Activity-based costing for hospitals
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Activity-Based Costing for Hospitals

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This article examines the application of activity-based costing to hospitals using current health care practices and procedures such as diagnosis-related groups, patient-activity systems, case management, and critical path analysis.

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The challenges posed by managed care, capitated payments, and other restrictive hospital reimbursement mechanisms such as diagnosis-related groups (DRGs) provide an ideal setting for the implementation of activity-based costing (ABC) in hospitals. Current health care practices and procedures such as DRGs, patient-acuity systems, case management, critical path analysis, utilization review, and others can be used in the implementation of the ABC system.

ABC in the manufacturing sector has remained a focal point of interest for practitioners and academics for a number of years. Studies applying the basic principles of ABC used in manufacturing firms to health care organizations have appeared in health care journals only recently. However, a majority of the studies of ABC in health care settings focus on a narrow application of ABC to a department within the health care organization. For instance, Chan[1] examines the application of ABC to the costing of laboratory tests, Ramsey[2] examines the application of ABC to the hospital's radiology department and a nursing station and finally, Canby[3] applies ABC to the X-ray department of the hospital. In this article, I provide a framework for the implementation of ABC for a health care organization's total operations and its specialized services.

The study described in this article examines the application of ABC to the hospital's inpatient services. Application of ABC to a hospital's outpatient care service requires additional considerations. Outpatient care generally involves a much larger number of units of service with relatively small cost per unit. Also, databases on outpatient services and related costs are often poorly developed and bills are often generated at multiple sites. ABC can nonetheless still be applied to a few selected high-volume and high-cost–low-profit margin outpatient services using the principles and techniques described in this article.

NEED FOR A NEW COST SYSTEM

In conventional cost accounting systems, direct costs such as costs of specific services (e.g., use of the operating room, diagnostic procedures, laboratory

Key words: *activity-based costing, case management, critical path analysis, hospitals*

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tests, pharmacy, and physical therapy) are billed directly to patients. However, indirect costs or overhead for the entire hospital operation (including individual departments) are typically accumulated and divided by the total number of patient days to determine the per diem cost. In this system, hospitals assume overhead cost per patient day is the same irrespective of the patient type, level of care, procedure being performed, or length of stay.

However, not all overhead costs vary on a patient-day basis. For instance, overhead costs relating to admissions and registration do not vary with the number of patient days but vary with the number of patients admitted, that is, the cost associated with admitting patients is independent of length of stay. Also, the cost per patient day is not the same across all patients. Patients with short stays but who require extensive nursing support have a higher cost per patient day compared to patients who require long stays with minimal nursing attention. Therefore, conventional hospital cost systems can report seriously distorted cost per patient when patient care is diverse in terms of either level of care (acuity) or amount of care (patient days).

Pricing, which historically has not been a key factor in hospital marketing, is now an important criterion through which hospitals compete for business from large organizational buyers such as managed care organizations (e.g., health maintenance organizations [HMOs] and preferred provider organizations [PPOs]), third party insurers, and employers. This price competition and the resulting importance of accurate cost information make the need for a new cost system urgent in most hospitals.

ACTIVITY-BASED COSTING

ABC is an information system that maintains and processes data on a firm's activities and products/services. It identifies the activities performed, traces costs to these activities, and then uses various cost drivers to trace the cost of activities to the final products/services. Cost drivers are factors that create or influence cost and reflect the consumption of activities by the products/services. An ABC system can be used by management for a variety of purposes relating to both activities and products/services.[4]

ABC involves a two-stage allocation process. In the first stage, we assign hospital costs to activity pools such as "admit patients," "cardiac catheterization," "administer ECG tests," and so on. In the second stage, costs are assigned from these activity pools to individual patients, or units of episodic care, using appropriate cost drivers that measure the patients' consumption of these "activity resources."

DEVELOPING THE ABC MODEL

This section details the development and implementation of ABC on a hospitalwide basis, weaving together the principles and techniques of ABC with current health care practices such as case management, critical path analysis, acuity levels, and total quality management (TQM). The steps in developing and implementing the ABC model are outlined below.

Step 1: Form a cross-functional steering committee

In order to establish a process for implementing ABC, first form a committee that will ultimately be responsible for the implementation and evaluation of the ABC system. A cross-functional steering committee could consist of the following members:

1. RN case coordinators/case management specialists
2. physicians
3. accountant
4. information systems manager
5. medical records personnel
6. outside consultant (if necessary).

The committee and its members should meet regularly with physicians, hospital staff, and management to identify issues that could affect the implementation of the ABC system, such as utilization of resources, quality patient care, communication between the nursing staff and physicians, information systems, and process improvements. It is very important to gain staff and physician support for the ABC system. Personnel will more readily accept the new system if they are educated about the nature of the system and are concurrently involved in the development and implementation phases.

Step 2: Identify case types/DRGs for analysis

Case types for analysis are typically selected based on case volume (high volume), financial impact (high cost, low profitability), variance measure (high variance from DRG estimate), quality assurance issues (high risk), or special interest (new service). Also, for initial analysis, case types with predictable hospital delivery paths are selected. When a high-volume or

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high-cost case type is selected, a decrease in length of stay (LOS) of even 1 day has a very significant impact on costs.

