	174.00	170.00	1	344.00
OPERATING ROOM SUPPLIES	Sutures	17.00	7.00	5	120.00
	Basic surgical pack	17.00	6.00	1	23.00
	Additional OR supplies*	118.00	50.00	1	168.00
RECOVERY	Recovery level II -- 1/4 hours	24.00	11.00	3	105.00
CENTRAL STORES	Central store supplies*	25.50	58.00	1	83.50
LABORATORY SERVICES	Blood profile, potassium, renal profile	29.50	11.00	2	81.00
CARDIOLOGY / EKG	EKG 3 channel w/o physician in	13.00	12.00	1	25.00
PHARMACY	Pharmaceuticals*	163.50	133.00	1	296.50
RESPIRATORY THERAPY	Incentive spirometer	4.00	3.00	5	35.00
	New start spirometer & oxygen	6.00	4.00	1	10.00
EMERGENCY ROOM	ER visit level II -- intensive	80.00	142.00	1	222.00
DIETARY	Daily hospital service	24.00	18.00	3	126.00
LAUNDRY / LINEN	Daily hospital service	9.00	6.00	3	45.00
					2,735.00

* Detail of specific items charged collapsed into one line item.

Table 3. Brookwood Medical Center, Department 6103, Nursing MED/SURG

Budget $95,759

Description	Budgeted Volume in Days	Minutes Daily Service	Budgeted Minutes	Percent Allocation	Allocation	Daily Rate
Acuity level 1	18	346	?	?	?	?
Acuity level 2	264	394	?	?	?	?
Acuity level 3	199	464	92,336	0.343	$32,864	$165
Acuity level 4	25	547	13,675	0.051	4,867	195
Observation	165	40	6,600	0.025	2,349	14
Observation	133	30	3,990	0.015	1,420	11
All others	211	200	42,200	0.157	15,020	71
Total			269,045	1.000	95,759	

Table 4. Calculations for Reciprocal Service Department Allocation

	Service Departments		Revenue Departments	
	IS	**Housekeeping**	**OR**	**ER**
Beginning balance	100,000	60,000	0	0
IS allocation (100,000)	10,000[1]	50,000[2]	40,000[3]	
Balance after allocation	*0*	*70,000*	*50,000*	*40,000*
Housekeeping allocation	21,000[4]	(70,000)	28,000[5]	21,000[6]
Balance after allocation	*21,000*	*0*	*78,000*	*61,000*
2nd IS allocation	(21,000)	2,100	10,500	8,400
Balance after allocation	*0*	*2,100*	*88,500*	*69,400*
2nd housekeeping allocation	630	(2,100)	840	630
Balance after allocation	*630*	*0*	*89,340*	*70,030*
3rd IS allocation	(630)	63	315	252
Balance after allocation	*0*	*63*	*89,655*	*70,282*
3rd housekeeping allocation	19	(63)	25	19
Balance after allocation	*19*	*0*	*89,680*	*70,301*
Transfer minimal balances	(19)	0	10	9
Ending balance	0	0	89,690	70,310

[1] $100,000 * 10%
[2] $100,000 * 50%
[3] $100,000 * 40%
[4] $70,000 * 30%
[5] $70,000 * 40%
[6] $70,000 * 30%

Table 5. Brookwood Medical Center, Education Allocation to Emergency Room

Allocation base: paid hours
Budget -- $500,000

Department	Paid Hours	Percentage of paid hours by department	Amount allocated
Pain Management	2,083	?	?
Diabetic Services	8,993	?	?
Emergency Room	124,212	?	?
Monitoring Services	40,634	?	?
Quality Assurance	21,314	?	?
Dietary	167,411	?	?
Collections	13,650	0.279320	$1,396.60
Outpatient Registration	19,776	0.404677	$2,023.39
All others	4,488,783	91.854210	$459,271.05
Total	4,886,856	100.00%	$500,000.00