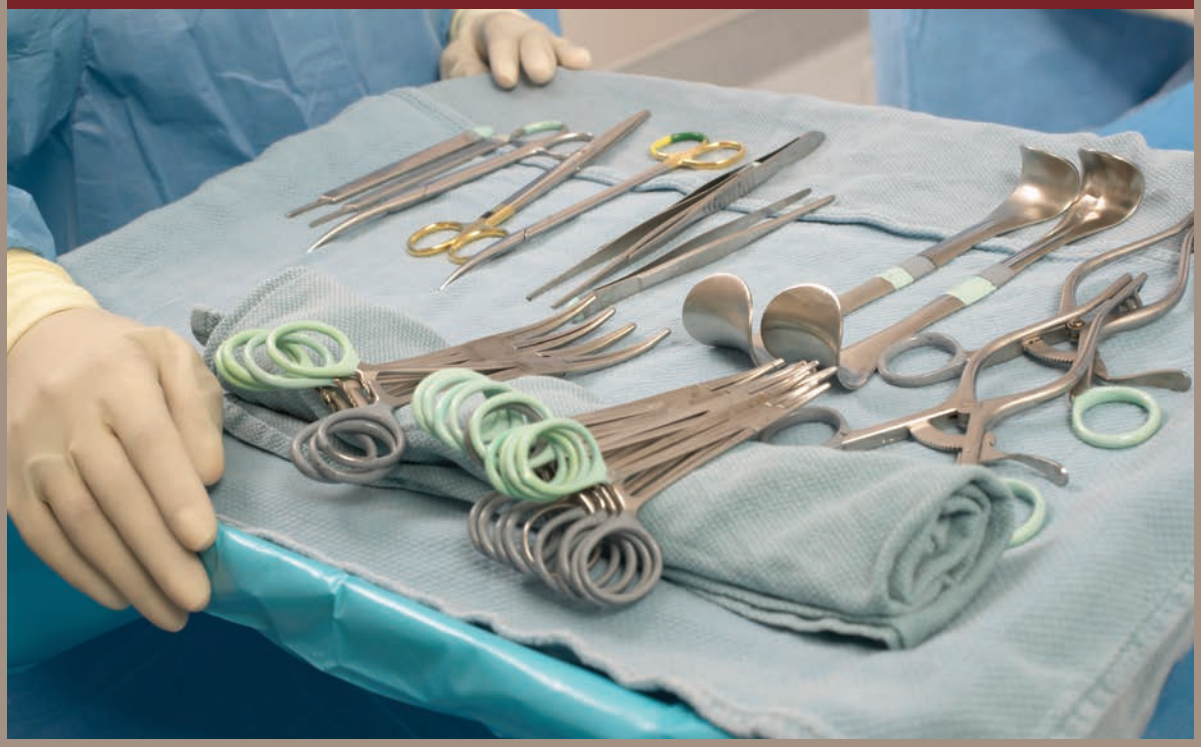
Chapter 13

Cost Control Through Standard Costs



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Learning Objectives

- Explain the significance of profit analysis for an organization.
- Describe the major characteristics and conditions of a standard cost system.
- Compute medical supplies price and usage variances, and identify potential causes of such variances.
- Compute labor rate and efficiency variances, and identify potential causes of such variances.
- Describe the interrelationships that exist among medical supplies and labor variances.
- Explain the major considerations that are the basis of standard costs for overhead.
- Distinguish between a budget variance and a capacity variance for overhead.
- Explain why the capacity variance is related only to fixed overhead costs.
- Explain how standard costs can be used in a process cost system.

Chapter Outline

Introduction

In measuring success in any undertaking, a comparison is usually made between actual performance and expected performance. Any difference is a variance. A manager is then left with the responsibility to explain the what, why, and how of the variance. In doing so, the manager must understand the influence of key variables on the actual results, focus on areas that deserve more detailed investigation, and determine changes that must be made in future planning and control. This chapter introduces the concept of profit analysis and then concentrates on variances associated with a standard cost system for direct medical supplies, direct labor, and factory overhead. The next chapter extends these concepts to analyzing revenues and operating expenses.

13.1 Profit Analysis

Profit is an overall measure of how well an organization is doing. A profit variance, then, is the difference between the actual net income and the planned net income for the same period. The causes of such a variance are related to the various elements that make up net income: revenues, cost of goods or services sold, and operating expenses. The following table shows a disaggregation of the profit variance into more detailed elements.

	Actual	Budget	Variance	
Revenues	$385,000	$365,000	$20,000	Favorable
Cost of goods or services sold	282,500	227,250	55,250	Unfavorable
Gross margin	$102,500	$137,750	$35,250	Unfavorable
Operating expenses	81,250	90,000	8,750	Favorable
Net income	$ 21,250	$ 47,750	$26,500	Unfavorable

To have a variance, a baseline with which to compare actual results is necessary. Common baselines are results of a prior month or year, a budget, a flexible budget, or a standard. The analysis of a profit variance necessarily looks at each significant area in the income statement, and each area has a baseline that management feels is appropriate for the circumstances. The analysis then looks at causes of variation from the baseline.

The cost of goods sold, comprised of the cost of medical supplies, labor, and facility overhead, is generally the most significant cost in the income statement. Consequently, companies expend great effort to manage and control these costs. Managers can easily cite examples of how small savings on a unit basis—or on a single operation or task performed—add many dollars to profit. Analysis of cost variances helps managers to find cost savings.

Cost variances are often based on comparisons between actual and standard costs. Besides cost control, cost variances are also used to evaluate the performance of managers who are responsible for particular costs. For example, a clinic manager might examine medical supplies, labor, and overhead cost variances in the oncology department to evaluate the performance of the oncology department manager.

13.2 The Use of Standards

Standard costs are appropriate where an organization has standard products, services, or repetitive operations, and where management controls the factors comprising a standard cost.

Definition of Standard Costs

A **standard cost** for a product is the amount that management believes one unit of product or service should cost and consists of a **price standard** (a generic term indicating price for medical supplies, rate for labor, and rate for facility overhead) and a **quantity standard** (a generic term indicating quantity for medical supplies, time for labor, and activity or volume for facility overhead). Setting standards for price and quantity involves management judgments, activity studies, work measurement studies, vendor analyses, and contract negotiating, as well as a number of other techniques.

Standards are generally stated on a per unit basis: per unit of quantity, per unit of time, per unit of activity, or per unit of service. Once set, these standards remain unchanged as long as no changes occur in operating methods; in factors that influence quantities; or in unit prices of medical supplies, labor, and factory overhead.

Advantages of Standards

A standard cost system presents many advantages to an organization. Although the primary purpose has always been cost control, properly set standards have many other advantages. This section covers five major advantages of standard costs.

Cost Control

Cost control is comparing actual performance with the standard performance, analyzing variances to identify controllable causes, and taking action to correct or adjust future planning and control. As discussed later in this chapter and the next chapter, costs can change for at least four reasons: (1) changes in levels of prices or fees, (2) changes in efficiency, (3) changes in activity or volume, and (4) changes in the product mix. Variance analysis must identify these changes as well as the managers responsible for these differences so that adjustments can be made to the standards or so that good performance can be rewarded.

Standard cost accounting follows the principle of **management by exception**. Actual results that correspond closely to the standards require little attention. The exceptions, however, are scrutinized. Management by exception can be desirable because it highlights only those weak areas that require management's attention. However, a behavioral effect can occur when management by exception is applied to people. If a worker is ignored when operating according to the standard and is noticed only when something is wrong, the worker may become resentful and perform less satisfactorily. While it may be argued that the worker is being paid to operate at standard, the human factor cannot be ignored. Without recognition, the worker becomes discontented; this discontentment may spread throughout the organization with a loss of both morale and productivity.

Cost Management

Cost management is related to cost control, but here the emphasis is on establishing the level of costs that becomes the benchmark for measuring performance. It can be as simple as decreasing the costs of operations through improved methods and procedures, using better selection of resources (human, medical supplies, and facilities), or eliminating unnecessary (non-value-added) activities. As standards are set and periodically reviewed, operations can be analyzed to identify waste and inefficiency and to eliminate their sources. These reviews can also highlight better than expected performance; appreciation will motivate employees to continue looking for better ways to operate. A standard cost system creates an environment in which people become cost conscious, always looking for continuous improvements in the process.

Decision Making

If standards are set at currently attainable levels (a concept discussed later in the "Quality of Standards" section), the standard costs are useful in making many types of decisions. For example, some common decisions involve regular, special order, or transfer pricing; cash planning; whether to sell or process further; and whether to make or buy. When an analysis is used as the basis for setting the standard costs, managers need not perform a new analysis for each decision.