Figure 1 shows a sample graph based on case volume and contribution margin (Price – Variable Cost) per case for each DRG. DRGs in the top left quadrant have the highest case volume and low margin. The hospital is likely to gain the greatest benefit from activity analysis and ABC analyzes these DRGs.

DRGs should not be the only classification system used to develop and implement critical paths and the ABC system. Cost distortions can result when DRGs are broad based and include case types that are nonhomogeneous. In some cases, it might be more accurate to use the *International Classification of Diseases—Ninth Edition—Clinical Modifications* (ICD-9-CM diagnosis codes) instead of DRGs to analyze particular case types.

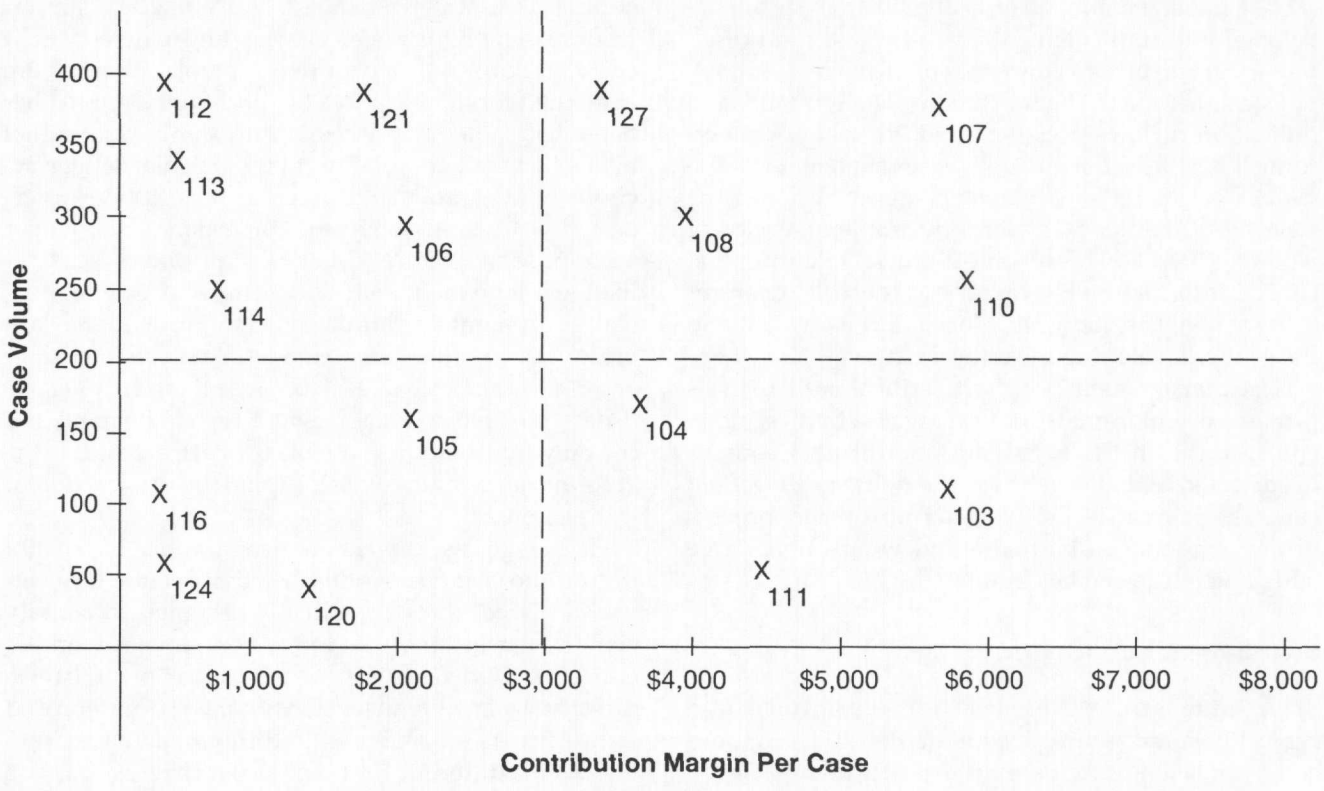
Step 3: Profile the health care delivery system

Using case management and critical path analysis, perform activity analysis across all operations and processes that are required to move the patient from preadmission to discharge.

Case management is both a model and a technology for restructuring the clinical production process to ensure that a patient receives needed services in a supportive, efficient, and cost-effective manner. When integrating case management with the hospital cost accounting system, two perspectives of case management should be considered: the hospitalwide sys-

FIGURE 1

SAMPLE DRG VOLUME—PROFITABILITY MATRIX



Note: Numbers relate to DRG categories

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tems/processes and the direct patient care delivery system or critical path. Analyzing the hospitalwide processes involves examining in detail the activities involved in the preadmission process, the hospital stay process, and the patient discharge process. For instance, in performing an activity analysis of the hospital stay process, the hospital should review the following activities: ordering and receiving drugs from the pharmacy, ordering and providing therapeutic and diagnostic services, utilizing specialty services, and using all the auxiliary services such as laundry, dietary, administrative, and janitorial.

The direct patient care delivery system or critical path analysis is an abbreviated report that shows the critical or key incidents that must occur in a predictable and timely order to achieve the hospital's medical and financial goals. Critical paths are tools that, once individualized by the primary nurse and physician for a particular patient within the first 24 hours of admission, are used on every shift on each consecutive unit to plan and monitor the flow of care.[3] Table 1 presents a sample critical pathway for acute myocardial infarction for days 0–6.

Case management and critical path analysis are developed and implemented typically by a multidisciplinary group of staff consisting of physicians, nurses, physical therapists, diagnostic specialists, quality and utilization review specialists, and other support personnel. RN case coordinators/case management specialists act as liaisons between this group and the steering committee formed for the implementation of ABC (see Step 1). This linkage is crucial to ensure that clinical information is available to the ABC team for activity analysis and cost information is available to the group developing the critical path.

Case management along with critical path analysis proves a useful framework to analyze activities and to collect data on the type and amount of resources needed and actually used for the delivery of patient care. The data can be used to determine where process improvements can be made and where non–value added activities can be eliminated.

Step 4: Aggregate activities

The number of different actions performed in a typical hospital facility is so large that it is economically unfeasible to create an activity pool for each separate action. Therefore, many individual actions have to be aggregated to form a few separate distinct activity pools. A single cost driver is then used to trace the cost of these activities to different procedures/patients. For instance, the different actions associated with the admissions/registration process such as reservations/scheduling, inpatient registration, admissions testing, and patient placement are aggregated into one activity pool—"admit patients." One must note that as more and more actions are aggregated into an activity, the ability of a cost driver to accurately trace the resources consumed by patients decreases. On the other hand, creating separate activity centers for actions that are either similar or inseparable just adds complexity to the ABC system without providing any new insights into how resources are consumed.

Step 5: Analyze cost flow using cost drivers

The hospital cost management system is used to develop cost information on different activities along the critical path from preadmission to discharge. The procedure involves a detailed analysis of the company's general ledger accounts. In collecting cost information it is necessary to combine certain ledger accounts that are associated with use of similar resources. For instance, salaries and fringe benefit costs that are recorded in two separate accounts are combined for the purposes of allocation. On the other hand, it is sometimes necessary to examine individual bills and vouchers relating to a particular ledger account when similar resources are consumed differently by different activities. For instance, the ledger account Maintenance—Medical Equipment is examined to obtain maintenance expenses relating to medical equipment in radiology, operating room, laboratory, and other departments. Analysis of ledger accounts is not a trivial task because there are over 300 different expense categories at a typical hospital and the only information available for each account is the account name and concise explanations of different transactions.

First-stage cost drivers are used to trace the cost of inputs into cost pools for each activity center (see Figure 2). Direct costs are directly assigned to activity centers. For instance, salaries of employees working entirely within an activity center (department) can be directly assigned to that activity center. Common and indirect costs are assigned to different activities centers using different first-stage cost drivers. Table 2 lists different first-stage cost drivers (allocation bases) used to allocate hospital overhead costs to activity centers.

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TABLE 1

CRITICAL PATHWAY: ACUTE MYOCARDIAL INFARCTION

Activities	Day 0 (Preadmission)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Admit patients	Patient reservation Insurance verification Routine admission testing						
Provide nursing care		Complete blood chemistry	Complete blood chemistry	Complete blood chemistry	Complete blood chemistry	Complete blood chemistry	Complete blood chemistry
Perform diagnostics		CBC with differential Cardiac isoenzymes q 8 hr PT, PTT, ACT initially and PTT q 6 hr Beta hCG 12-lead ECG daily Chest X-ray	CBC PTT (if on heparin) Cardiac isoenzymes if not at baseline 12-lead ECG daily and per protocol MUGA scan or echocardiogram, if indicated	CBC PTT (of on heparin) Cardiac isoenzymes if not at baseline 12-lead ECG daily and per protocol	CBC PTT (if on heparin) Cardiac isoenzymes if not at baseline 12-lead ECG daily and per protocol	CBC 12-lead ECG daily and per protocol	CBC 12-lead ECG
Provide nursing care		ECG monitoring	ECG monitoring	ECG monitoring	ECG monitoring	ECG monitoring	ECG monitoring
Administer ECG & other tests		HR, RR, BP q 1 hr Rhythm strip q shift and p.r.n. Continuous oximetry Heart sounds, breath sounds q 1–2 hr	HR, RR, BP q 2 hr Rhythm strip q shift and p.r.n. Continuous oximetry Heart sounds and breath sounds q 2 hr	HR, RR, BP q 2 hr Rhythm strip q shift and p.r.n. D/C oximetry Assess other body systems as needed	HR, RR, BP q 4 hr Rhythm strip q shift and p.r.n.	HR, RR, BP q 4 hr Rhythm strip q shift and p.r.n. Assess other body systems as needed	HR, RR, BP q 4 hr Assess other body systems as needed