Record Keeping Costs

A standard cost system saves record keeping costs, not during the initial startup, but in the long-run operation of the system. When using actual costs, each item of medical supplies issued from a storeroom has its cost, which came from a specific purchase order. The cost transferred to patient billing is calculated using an inventory flow method: specific identification, FIFO, LIFO, moving average, or weighted average. For hospitals with hundreds or thousands of different medical supplies in stock, identifying costs to move to patient billing can be an enormous task. When standard costs are in place, each item in the same medical supplies classification has the same standard cost. Therefore, costs transferred to patient billing are the standard cost per unit times the number of units issued. All inventories have their standard costs, and balances are always stated at standard. In Chapter 5, we discussed inventory in greater detail.

Inventory Valuation

A standard cost system records the same costs for physically identical units of medical supplies and products; an actual cost system can record different costs for physically identical units. Differences between the two costs tend to be waste, inefficiency, and non-value-added activities. Such items, if incurred at all, are period costs and excluded from inventory amounts. They should not be capitalized and deferred in inventory values. Therefore, standards provide a more rational cost in valuing inventories.

Occasionally, differences between actual and standard costs show positive efficiencies. Performance has been better than expected. If this situation will continue, the standards are revised. Otherwise, the current standards still provide a rational basis for costing products.

The Quality of Standards

The term "standard" has no meaning unless we know upon what the standard is based. A standard may be very strict at one extreme or very loose at the other extreme. We broadly classify standards as strict or tight standards, attainable standards, and loose or lax standards.

No easy solution exists as to how standards should be set. The objective, of course, is to obtain the best possible results at the lowest possible cost. Often human behavior becomes the dominant concern in setting standards. A very rigorous standard may motivate some employees to produce exceptional results. On the other hand, a standard that is too strict and cannot be reached may discourage employees and produce only modest results. In setting a level of standards, management must consider the employees, their abilities, their aspirations, and their degree of control over the results of operations.

Strict standards are set at a maximum level of efficiency, representing conditions that can seldom, if ever, be attained. They ignore normal medical supplies spoilage and idle labor time due to such factors as medical machine breakdowns. These standards appear to represent perfection, something few employees will achieve. Although a standard should challenge people, a standard that is virtually unattainable will not motivate most employees to do their best and may actually be counterproductive. An employee is more likely to put forth increased effort when feeling successful. In other words, a person's aspirations increase with success and decrease with failure.

In addition, variances from strict standards have little significance for control purposes. There will never be a favorable variance, only zero or unfavorable variances. In fact, most variances will be large and unfavorable. The question is: "What does such a variance measure?"

Loose standards tend to be based on past performance and represent an average of prior costs. They include all inefficiency and waste in past operations. Such standards are not likely to motivate employees to higher performance. The very nature of loose standards means less than efficient performance. As a result, variances from loose standards are almost always favorable and provide little useful information for cost control. Again, the question is: "What does such a variance measure?"

Attainable standards can be achieved with reasonable effort. Perhaps the standards should be somewhat lower than what can be achieved by earnest effort. With success, the employees gain confidence and tend to be more productive. For a more experienced group of workers, an exacting standard may serve as a challenge that motivates an employee to higher levels of performance. With less experienced workers, standards may have to be set at a lower level at first. As learning takes place, the standards may be raised. Increases in standards should be made with caution and should be accepted by the employees as being fair.

Managers should expect to see favorable and unfavorable variances with an attainable standard. Some employees will meet and exceed the standard with reasonable effort, while others will not meet the standard because of poor performance.

Revising the Standards

Standard costs should be reviewed periodically to see if revisions are necessary to maintain a selected level of quality. Although many factors may combine that determine the best time to review standard costs, they should be reviewed at least once a year. Otherwise, they may not be current. This does not mean waiting until the end of the year. Medical facilities with thousands of items on standards will have a department dedicated to reviewing standards throughout the year.

A key for reviewing standards is to identify changes taking place that outdate existing standards. Changes that typically call for a revision to one or more standard costs include:

1. increases or decreases in the price levels of specific medical supplies and other types of supplies, such as housekeeping;
2. changes in personnel payment plans or wage schedules;
3. modifications of medical supplies type or specifications;
4. acquisitions of new equipment or dispositions of old equipment;
5. modifications of operations or procedures;
6. additions or deletions of patient care lines;
7. expansions or contractions of facilities;
8. changes in management policies that affect the amount of costs and the way costs are accumulated and identified with activities, operations, and services; and
9. increased experience of employees.

Management policies can have a significant impact on standard costs. Examples of the most common policy areas are the definition of capacity, the classification of fringe benefits, depreciation methods, and capitalization and expense policies. Capacity definitions influence the level of waste and inefficiency that management will tolerate and the amount of fixed costs applied to individual units of an operation, task, or product. A redefinition of capacity can be due to changes in the number of shifts, in hours of operation with given shift schedules, or in patient demand. Fringe benefits can appear in several ways, any of which can influence a service cost significantly. Management can classify any element of fringe benefit cost as a direct cost of the service, an indirect cost through a labor-related cost pool, an indirect cost through a facility overhead cost pool, or a period cost through a general and administrative cost pool. Management determines which depreciation methods are in use. One common policy is to change from a declining balance method for existing equipment to a straight-line method at about the midlife point of the asset life. Occasionally, management will change the method applied to new equipment purchased. The criteria for capitalization and expense decisions determine which costs are capitalized as assets and charged to operations through depreciation and amortization and which costs are charged immediately upon incurrence. Any change in the criteria alters the treatment of those costs affected.

Throughout the chapter, we assume that standards are entered into the formal accounting system. As such, service costing is determined through a standard cost system. Many companies do not follow this practice. Instead, they use standards to determine cost variances for control purposes. Revision of standards is much more critical if the standards are the basis for service costing.

13.3 Standard Cost Sheet

In a healthcare organization, a cost sheet would be developed with input from a healthcare professional and a financial professional. The healthcare professional would define the time it takes to complete a procedure, the labor entailed, the supplies needed, and the equipment to be used. Once this list is generated, the financial professional would analyze the list from the prospective of costs for each of the elements on the list.

Once standards have been set for each cost component (direct medical supplies, direct labor, and manufacturing overhead), the costs are summarized in a **standard cost sheet**. Here the cost of each category of direct medical supplies used; the cost of each direct labor operation employed; and the cost of all overhead tasks, operations, processes, and support functions applied to a unit of service are itemized. Standard cost sheets can be extremely lengthy or very simple depending on the service process.

Suppose that Zaner Medical Supplies, Inc., owner of over 200 medical supply franchises, uses a standard cost system in accounting for its bandages specials. The standards currently are as follows:

Component	Total Cost of Component	Unit Cost
Medical supplies	3 boxes at $4.00 per box	$12.00
Direct labor	0.5 hour at $7.00 per hour	3.50
Variable overhead	0.5 hour at $6.00 per hour	3.00
Fixed overhead	0.5 hour at $9.00 per hour	4.50
Total cost per purchase		$23.00

This standard cost sheet gives the total unit cost of each special purchased. For each completed special, three boxes of direct medical supplies at a total cost of $12 is taken from medical supplies inventory and charged to bill. Also, $3.50 is charged for direct labor, and a total of $7.50 in overhead costs is applied. Nothing is noted here about the actual costs incurred because all production is carried only at standard cost. Thus, when completed purchases are transferred to Cost of Goods Sold, the cost is $23 per special. The standard cost sheet becomes the basis for all accounting entries related to the cost of the special.

To explain standards for medical supplies, direct labor, and overhead, we need to know the volume of output and the medical supplies quantities allowed for that volume in order to calculate certain variances. The standard cost sheet lists the allowed amounts. The volume of output will be expressed as units of product or equivalent units, depending on the circumstances in production.

13.4 Standards for Medical Supplies

Standards are established for the cost of obtaining medical supplies and for the quantities to be used in serving patients. Managers then compare actual costs against these standards to ascertain variances. Basically, two types of variances exist: price and usage. Different variances may be developed for specialized purposes, but they can always be classified as variations in the price of medical supplies or in the quantities used, or as a combination of price and usage. If the actual cost is greater than the standard cost, the variance is an **unfavorable variance**; if actual cost is less than the standard cost, the variance is a **favorable variance**. It should be noted that favorable versus unfavorable do not necessarily imply good versus bad for the overall interests of the company.

Medical Supplies Price Variance

A **medical supplies price variance** measures the difference between the prices at which medical supplies are acquired and the prices established in the standards. What is in the standard, how a variance is calculated, and what are potential causes of variances are now explained.

Setting the Price Standard

A standard price is set for each item of medical supplies the company expects to use. The cost elements that make up the standard are a matter of management policy. Although the purchase price is the dominant element, other costs may also be included, such as the cost of insurance for medical supplies in transit, the cost of transporting medical supplies, various cash and trade discounts, and costs of receiving and inspecting medical supplies at the receiving dock. Once management decides on the elements, the next step is assessing prices. The estimation techniques are not discussed here, but common approaches to determining amounts include:

1. statistical forecasting;
2. knowledge and experience in the particular type of business;
3. weighted average of prices in most recent purchases; and
4. prices agreed upon in long-term contracts or purchase commitments.