continues

TABLE 1

CONTINUED

Activities	Day 0 (Preadmission)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Provide nursing care Cardiac catheterization Dispense medications		Heparin IV NTG continuous IV infusion Beta blocker Calcium channel blocker ACE inhibitor ASA Morphine IV, analgesics Stool softener Sedative Antiemetic	Heparin IV Titrate and D/C NTG infusion NTG SL, transdermal Beta blocker Calcium channel blocker ACE inhibitor ASA Analgesics Stool softener Sedative	Heparin IV NTG SL, transdermal or spray Beta blocker Calcium channel blocker ACE inhibitor ASA Analgesics Stool softener Sedative	D/C heparin NTG SL, transdermal, or spray Beta blocker Calcium channel blocker ACE inhibitor ASA Analgesics Stool softener Sedative	NTG SL, transdermal, or spray Beta blocker Calcium channel blocker ACE inhibitor ASA Analgesics Stool softener Sedative	NTG SL, transdermal or spray Beta blocker Calcium channel blocker ACE inhibitor ASA Analgesics Stool softener
Provide meals		Low-salt, low-fat, low-cholesterol, of ADA diet	Low-salt, low-fat, low-cholesterol, or ADA diet	Low-salt, low-fat, low cholesterol, or ADA diet	Low-salt, low-fat, low cholesterol, or ADA diet	Low-salt, -fat, cholesterol, or ADA diet, NPO after 2400 for stress test	Low-salt, low-fat, low-cholesterol, or ADA diet
Provide nursing care		Bed rest (semi-Fowler's) assistance with ADLs	OOB to chair Assistance with ADLs	OOB to chair Assistance with ADLs	Ambulation, ADLs with assistance	Ambulation with supervision	Ambulation with supervision
Provide therapy		IV access Antiembolism stockings Intake and output Oxygen 2 liters/min	IV access Antiembolism stockings Intake and output Oxygen 2 liters/min	IV access Antiembolism stockings Intake and output Possibly D/C O_2	IV access Transfer to telemetry unit Antiembolism stockings D/C intake and output	IV access Antiembolism stockings	Stress test D/C IV access after

continues

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TABLE 1

CONTINUED

Activities	Day 0 (Preadmission)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Provide nursing services—teaching		Orientation to CCU and hospital routines Review of C.P. Cardiac teaching begins	Instruction on diet Cardiac teaching	Orientation to the difference between CCU and telemetry unit Cardiac teaching	Cardiac teaching	Explanation of stress test Complete cardiac teaching	Written instructions: medications, what to report, activity limits, and next appointment
Discharge planning		Social services Discharge teaching	Dietary and cardiac rehabilitation Plan for family teaching	Discharge teaching	Discharge teaching	Discharge teaching Plan discharge	Discharge to home

Second-stage cost drivers are used to measure the amount of activity resources consumed by different procedures (DRGs) or patients (see Figure 2). Table 3 lists second-stage cost drivers used for the different activity centers.

Step 6: Educate hospital staff about the ABC system

On-site training seminars are held throughout the design and implementation stage to introduce and educate hospital administrators, nurses, and physicians to the concepts and benefits of ABC, case management, and critical path analysis. Hospital staff meetings are used to report progress and to discuss any problems that the steering committee has encountered. These seminars and periodic meetings have two main objectives: to ensure that the design and implementation are appropriate and to build commitment to the ABC and case management system among the hospital staff.

Step 7: Evaluate and analyze data and results

ABC systems in combination with case management and critical path analysis provide crucial financial and clinical measures to conduct variance analysis and evaluate the efficiency of the health care delivery system in terms of achieving expected patient outcomes, timely discharge of patients, appropriate utilization of resources, and cost control.

Variances can be categorized into the following:

1. *Patient variances*: These are due to complications or changes in the patient's health, for instance, conditions such as allergic reactions, infections, diarrhea, and hemorrhages that affect LOS and costs.
2. *Caregiver variances*: These can be due to physician variances or nursing variances. Examples include inappropriate use of equipment, untimely tests, insufficient protection, inadequate discharge planning, failure to promptly notify appropriate personnel, and inadequate patient education.
3. *Environmental variances*: Causes for these variances include equipment breakdown, unavailable beds, scheduling problems, lab delays, and power outages.
4. *Price variances*: These are variances caused by paying higher than budgeted prices for supplies, drugs, instruments, and labor.

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FIGURE 2

GRAPHIC EXAMPLE OF ACTIVITY-BASED COSTING

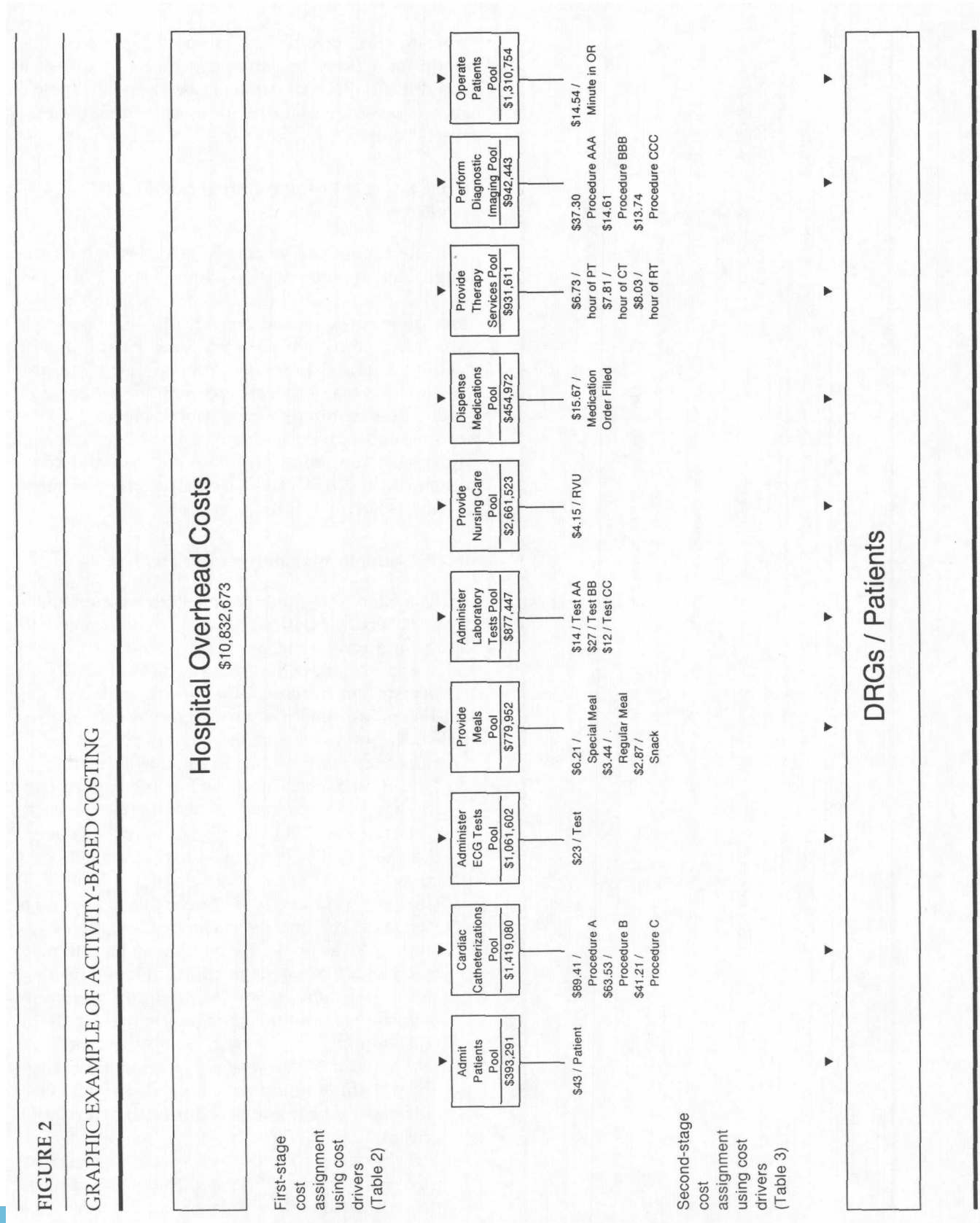

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TABLE 2

FIRST-STAGE COST DRIVERS

	Hospital overhead costs	First-stage cost drivers
Labor-related	Supervision	Number of employees/payroll dollars
	Personnel services	Number of employees
Equipment-related	Insurance on equipment	Value of equipment
	Taxes on equipment	Value of equipment
	Medical equipment depreciation	Value of equipment/equipment hours used
	Medical equipment maintenance	Number of maintenance hours
Space-related	Building rental	Space occupied
	Building insurance	Space occupied
	Power costs	Space occupied, volume occupied
	Building maintenance	Space occupied
Service-related	Central administration*	Number of employees/patient volume
	Central service†	Quantity/value of supplies
	Medical records, and billing/ accounting	Number of documents generated/patient volume
	Cafeteria	Number of meals/number of employees
	Information system	Value of computer equipment/number of programming hours
	Laundry	Weight of laundry washed
	Marketing	Patient volume

*Central administration costs include salaries of the president, vice president, and other central administrative staff.
†Central service costs include supplying, reclaiming, and sterilizing supplies such as gloves, needles, glassware, syringes, linens, surgical packs, and instruments.

5. *Efficiency variances*: These usually include duplicated tests or labwork due to faulty procedures, wastage, patient delay, inadequate credit and insurance screening, staffing schedules, inefficient records location and retrieval systems, absenteeism, and medication dispensing errors.

A variance analysis report for each activity center is completed during a patient's stay at the hospital. The report, in addition to providing patient identification and medical information, lists the different categories of variances, possible reasons for the variances, and resources lost or consumed as a result of the negative variances. Resources consumed are measured in units of cost drivers used specific to each activity center, for instance, for nursing care activity pool, resources consumed is measured in number of relative value units (RVUs).