Accounting for a Price Variance

A medical supplies price variance is isolated at the time of purchase. To be able to act upon an excessive variance as soon as possible, management should determine the medical supplies price variance when the medical supplies are purchased rather than waiting until the time the medical supplies are used in providing medical services.

The actual quantity of medical supplies purchased is entered in the medical supplies inventory at standard prices. The liability to the supplier is recorded at actual quantities and actual prices. Any difference between the two amounts is recorded as a price variance.

To illustrate, assume that Zaner Medical Clinics bought 40,000 units of medical supplies for $159,200, which is $3.98 per unit. To make the example easier to follow, we will use the following symbols:

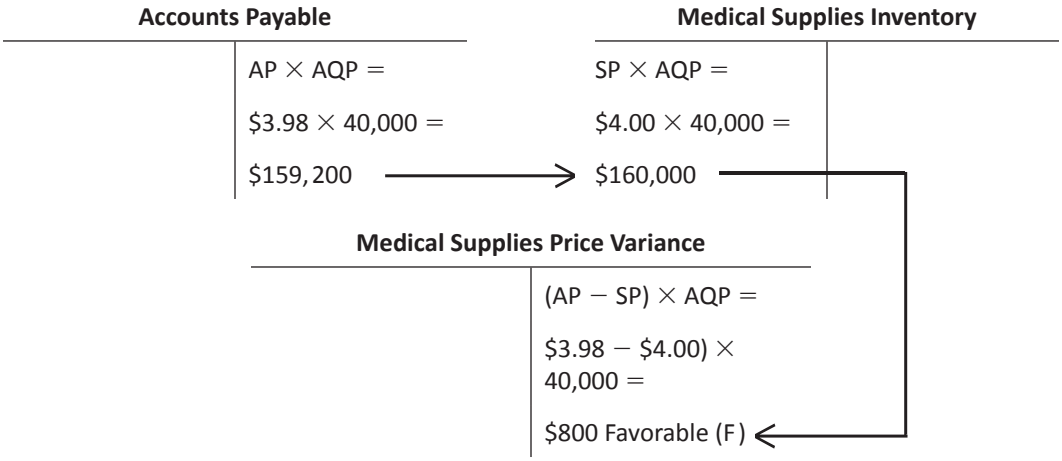
AQP = Actual quantity purchased

AP = Actual price = $3.98

SP = Standard price = $4.00

MPV = Medical supplies price variance.

The cost flow of actual and standard costs would appear in T-account form as follows:



To calculate the variance without thinking in terms of accounts, the information from the T-accounts can be summarized into convenient formulas.

$$AP \times AQP = \$3.98 \times 40{,}000 = \$159{,}200$$

$$SP \times AQP = \$4.00 \times 40{,}000 = \$160{,}000$$

$$MPV = (AP - SP) \times AQP = -\$0.02 \times 40{,}000 = \$800 \text{ Favorable.}$$

Note that the actual quantity is used in all three calculations above. Only the prices differ. A medical supplies price variance can be either favorable or unfavorable when actual costs are compared with standard costs. In this illustration, the medical supplies price variance is favorable because the medical supplies were purchased at a cost below the standard.

Causes of the Price Variance

A variance occurs for any number of reasons. If the variance is significant, we must identify causes. If performance is deemed good, the responsible people should be praised and, where appropriate, rewarded. If the investigation finds out-of-control situations, corrections can be made so variations are eliminated in the future. In some cases, outdated standards are being used and need to be adjusted.

Although many causes for variances pertain to any given situation, a list of the common sources is as follows:

1. fluctuations in market prices;
2. medical supplies substitutions;
3. market shortages or excesses;
4. purchases from vendors other than those offering the terms used in the standard;
5. purchases of higher or lower quality medical supplies;
6. purchases in nonstandard or uneconomical quantities;
7. changes in the mode of transportation;
8. changes in the patient service schedule that result in rush orders or additional medical supplies;
9. unexpected price increases or decreases;
10. fortunate buys; and
11. failure to take cash discounts.

Responsibility for the Price Variance

The purchasing department is usually charged with the responsibility for price variances. If the purchasing function is carried out properly, the standard price should be attainable. When lower prices are paid, a favorable medical supplies price variance is recorded, indicating that the department's purchases were below the standard cost. Higher prices are reflected in an unfavorable medical supplies price variance. In some circumstances, price variances really should be charged to a production department instead of to the purchasing department. As examples, a rush order may be caused by last-minute patient service needs, or physicians may request a specific brand name for medical supplies, such as brand name rather than generic drugs, rather than allowing the purchasing department to buy by specifications, which, for example, could be cheapest available generic substitution.

Periodic reports show how actual prices compare with standard prices for the various types of medical supplies purchased. Reports on price variances may be made as frequently as daily but will generally be weekly and monthly. They reveal which medical supplies, if any, are responsible for a large part of any total price variation and can help the purchasing department in its search for more economical vendors.

Medical Supplies Usage Variance

Medical supplies are used for treating patients, but the actual quantity used may be more or less than specified by the standards. The variation in the quantity of medical supplies is called a **medical supplies usage variance**. Other names for this type of variance are medical supplies quantity variance, medical supplies use variance, and medical supplies efficiency variance.

Setting the Quantity Factor

The quantity factor in a medical supplies standard is based on service standards, bills of medical supplies, and routings. Combined, these items specify the quality, size, thickness, weight, and any other factors necessary for treating a patient. Also included in the quantity factor are any desired allowances for normal acceptable waste, scrap, shrinkage, and spoilage that may occur.

Accounting for a Usage Variance

As medical supplies are used, the patient billing is increased by the standard quantity used multiplied by the standard price. The medical supplies inventory account is decreased by the actual quantity used multiplied by the standard price. Returning to Zaner Medical Supplies, assume that 31,000 pounds of medical supplies are withdrawn from Medical Supplies Inventory for processing orders. Because the standard cost sheet indicates only 3 pounds should be used for each special unit, the standard quantity of medical supplies that should have been used is 30,000 pounds (3 pounds × 10,000 units).

For our example, we will use the following symbols:

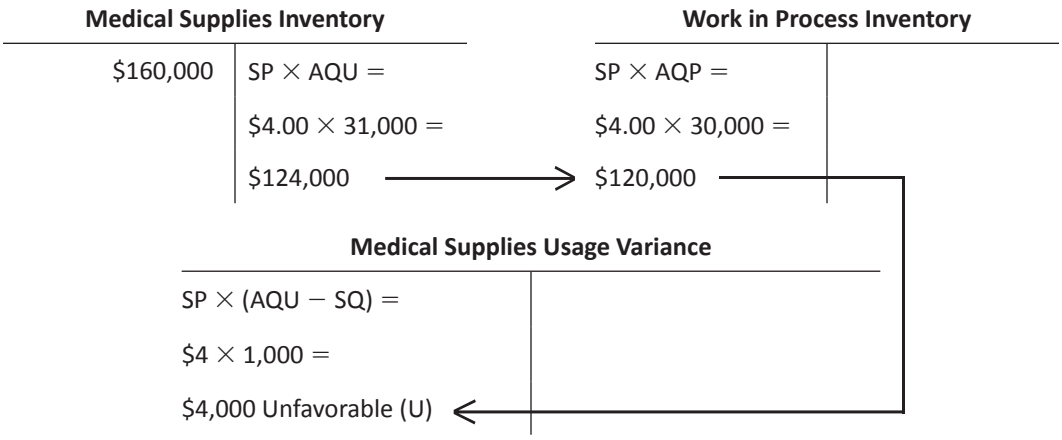
SP = Standard price

AQU = Actual quantity used

SQ = Standard quantity allowed

MUV = Medical supplies usage variance.

The cost flow of actual and standard costs would appear in T-account form as follows:



To calculate the variance without thinking in terms of accounts, the above information can be summarized into convenient formulas.

$$SP \times AQU = \$4.00 \times 31{,}000 = \$124{,}000$$

$$SP \times SQ = \$4.00 \times 30{,}000 = \$120{,}000$$

$$MUV = SP \times (AQU - SQ) = \$4.00 \times 1{,}000 = \$4{,}000 \text{ Unfavorable.}$$

In the first two equations, the standard unit price is used, but the quantities differ. In one case, the actual quantities issued from the storeroom are used. In the other, the standard medical supplies quantity allowed for each meal is used. Because only quantities can differ in the equations, any variation is a usage variance. The variance for Zaner Medical Supplies is unfavorable because the amount of medical supplies used is greater than the amount called for by the standard.

The following table illustrates the medical supplies costs and variances:

A	B	C	D	E	F	G
AQP × AP	A − C = Direct medical supplies price variance	AQP × SP	C − E = Increase or decrease in inventory	AQU × SP	E − G = Direct medical supplies usage variance	SQ × SP
40,000 × $3.98 = $159,200	$159,200 − $160,000 = $800F	40,000 × $4.00 = $160,000	$160,00 − $124,000 = $36,000	31,000 × $4.00 = $124,000	$124,000 − $120,000 = $4,000U	30,000 × $4.00 = $120,000

Causes of the Usage Variance

What causes a medical supplies usage variance? To answer this question, we look at the elements that make up the quantity standard and the specific situation. Examples of common causes include:

1. changes in product specifications;
2. medical supplies substitutions;
3. breakage during the handling of medical supplies in movement and processing;
4. improper use of medical supplies by workers;
5. machine settings operating at nonstandard levels;
6. waste; and
7. pilferage.

Responsibility for the Usage Variance

Ordinarily, medical supplies usage variances are chargeable to patient-care departments in a medical facility. They often arise as a result of wasteful practices in working with medical supplies.

Reports on the quantities of medical supplies used are given to the responsible department supervisor. A supervisor, for example, may receive daily or weekly summaries showing how the quantities used in the department compare with the standards. At the operating level, managers can directly control the use of medical supplies. Often, reports on variations from standard are for physical quantities only. Managers may not need immediate feedback from a cost report. Daily or weekly cost reports simply tell managers the financial magnitude of variations and serve as a reminder that corrections should be made before losses become too great.

Summary reports of actual and standard medical supplies consumption given in dollars, with variances and variance percentages, also go to the clinic manager at least monthly. If the variances in any department are too large, the clinic manager can take steps to reduce them. During the month, of course, the operating managers will watch medical supplies usage; if they have been doing their jobs properly, the accumulated variances for the month should be relatively small.

Interrelationships of Price and Usage Variances

We have treated the medical supplies price and usage variances as though they are independent and unrelated. In many cases, the event that causes one variance also causes the other. For example, assume the purchasing department buys lower-grade medical supplies at a substantially reduced price. This generates a favorable price variance for purchasing. When those medical supplies are used in patient care, they result in a higher than normal waste. This gives the operating supervisors unfavorable usage variances. Keeping the two variances in isolation makes the purchasing agent look good, while the operating supervisors turn in poor performances. In reality, both variances are the responsibility of the purchasing department. If the variances net out favorable, the purchasing decision has benefited the company. On the other hand, a net unfavorable variance is a loss to the company.

The operating people can also influence the price variance. If improperly adjusted machines, for instance, generate a higher than usual waste, more medical supplies may be needed from the storeroom. When a supervisor requisitions the medical supplies and the storeroom manager realizes sufficient quantities are not available, a request is made to the purchasing department to order more. To fulfill patient needs, a rush order is issued. The higher prices paid for a rush order will result in an unfavorable price variance.

The warning of these situations is simple: Investigation of variances must not be done in isolation.

13.5 Standards for Labor

We can set standards for direct labor and measure variances from the standards in much the same way as we did for medical supplies. The price factor is called rate; the quantity factor is time. When referring to variations in time, we use the term *efficiency*. The **labor rate variance** measures the portion of the total labor cost variance caused by the difference between the actual wage rate paid and the standard wage rate. The **labor efficiency variance** measures the portion of the total labor cost variance caused by the difference between the actual hours worked and the standard hours required for production.

When discussing standards for labor, we assume direct labor only. Indirect labor consists of the costs for people working in the departments but not directly charged to a specific patient, and for the time of direct laborers classified as training time, break time, overtime premium, and idle time. These costs are often distributed from payroll to overhead and become part of overhead standards. Therefore, indirect labor is discussed later as part of overhead.

Setting Rate Standards

Standard cost systems rely on individual labor rates by skill-level classification for better control and accuracy. However, in some cases, standard rates can be set for entire cost centers or departments. Regardless of how it is structured, the underlying wage or salary rate used as the standard rate will be established either through contract negotiations or by

the prevailing rates in the location where the work is performed. The details for selecting wage-level classifications cover training, education, experience, special physical abilities, and set of task skills.

When setting the standard rates, management must decide whether to use a basic labor rate or a "loaded" labor rate as the standard. A "loaded" labor rate includes labor-related costs such as overtime premiums, shift premiums, bonuses and incentives, payroll taxes, and fringe benefits. Those factors not included in the labor rate standard will be included in overhead. Therefore, management will look at the advantages of treating these cost factors as direct costs or as indirect costs.

In a healthcare organization, good clinical record keeping is essential to support the cost of care and set standard rates. In some cases, patient care needed is minimal, but in others more intensive care is needed. The medical facility needs to justify its billing. Clinical record keeping can provide the data needed to justify this billing. For example, if the patient is at a high level of acuity, more nursing care and supplies will be needed, and then the patient billing should be higher. For a patient at a lower level of acuity, the billing should be less. Standard rate setting should reflect these differences, but accurate clinical record keeping will be essential to develop these standard rates.

Setting Time Standards

Time standards are more difficult to establish than medical supplies quantity standards. People's productivity is the basis for setting time standards, and people tend to differ in behavior from one time to the next. Setting time standards involves answering two questions: (1) Which operations are performed? and (2) How much time should be spent on each operation to provide the service? The answer to the first question is determined by reviewing operations and procedures, process charts, and routing lists. The answer to the second question will be determined from one or more of the following methods:

1. operation and body movement analysis (This involves dividing each operation into the elementary body movements such as reaching, pushing, turning over, etc. Published tables of standard times are available for each movement. These standard times are applied to the individual movements and added together for the total standard time per operation.);
2. time and motion studies conducted by specialists;
3. averages of past performance, adjusted for anticipated changes; and
4. test runs through the service process for which standards are to be set.

Accounting for the Rate and Efficiency Variances

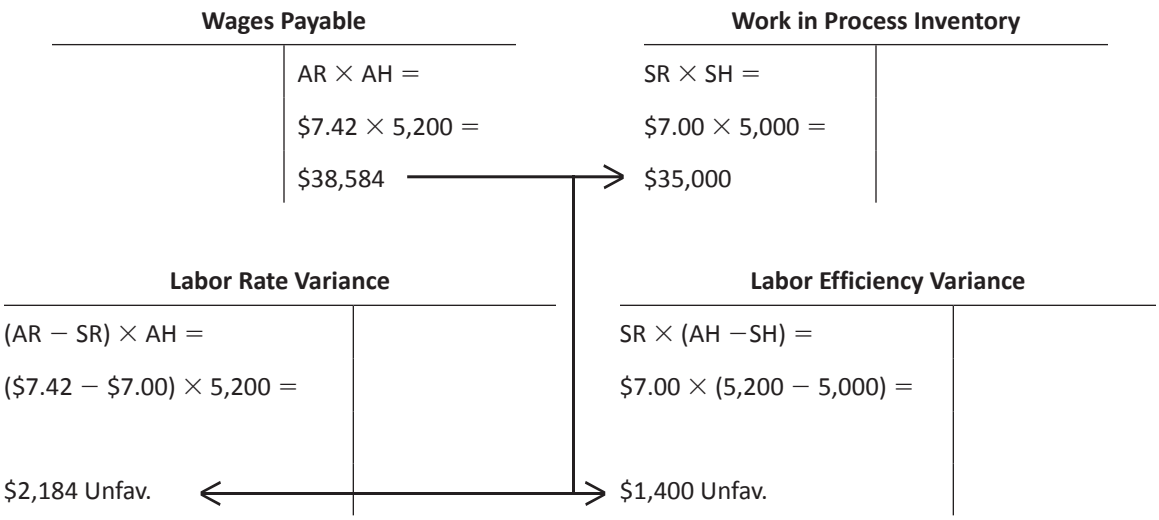
Unlike medical supplies, labor cannot be purchased and stored until needed. We purchase and use labor at the same time. Therefore, accounting for both variances is combined.

Zaner Medical Supplies shows a payroll for its direct workers of $38,584 and 5,200 hours. That gives an actual rate of $7.42 per hour. The standard cost sheet shows that each completed unit requires one half hour of direct labor time. Since 10,000 units were produced, 5,000 hours should have been worked (0.5 hour $\times$ 10,000 units).

For our example, we will use the following symbols:

AR = Actual rate
SR = Standard rate
AH = Actual hours
SH = Standard hours allowed
LRV = Labor rate variance
LEV = Labor efficiency variance.

The cost flow of actual and standard costs would appear in T-account form as follows:



The labor rate variance is commonly calculated first. It results whenever the actual rate paid to a worker differs from the standard rate. Calculating a labor rate variance requires holding the actual hours constant while comparing the difference in rates, as follows:

AR × AH = $7.42 × 5,200 = $38,584
SR × AH = $7.00 × 5,200 = $36,400
LRV = (AR − SR) × AH = $ 0.42 × 5,200 = $ 2,184 Unfavorable.

The variance is unfavorable because the actual rate exceeds the standard rate.