Figure 3 illustrates the application of variance analysis under an ABC system using a hypothetical example based on costs associated with the nursing care activity pool. Although the variance analysis proposed under the ABC system is similar in structure to a traditional variance analysis, there are two significant differences. First, since under the ABC system variance analysis is applied to each activity pool rather than the entire hospital's operation, more homogeneous cost pools and more causal cost drivers are used in the analysis. Second, with the use of a detailed variance analysis report and the emphasis on "activity analysis" under the ABC system, hospital

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TABLE 3

SECOND-STAGE COST DRIVERS

Activity center	Activities	Cost drivers
1. Admit patients	Reservation/scheduling, inpatient registration, billing and insurance verification, admission testing, room/bed/medical assignment	Number of patients admitted
2. Cardiac catheterization	Scheduling, prepare patient, administer medication, cardiac catheterization, film processing, interpret results, patient education	Number of procedures by type*
3. Administer ECG tests	Scheduling, prepare patient, perform ECG procedure, interpret results	Number of tests
4. Provide meals/ nutritional service	Plan meals, purchase supplies, prepare food, deliver food, clean and sanitize	Number of meals by type†
5. Administer laboratory tests	Obtain specimens, perform tests, report results	Number of tests by type‡
6. Provide nursing care	Transport patients, update medical records, provide patient care, patient education, discharge planning, inservice training	Number of Relative Value Units
7. Dispense medications	Purchase drugs and medical supplies, maintain records, fill medication orders, maintain inventory	Number of medication orders filled
8. Provide therapy	Schedule patients, evaluate patients, provide treatment, educate patients, maintain records	Number of hours by type
9. Perform diagnostic imaging	Schedule patients, perform procedures, develop film, interpret results, transport patient	Number of procedures by type§
10. Operate patient	Schedule patients, order supplies, maintain supplies, instruments & equipment, provide nursing care, transport patient	Number of hours of surgery by surgical suite type

*Cardiac catheterization procedures include therapeutic procedures such as angioplasty, thrombolysis; and diagnostic procedures such as left heart catheterizations, ventriculography, and coronary angiograms.
†Different meal types include special meals, regular meals, and snacks.
‡Laboratory tests include pathological tests, chemical tests, blood tests, immunological tests, and nuclear medicine.
§Diagnostic imaging procedures include routine radiographs of spine, neck, chest, and extremities; mammography; and fluoroscopic procedures such as gastrointestinal series, barium enema, and gallbladder examinations.

administrators are better able to pinpoint weaknesses in the health care delivery system and focus their improvement efforts.

NUMERICAL EXAMPLE OF ABC IN HOSPITALS

To provide a numerical example of ABC in hospitals, assume the following information:

St. Joseph Hospital offers two services/procedures, DRG 1X1 and DRG 1X2. DRG 1X1 is a procedure requiring high-acuity care with a 5-day stay (LOS = 5 days) in the hospital, after which the patient is moved to a nursing home. DRG 1X2 is a procedure requiring low-acuity care with a LOS in the hospital also of 5 days.

Conventional cost system:

The cost of the two procedures under the conventional cost accounting system is computed in Table 4. Note that direct costs are all costs that can be directly assigned to the patient or DRG including physician fees, direct nursing costs, room costs, medications, laboratory tests, and therapy services. Hospital overhead allocated includes hospital and departmental overhead that is not directly assigned to the patient or

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FIGURE 3

ILLUSTRATIVE EXAMPLE OF VARIANCE ANALYSIS UNDER AN ABC SYSTEM

Assume the following information for the nursing activity center of St. Joseph Hospital for the month of September:

Nursing Activity Center
Cost Driver = Number of Relative Value Units (RVUs)

Budget	**Actual**
Activity Level = 600,000 RVUs	Activity Level = 641,331 RVUs
Overhead Costs = $2,700,000	Overhead Costs = $2,661,523
Budgeted Cost per RVU = $4.50	Actual Cost per RVU = $4.15

Information obtained from the Variance Analysis Reports of all patients for the month of September.
Patient Variance = 8,231 RVUs
Caregiver Variance = 11,624 RVUs
Environmental Variance = 14,275 RVUs
Efficiency Variance = 7,201 RVUs

Summary Variance Report for Nursing Activity Center*

Actual Costs†	**Flexible Budget (based on actual quantity)**	**Budgeted Costs‡**
641,331 RVUs × $4.15/RVU = $2,661,523	641,331 RVUs × $4.50/RVU = $2,885,989	600,000 RVUs × $4.50/RVU = $2,700,000

Price Variance = $224,466 (F)

Quantity Variance $185,989 (U)

Patent Variance = 8,231 RVUs × $4.50/RVU = 37,039.50 (U)
Caregiver Variance = 11,624 RVUs × $4.50/RVU = 52,308.00 (U)
Environmental Variance = 14,275 RVUs × $4.50/RVU = 64,237.50 (U)
Efficiency Variance = 7,201 RVUs × $4.50/RVU = 32,404.50 (U)

*It is recommended that individual cost drivers be used for different activity pools in analyzing price and quantity variances. In this example, it is assumed that a single cost driver—number of RVUs—adequately captures the consumption of resources in this activity center.
†Here overhead costs for the Nursing Care Activity Center are assumed to be essentially variable in relation to the cost driver used (number of RVUs). For fixed costs, variances can be further divided into strategic and operational capacity variances.
‡For simplicity, budgeted activity level is assumed equal to standard activity level.