The labor efficiency variance (also called quantity, time, or usage variance) results when employees' total actual hours worked differ from the standard. We calculate the variance by holding the rate constant while comparing the difference in hours. The following summarizes this procedure:

$SR \times AH = \$7.00 \times 5{,}200 = \$36{,}400$

$SR \times SH = \$7.00 \times 5{,}000 = \$35{,}000$

$LEV = SR \times (AH - SH) = \$7.00 \times 200 = \$1{,}400$ Unfavorable.

The variance is unfavorable because the actual hours worked are more than the standard hours allowed for the 10,000 meals produced.

Because the hours are purchased and used at the same time, an alternate approach to calculating the variances can be used:

Actual Cost	Inputs at Standard	Standard Cost
$AR \times AH$	$SR \times AH$	$SR \times SH$
$\$7.42 \times 5{,}200$ hours = $38,584	$\$7.00 \times 5{,}200$ hours = $36,400	$\$7.00 \times 5{,}000$ hours = $35,000

Rate variance	Efficiency variance
$2,184 unfavorable	$1,400 unfavorable

Causes of Labor Variances

Labor rates are usually set by contract, negotiations, management, or federal laws or regulations. So why would a labor rate variance occur? Two basic reasons exist. First, labor rates often represent an average for a task, operation, or work center. If a departmental manager shifts workers' assignments because of sudden changes in personnel requirements or a shortage of personnel, the average rate can easily change depending on how the shift relates to higher-paid or lower-paid workers. A second reason is that standard labor rates may include cost elements beyond the basic labor rate. Any changes in overtime worked, shift differentials, payroll taxes, or fringe benefits will show up in a labor variance if these elements are part of the standard rate.

Labor efficiency relates to how many units are completed per actual hour for each task, operation, or process. Many reasons exist for why productivity varies from the level assumed in the standard time. Some of the common causes of a labor efficiency variance include:

1. use of lower-skilled or higher-skilled workers;
2. effects of a learning curve;
3. use of lower-quality or higher-quality medical supplies;
4. changes in service methods;
5. changes in scheduling;
6. installation of new equipment;
7. poorly maintained equipment or machine malfunction;

8. delays in routing work, medical supplies, tools, or instructions;
9. insufficient training, incorrect instructions, or worker dissatisfaction; and
10. the additional time needed to take care of a patient who does not cooperate.

Responsibility for Labor Variances

Labor rate and efficiency variances are charged to the department managers who have control over the use of workers. Labor rate variances are often the responsibility of personnel managers who manage hiring, union contracts, and perhaps labor scheduling. Although a labor rate variance is important to understand and control, managers tend to concentrate more on the labor efficiency variance because it has a greater impact on capacity utilization and the department's ability to meet schedules. Labor efficiency is compared by department and by job with established standards. Daily or weekly reports to department managers and the clinic manager help to locate and solve difficulties on a particular job or in a department. Differences between standard costs and actual costs incurred by a job or department may show that a job cannot be handled at the standard labor cost or that a department is not managed properly.

Interrelationships of Variances

As discussed with medical supplies, variances should not be analyzed in isolation from one another. The event that causes one variance can easily be the cause for one or more other variances. Future cost planning and control can be improved when interrelationships among labor variances and between medical supplies and labor variances are identified and understood.

Labor Rate and Efficiency Variances

People perform the productive effort; thus, the rate of pay and the time required are related. Because so many relationships can exist between the two factors, only a few examples are cited to aid in identifying what to look for in a specific operation.

Assume a number of employees are in various temporary nursing services that have been contracted to fill shifts temporarily. As a short-term solution, a manager has two options: (1) employ temporary workers or (2) shift other workers internally and add overtime. Using temporary workers may be cheaper or more expensive depending on the situation. They are not as experienced with the equipment, procedures, and processes. They may take more time than the standard allows. Therefore, hiring temporary workers can result in both rate and efficiency variances. The second option is to shift existing workers and use overtime. The move will put differently skilled workers on new jobs. The move can create either a favorable or an unfavorable rate variance depending on the mix of workers. Their experience levels may be higher or lower than the specific job requires and can result in an efficiency variance. Adding overtime could affect a rate variance, depending on how the company treats the overtime premium. Efficiency should not be an issue of overtime unless the workers become less productive through fatigue.

In another case, suppose an employee is having difficulties working on a particular machine. The worker is taking more time than standard to provide patient services. The manager, trying to keep on schedule and not lose capacity to inefficiency, shifts a more skilled, higher-paid worker to the job. The higher-paid worker will yield an unfavorable rate variance but can reduce the unfavorable efficiency variance or create a favorable one.

Medical Supplies and Labor Variances

Medical supplies and labor variances can also be related to the same source. Assume, for instance, that a purchasing agent made a fortunate buy on a lower-quality grade of medical supplies. The "good buy" yields a favorable medical supplies price variance for purchasing. However, when the medical supplies are used in serving patients, they crumble and create more waste than anticipated. More medical supplies are needed, and an unfavorable medical supplies usage variance arises. A department manager, desiring to minimize the lost time, moves higher-skilled people to the operation where the higher waste occurs. This action leads to a labor rate variance and may influence the magnitude or the direction of a labor efficiency variance.

In another case, a worker starts the shift fatigued and stressed. Lack of concentration results in higher waste, which takes more medical supplies and time. This results in unfavorable medical supplies usage and labor efficiency variances. Because more medical supplies are needed, the manager requisitions additional medical supplies from the storeroom. The storekeeper finds fewer medical supplies available than are now required. Purchasing is asked to place a rush order so that patient care can proceed with minimum delay. The rush order increases the purchasing costs, causing an unfavorable medical supplies price variance.

13.6 Standards for Overhead

The facility overhead costs consist of all manufacturing costs that are not classified as direct medical supplies and direct labor. Examples of facility overhead costs include indirect medical supplies, indirect labor, maintenance and repairs, lubrication, power, facility property taxes and insurance, and depreciation. Service organizations will have similar overhead costs related to providing services.

In a standard cost system, we use a standard overhead rate to apply these costs to services. We accumulate the actual overhead costs and compare them to the applied amounts to determine whether the standards were met. Variances from the standard help to direct management's attention to situations where costs should be controlled more closely, where managers should be praised and rewarded for good performance, or where the standards should be revised.

Development of Overhead Rates

Standard costs for overhead have price and quantity factors, just like direct medical supplies and direct labor. Price is reflected in one or more overhead rates; quantity is the

measure of activity. Price and quantity in this case are closely linked. In developing standard overhead rates, five major considerations must be evaluated.

First, which cost elements are included in overhead? We need to identify the individual costs that compose overhead. When certain variances occur, these items will be examined for specific changes.

The second consideration is the measure of activity for relating overhead costs to products. A **measure of activity** for this purpose represents the factor that best expresses how costs change as volume increases or decreases. As noted in earlier chapters, we refer to the measure of activity as an allocation base or cost driver. Although many factors can influence costs, we select a dominant cost driver. The common ones are direct labor hours or costs, machine hours, and units of products. In Chapter 11, we examined activity-based costing and identified other cost drivers that cause costs to be incurred. Our use of the measure of activity is the same as a primary-stage cost driver in those discussions. For standard costs, the appropriate measure must be selected if variances are to provide any meaningful information.

Third, and closely related to the measure of activity, is the concept of capacity and the anticipated volume level for the current period. We discussed several capacity concepts in Chapter 11. The capacity or volume concept selected and the determination of the current period level significantly influence overhead rates because of the presence of fixed costs.

A fourth consideration is cost behavior. The behavior of each cost within overhead is important because management plans and controls variable costs differently than it plans and controls fixed costs. Consequently, distinguishing variable from fixed overhead costs aids in analyzing variances for cause and responsibility. Standard cost systems often use dual overhead rates for variable overhead costs and for fixed overhead costs. In separating the variable and fixed cost rates, different cost drivers may be used for each cost behavior.

The fifth consideration is the level at which overhead rates should be set: by task, by machine or labor operation, by activity center, by department, by facility, or overall. For a single product operation, overall rates for variable and fixed costs are sufficient. The greater the product and operation diversity, the more likely it is that rates are set for smaller groupings of costs. For our illustration with Zaner Medical Supplies, we assume an overall rate merely to illustrate the concepts. The same considerations will apply should a company compute rates by task, activity center, and so forth.

Flexible Overhead Budgets

As we have noted in previous chapters, a **flexible overhead budget** is based on a formula that expresses the budgeted overhead at any point within the relevant range. The formula recognizes that some costs are variable and some are fixed. The following schedule shows the flexible overhead budget formula for Zaner Medical Supplies. We assume here that the measure of activity is direct labor hours.

Cost Item	Fixed Cost	Variable Cost Per Direct Labor Hour
Indirect medical supplies	—	$1.90
Hourly indirect labor	—	1.27
Supervision	$21,000	—
Repair and maintenance	3,600	1.11
Utilities and occupancy	10,580	1.00
Depreciation	13,800	—
Miscellaneous costs	520	0.72
Totals	$49,500	$6.00

The flexible budget cost function is: $49,500 + ($6.00 × number of hours). Since we know that the hours are related to units prepared in terms of two per hour, we can restate the formula as: $49,500 + ($3.00 × units prepared). Typically, we would have multiple products or services using different amounts of direct labor, which would require the use of the basic formula.