DRG. In a conventional cost accounting system, overhead is allocated on a patient-day basis, as follows:

Hospital overhead allocated / patient-day =
Hospital overhead costs / Number of patient days =
$10,832,673 / 54,838 patient days =
$197.54/patient day

Activity-based cost system:

Let us next assume that St. Joseph Hospital has analyzed its operations using case management and critical path analysis and has identified 10 activity centers (Figure 2) and its first- and second-stage cost drivers (Tables 2 and 3, respectively). It has also analyzed the activities involved within each of the activity centers. Figure 4 presents the analysis of 1 of the 10 activity centers, Perform Diagnostic Imaging Pool, as an illustration.

As shown in Figures 2 and 4, the hospital has determined the amount of overhead cost traceable to each of the 10 activity centers and has computed the overhead rate for each activity center using first- and sec-

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TABLE 4

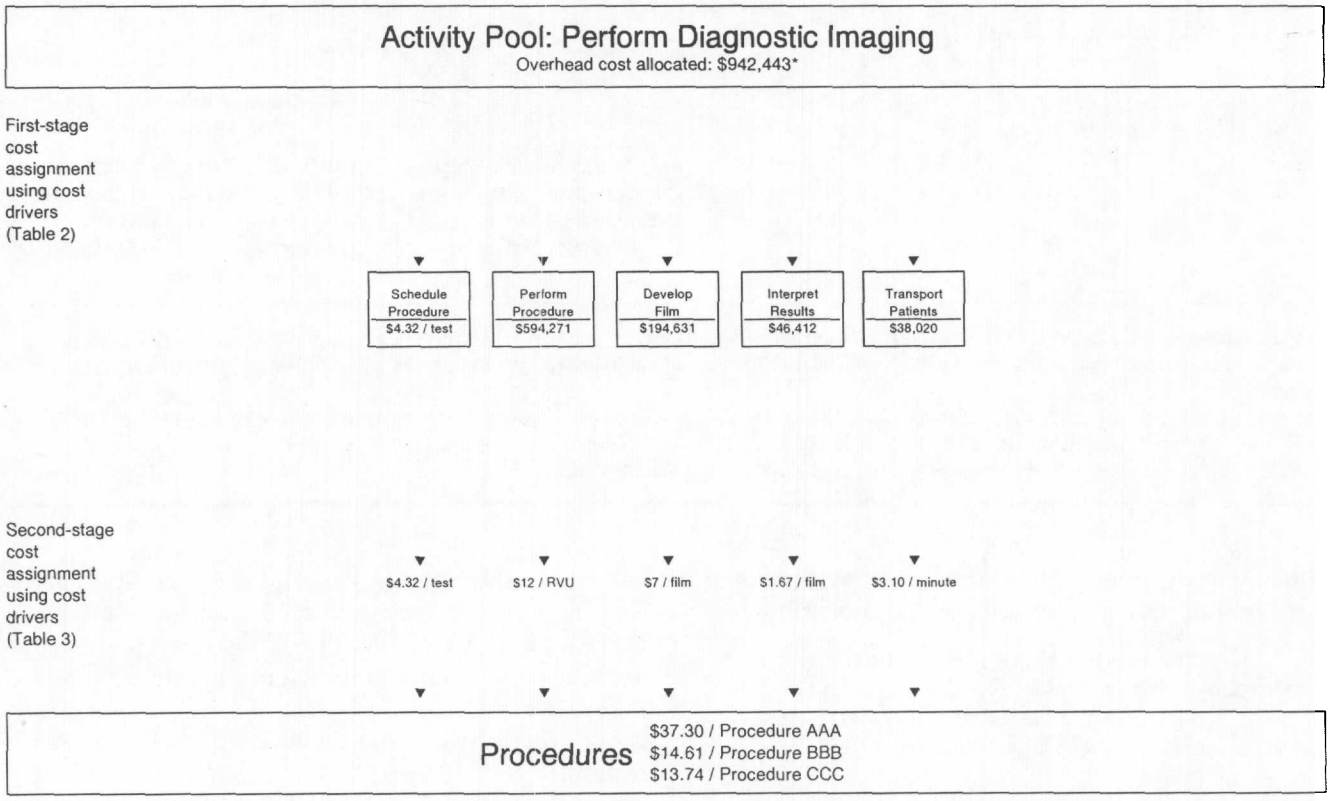
COST UNDER CONVENTIONAL COST ACCOUNTING SYSTEM

	DRG 1X1	DRG 1X2
Patient days	5	5
Direct cost	$8,451.00	$2,421.00
Hospital cost allocated (5 patient days x 197.54)	987.70	987.70
Total Costs	$9,438.70	$3,408.70

ond-stage cost drivers respectively. In Table 5 these rates have in turn been used to assign the hospital overhead costs to the individual patients/DRGs based on the actual number of activity transactions. Note from Table 5 that the use of ABC has resulted in $3,079.78 in overhead cost being assigned to DRG 1X1 and $835.11 in overhead cost being assigned to DRG 1X2. These amounts are used in Table 6 to determine the total cost of DRG 1X1 and 1X2 under ABC. For comparison purposes, we also present costs for DRG 1X1 and 1X2 under the conventional cost system (see Table 4). Under the conventional cost system, DRG 1X1 is undercosted by over 22 percent and DRG 1X2 is

FIGURE 4

GRAPHIC EXAMPLE OF ABC ACTIVITY CENTER: PERFORM DIAGNOSTIC IMAGING POOL



*These are overhead costs relating to the activity center. Direct costs such as salaries of the radiologists, technologists, technicians and staff, cost of supplies and depreciation and maintenance of screening equipment etc. are directly assigned to the activity pools.

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TABLE 5

OVERHEAD COST PER DRG

Activity center	DRG 1X1			DRG 1X2		
	Number of transactions	Rate per transaction	Overhead cost	Number of transactions	Rate per transaction	Overhead cost
Admit patients pool	1 patient	$43/patient	$43.00	1 patient	$43/patient	$43.00
Cardiac catheterizations pool	2 Procedure A	89.41/Procedure A	178.82	1 Procedure C	$41.21/Procedure C	41.21
Administer ECG tests pool	7 tests	$23/test	161.00	4 tests	$23/test	92.00
Provide meals pool	9 special meals	$6.21/special meal	55.89	9 regular meals	$3.44/regular meal	30.96
	6 snacks	$2.87/snack	17.22	6 snacks	$2.87/snack	17.22
Administer laboratory tests pool	4 tests BB	$27/test BB	108.00	3 tests AA	$14/test AA	42.00
Provide nursing care pool	312 RVUs	$4.15/RVU	1,294.80	104 RVUs	$4.15/RVU	431.60
Dispense medications pool	14 medication orders	$15.67/medication order filled	219.38	6 medication orders	$15.67/medication order filled	94.02
Provide therapy sessions pool	7 hrs CT	$7.81/hour of CT	54.67	2 hrs CT	$7.81/hour of CT	15.62
Perform diagnostic imaging pool	2 procedures AAA	$37.30/procedure AAA	74.60	2 procedures CCC	$13.74/procedure CCC	27.48
Operate patients pool	1 hr in OR	$14.54/minute in OR	872.40			
			$3,079.78			$835.11

TABLE 6

COST PER DRG UNDER ABC AND CONVENTIONAL COST SYSTEM

	Activity-based costing		Conventional cost system	
	DRG 1X1	DRG 1X2	DRG 1X1	DRG 1X2
Direct costs	8,451.00	2,421.00	8,451.00	2,421.00
Hospital overhead allocated	3,079.78	835.11	987.70	987.70
Total costs	11,530.78	3,256.11	9,438.70	3,408.70
			Undercosted by 22.16%	Overcosted by 4.47%

overcosted by almost 5 percent. Using ABC, we have been able to identify the overhead costs that are traceable to each DRG/patient based on consumption of activity resources and thus obtain more accurate cost data.

Accurate costs reported by the ABC systems reduce the risk that poor case-mix decisions, faulty pricing decisions, and suboptimal capital budgeting decisions will be made because of inaccurate costs. This risk can be particularly high when competitor hospitals can take advantage of a hospital's poor decisions that can occur as a result of inaccurate costs.

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ABC is a relatively new concept for hospitals. Integrating ABC with case management, critical path analysis, and other hospital control processes represents an exciting new development. It provides a structured approach to analyzing activities, costing services, reducing costs, and improving quality. In addition, it brings to bear the skills of employers from different functional areas of the hospital and helps generate ideas and innovative solutions to the problems at hand.

There are numerous challenges in implementing an ABC system in hospitals. First, collecting the data needed to establish an ABC system is time consuming and expensive. An ABC system is much more complex and detailed than a traditional cost system because costs are allocated to different activity pools and each of these pools is further broken down into several separate activities. This requires detailed analysis of financial accounting records as well as inquiries and interviews to identify and gather costs and other information on specific activities. In some cases, information required for an ABC system is almost impossible to obtain. Also, the statistical analysis required to allocate costs is much more complex for an ABC system. Another barrier to successfully implementing the ABC system is that many organizations view it as a quick fix and purely an exercise in accounting concerned only with developing better cost data. A successful implementation of an ABC system requires a comprehensive paradigm shift in management—a move from a functional departmental view of the hospital management structure to a more cross-functional view of hospital activities and processes. This requires reeducation of the entire organization from physicians to nurses to administrative staff. For this to happen, the initiative and impetus for change should come from senior management. Very often, changing management's perspective is far more complex and challenging than designing the system.

This article introduces the application of ABC to the management of hospitals. As more and more hospitals gain experience with ABC, their shared experiences will provide further insights into the integration and implementation of ABC in hospitals.

REFERENCES

1. Chan, Y.C. "Improving Hospital Cost Accounting with Activity-Based Costing." *Health Care Management Review* 18, no. 1 (1993): 71–77.
2. Ramsey IV, R. "Activity-Based Costing for Hospitals." *Hospital and Health Services Administration* 39, no. 3 (1994): 385–96.
3. Canby IV, J. "Applying Activity-Based Costing to Healthcare Settings." *Healthcare Financial Management* 49, no. 2 (1995): 50–56.
4. Turney, P.B.B. "What is the Scope of Activity-Based Costing?" *Journal of Cost Management* 3, no. 4 (1990): 40–42.
5. Zander, K. "Nursing Case Management: Strategic Management of Cost and Quality Outcomes." *Journal of Nursing Administration* 18, no. 5 (1988): 23–30.

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