The overhead rates are also available from these numbers, if we assume a volume of 5,500 direct labor hours or 11,000 units prepared. For variable costs, the rate is $6.00 per hour or $3.00 per unit (0.5 hour × $6.00). The fixed costs are $9.00 per hour ($49,500 ÷ 5,500 hours) or $4.50 per unit (0.5 hour × $9.00).

The significance of the flexible overhead budget becomes apparent in the next section, where we identify variances for overhead costs.

Framework for Two-Way Overhead Variance Analysis

Because different factors give rise to underapplied or overapplied overhead, we need a framework to identify the areas of potential causes of variations. In our framework, we compare actual overhead costs with a flexible budget and with the applied overhead to arrive at two possible variances: budget variance and capacity variance.

To begin, we need to know the actual overhead costs and the applied overhead costs. We have already seen for Zaner Medical Supplies that the company produced 10,000 units during the month. Actual overhead costs for the month are $31,500 variable and $50,000 fixed. The overhead accounts would then show the following information:

Actual costs:		
Variable	$31,500	
Fixed	50,000	$81,500
Applied costs:		
Variable ($3.00 × 10,000 meals)	$30,000	
Fixed ($4.50 × 10,000 meals)	45,000	75,000
Underapplied		$ 6,500

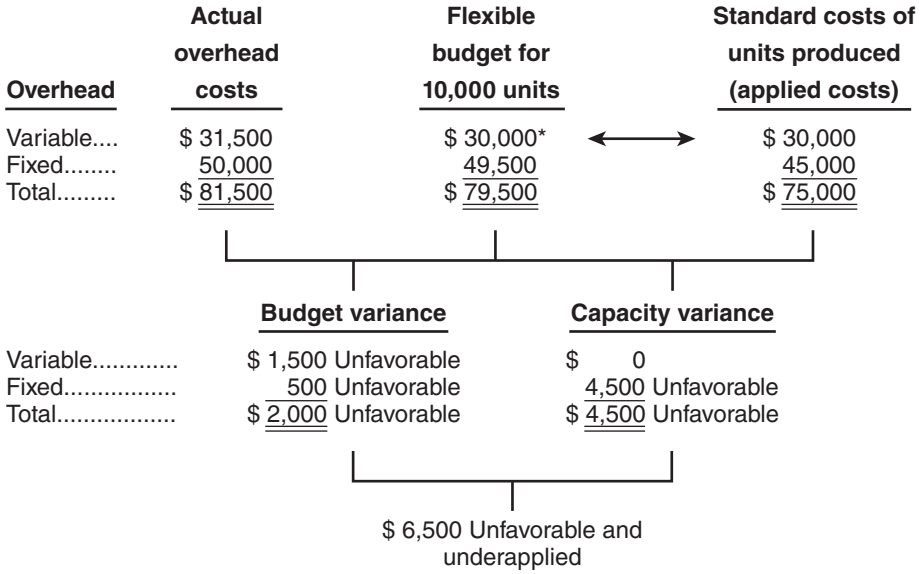
This information would appear in a T-account as follows:

Manufacturing Overhead	
Actual overhead = $81,500	Applied overhead = $75,000
Underapplied overhead = $6,500	

Remember, the cost per unit for variable and fixed overhead is calculated in advance and appears on the standard cost sheet for individual products. Therefore, the rates used in the example are applied directly to actual units or equivalent units of product.

The next step is to compare the actual costs and applied costs with the flexible budget for 10,000 units produced. Figure 13.1 summarizes this information. Note that the two-way overhead variance analysis actually produces three variances: variable and fixed overhead budget variances, plus the fixed overhead capacity variance.

Figure 13.1: Overhead variances for Zaner Medical Supplies



*$6 × .5 hour × 10.000 units

Budget Variance

A **budget variance** is the difference between actual overhead costs and the flexible budget for actual units produced. It is also called a **controllable variance**. This variance is deemed controllable by the appropriate operating departments. In the previous example, the variance is unfavorable; more dollars were spent than were budgeted for 10,000 units. A more detailed examination of the variance is necessary to identify areas where managers need to take action. One approach for providing greater detail is to show the budget variance by individual cost item with the use of the flexible overhead cost function, as shown in the following table:

Cost Item	Actual Overhead	Flexible Budget for 10,000 Units	Budget Variance	
Indirect medical supplies	$10,250	$9,500	$750	U
Hourly indirect labor	6,250	6,350	100	F
Supervision	21,400	21,000	400	U
Repair and maintenance	9,050	9,150	100	F
Utilities and occupancy	15,930	15,580	350	U
Depreciation	13,800	13,800	0	
Miscellaneous costs	4,820	4,120	700	U
Totals	$81,500	$79,500	$2,000	U

A number of causes may exist for either a favorable or an unfavorable budget variance. The common causes will fall into one of four categories:

1. price changes in individual cost components of overhead costs;
2. variable overhead area;
3. estimation errors in segregating variable and fixed costs; or
4. any overhead costs that are incurred or saved because of inefficient or efficient use of the underlying activity measure (machine hours or labor hours, for example).

The estimation errors come in two varieties: (1) the inaccuracies in predicting what will occur in the future and (2) the reliability of approximations made in separating overhead costs into variable and fixed categories. The inefficient or efficient use of activity relates to the fact that in an activity (labor worked, for example), overhead costs are incurred to support that activity. If the activity is inefficient, overhead costs support inefficiency. On the other hand, if less activity occurs, lower total overhead costs are incurred to support it. Therefore, efficient resource use also saves overhead costs.

Capacity Variance

The **capacity variance** (also called a volume variance) is the difference between the flexible budget for the actual units produced and the amounts applied to work in process inventory. In Figure 13.1, because the variable overhead costs are the same in each column, the capacity variance is the difference between the budgeted fixed overhead and the applied fixed overhead. Therefore, the capacity variance is the amount of budgeted fixed overhead not applied (unfavorable) or the amount applied in excess of the budgeted fixed costs (favorable). A capacity variance, then, occurs when actual production differs from the capacity level used to calculate the standard fixed overhead rate.

Continuing with the example, we know that fixed overhead for the month was budgeted at $49,500, and we presume that 5,500 direct labor hours, or 11,000 units, constitute a normal level of operation. We first compute the hourly overhead rate:

[$49,500 (Budgeted fixed overhead)]/[5,500 (Hours of direct labor)] = $9.00 per hour.

We then convert the hourly rate to a rate per unit with the following computation:

0.5 hour per unit × $9.00 = $4.50 unit.

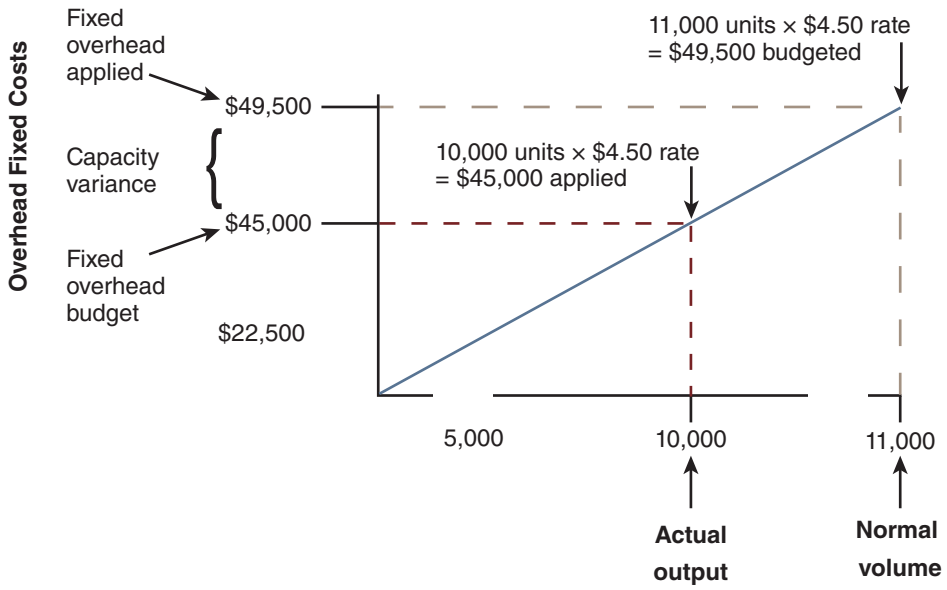
We see that the standard overhead rate for costing units is computed at the normal volume, so in this case it is $4.50 per unit. During the month, Zaner Medical Supplies produced 10,000 units. Fixed overhead is costed to the units by multiplying the standard rate of $4.50 per unit by the 10,000 units:

$4.50 × 10,000 units = $45,000 applied.

Fixed overhead budget	$49,500
Fixed overhead applied	45,000
Capacity variance (unfavorable)	$ 4,500

Figure 13.2 illustrates a graphical approach to the capacity variance concept. The diagonal line on the graph represents the amount of fixed overhead applied for various unit volumes. It rises at the rate of $4.50 per unit and reaches the $49,500 budgeted fixed overhead level at the normal volume of 11,000 units. However, the company only produced 10,000 units. With the rate of $4.50 per unit, only $45,000 of the budgeted fixed overhead was applied. The difference between the budgeted fixed overhead and the fixed overhead applied is the capacity variance, as designated on the vertical scale.

Figure 13.2: Analysis of capacity variance



Earlier we presented the budget variance for individual categories of overhead costs. We could extend the idea to the capacity variance, but we do not gain additional information from further detail. The capacity variance is an overall issue and has little to do with individual costs.

13.7 Capacity and Control

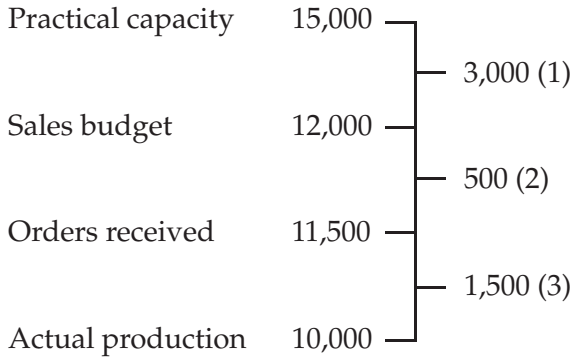
In general, we consider the capacity variance as an item that production departments do not control. The plant produces what marketing identifies as the sales requirements. Therefore, the production departments cannot be held responsible if the sales demand exceeds or falls below production at a normal level of plant operation. Other factors, however, may contribute to producing below capacity. Some of these factors are controllable (or somewhat controllable) by production departments. Excessive machine downtime (due to poor maintenance, for example) or inefficient production scheduling could be problems traceable to production managers. Lack of rapidity in completing tasks due to unskilled workers is a factor that is expected to some degree, but an excess of this condition may also be traceable to one or more production managers.

For Zaner Medical Supplies, normal volume was defined at 5,500 direct labor hours, or 11,000 units. Normal volume, as defined in Chapter 11, represents the average level of actual operation over several years. Practical capacity, on the other hand, is the level at which all facilities are used to full extent. Some allowance is made under this definition for expected delays because of changes in machine setups, necessary maintenance time, and other interruptions. Hence, practical capacity is less than theoretical maximum capacity, which could be obtained only under ideal conditions.

A comparison of the actual output with the output for practical capacity broadly measures the failure of the facility to operate at the level for which it was designed. Assume, for example, that Zaner Medical Supplies can reasonably be expected to produce 15,000 units a month. Yet only 10,000 units were produced. The **idle capacity** is defined as the difference between the practical capacity and the actual production for a given month. The idle capacity for Zaner Medical Supplies is determined as follows:

Practical capacity	15,000 units
Actual production	10,000
Total idle capacity	5,000 units

The idle capacity can be analyzed further to determine why facility capacity was not used as intended. Assume that the sales budget shows that 12,000 units were expected to be sold during the month, but that orders for only 11,500 units were received. The differences between practical capacity, sales budget, orders received, and actual production are illustrated as follows:



1. Practical capacity minus sales budget. The difference between the practical capacity and the sales budget for the month requires further investigation. Perhaps the company was overly optimistic and provided too much capacity. Or the marketing department may not be obtaining potential available customers. Additional analysis may reveal the nature of the problem and provide a foundation for improvements.
2. Sales budget minus orders received. The difference between the sales budget for the month and the orders received is a measurement of the inability of the marketing department to meet the budget quota. Perhaps the quota was too high, or the marketing department was not sufficiently aggressive.
3. Orders received minus actual production. The difference between the orders received and actual production reflects a mixture of idle time and inefficiency. Suppose that Zaner Medical Supplies used 5,200 hours to produce 10,000 units, and 5,000 hours were allowed. The 200 hours of inefficiency, in this case, consumed time that could have been used for production of an additional 400 units (200 hours ÷ 0.5 hour per unit). The difference between the orders received and the expected production for the time used (11,500 − 10,400 = 1,100 units) is a measurement of idle time.

13.8 Variances

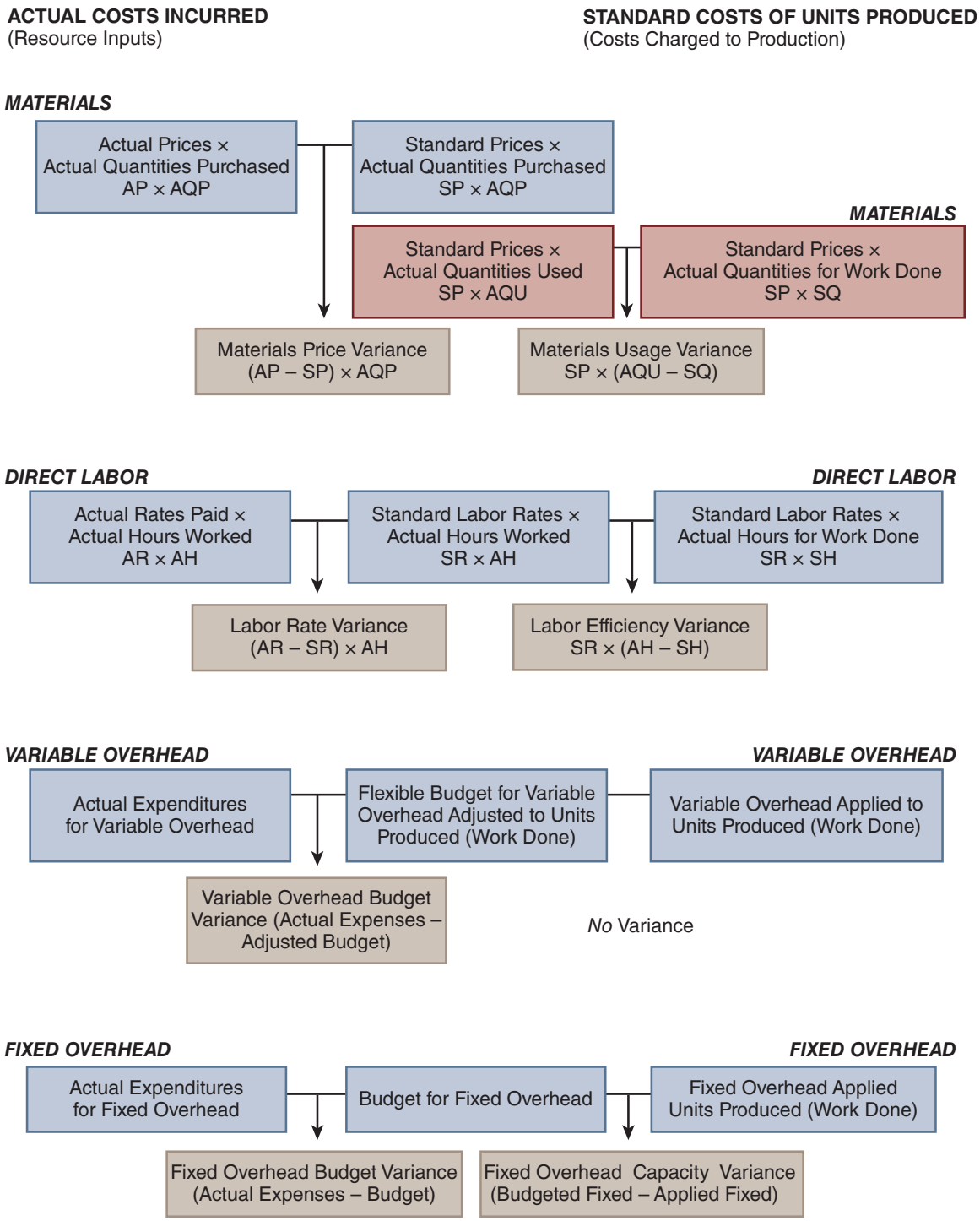
When cost variances occur, managers need to know what caused them. Knowing the amount of variance does not disclose the cause(s); rather, investigation is required. However, managers must decide whether the benefits of investigation and corrective action exceed the related costs. Obviously, a $10 unfavorable medical supplies usage variance from a standard cost of $50,000 would not be worth investigating. But where should the line be drawn?

Ideally, if the costs and benefits of investigating and correcting can be estimated, these costs and benefits should be compared in deciding whether to investigate. In practice, however, this is extremely difficult. Instead, many companies use simple decision rules based on prescribed dollar limits, such as "investigate any variance over $500." The main problem with this method is that $500 may be significant when the standard cost is $2,000 but may be insignificant when the standard cost is $20,000. Therefore, many companies use a percentage rule, such as "investigate any variance of 10% or more." Some companies use more sophisticated statistical approaches that set limits based on standard deviations from the standard cost. However, most companies do not seem to have formal decision rules; rather, managers are instructed to use "judgment."

Summary of Standard Cost Variances

We have completed a number of variance computations for the cost elements of production. Figure 13.3 contains a summary of all variances and the methods of calculating them. It also emphasizes that the costs charged to units produced are the standard costs. Therefore, work in process inventory and all subsequent accounts containing product costs will be stated at standard. Notice that costs on the far left side are all actual costs, while costs on the far right side are standard costs. If dollar amounts become smaller as we move from left to right, we experience unfavorable variances. If amounts become larger, we experience favorable variances.

Figure 13.3: Summary of standard cost variances



Disposition of Variances

In our discussion of materials and labor variances, we set up separate variance accounts. Overhead variances, although identified separately in worksheet analysis, are combined in the underapplied or overapplied amounts. At the end of each period, variance accounts must be closed. Where do these variances go? As a practical matter, all standard cost variances eventually go to Cost of Goods Sold. The most common practice is to close the variance accounts directly to Cost of Goods Sold, thus treating them as period costs. Occasionally, if the variances are significant in amount, they will be prorated to Cost of Goods Sold and to the appropriate materials, work in process, and finished goods inventories. We assume here that variances are closed to the Cost of Goods Sold account.

13.9 Standard Costs in Different Settings

Standard costs are applicable to service organizations. As with manufacturing companies, the more routine the service organization's activities, the easier it is to set standards. Generally, though, a service organization's activities are less routine than those of a manufacturing company. The following list contains examples of service organization activities for which standard costing would be appropriate:

1. filling prescriptions in a pharmacy;
2. picking medical supplies from a warehouse;
3. preparing food in the cafeteria;
4. answering telephones in customer service departments, and computer technical hotlines; and
5. calling on patients regarding billing.

Standard Costs in Service Organizations

Standard costing in a service setting will tend to emphasize labor and overhead, since materials are usually not a significant item. Some medical service environments, such as outpatient surgery or cancer treatment centers, may have significant costs for medical supplies. Calculating standard costs and variances for service organizations is similar to manufacturing companies. The main difference is that in determining standard quantities, the output of a service organization is often not as clear as for a manufacturing company. The following list contains examples of output measures that might be chosen in various service settings:

1. number of medical claims processed in an insurance company;
2. number of loan applications processed at a bank;
3. number of deliveries made by a delivery service;
4. number of patients treated in a particular department of a hospital; and
5. number of passengers transported by an ambulance company.

13.10 Ethical Considerations

Because cost variances are used to evaluate performance of cost center managers, there may be temptation to compromise ethics. This might happen in the standard-setting process or in reporting actual costs. A manager who has input in setting standards might deliberately provide inaccurate information in an attempt to produce loose standards. Likewise, a manager who plays a role in gathering or reporting actual costs might intentionally distort actual data. Top management should be aware that performance evaluation based on cost variances can produce these behaviors. Cost center managers must guard against compromising their integrity for a possible short-term gain.

A more subtle form of unethical behavior results when managers avoid doing their best for fear of causing the standards to be tightened. A manager might believe that cost decreases in the current period are unlikely to be replicated due to some unique conditions. In that case, the manager should prepare a convincing argument to upper management not to revise standards significantly. Upper management can alleviate these types of problems by not automatically adjusting the cost standard by the full amount of cost reduction. For instance, if the production manager knows that any cost reduction will cause next period's cost standards to decrease by only 50% of the cost reduction, the manager would tend to put more effort into cutting costs than if the standards were to be adjusted by the full cost reduction.

13.11 Three-Variance Method for Overhead

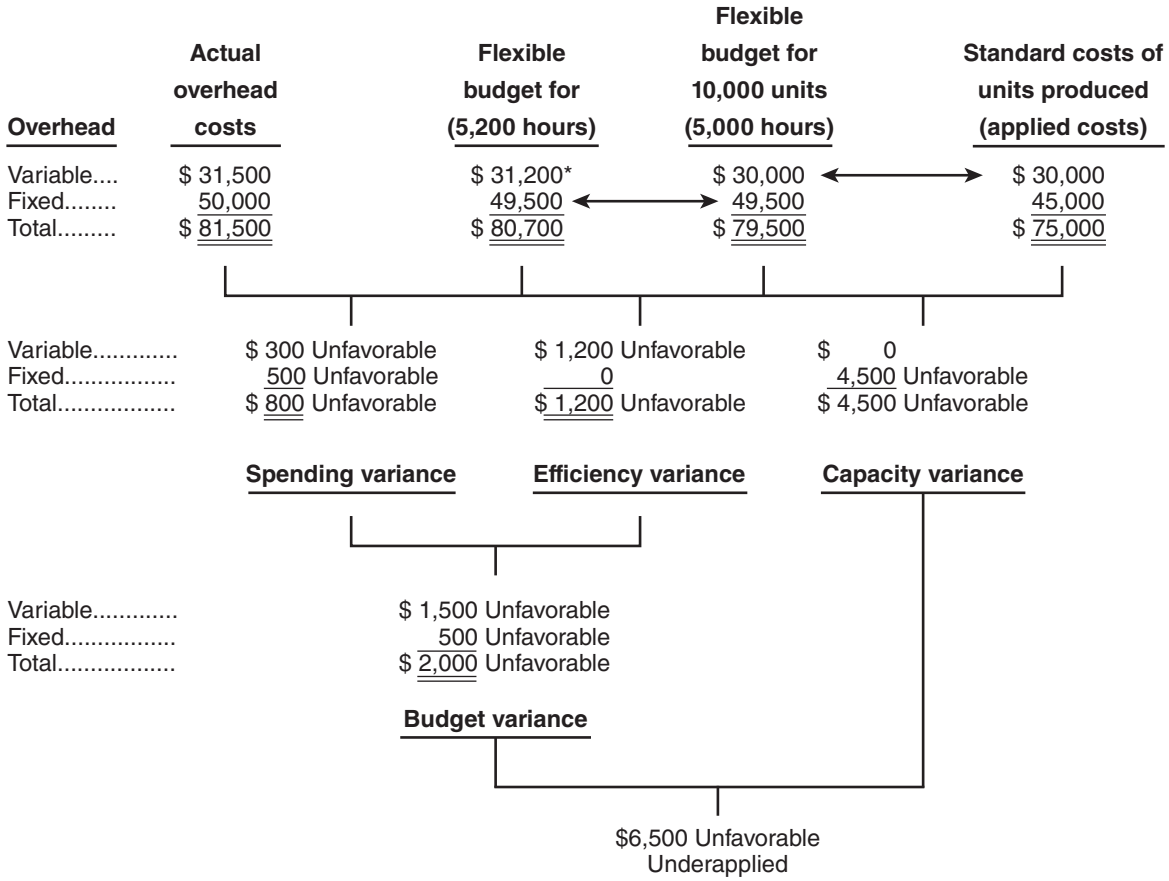
In many business situations, management needs more information about overhead costs to investigate variances and make appropriate adjustments. For example, measuring efficiency through comparing input activity bases with output activity bases provides a particularly helpful expansion to the variance analysis in certain situations where overhead cost behavior parallels resource input activity more closely than production output volumes. Consequently, we move from the two-variance approach discussed earlier in the chapter to a three-variance method. The information is available also to expand to four variances.

Framework for Three-Way Overhead Variance Analysis

The difference between the two-way and the three-way variance analysis is the treatment of the budget or controllable variance. The budget variance is divided into a spending variance and an efficiency variance. The capacity variance is the same in both approaches.

To show how the variances fit together, remember that overhead costs for Zaner Medical Supplies are related to direct labor hours. The actual direct labor hours worked were 5,200. Since Zaner Medical Supplies produced 10,000 units, it was allowed 5,000 (0.5 hour $\times$ 10,000 units) direct labor hours. Based on the variable and fixed costs we have shown in the chapter and the underapplied overhead of $6,500, we adapt Figure 13.1 to obtain Figure 13.4.

Figure 13.4: Three-way and four-way overhead variance analyses



*($6 × 5,200 hours)

Spending Variance

A **spending variance** is the difference between the actual overhead cost and the flexible overhead budget for the actual activity base (hours of operation in our example). The variance assumes that the best measure of the amount spent on overhead is based on the actual activity base. Therefore, the actual overhead for the preceding data is the cost of 5,200 direct labor hours; this amount is compared with the budget for those hours.

A spending variance is similar to the combination of the price (or rate) variances and the usage (or efficiency) variances in direct materials and direct labor. It shows that either the prices paid for overhead goods or services and/or the quantity used were not in agreement with the budget. A separate price or usage variance could be calculated.

The causes of spending variances include three of those categories presented for the budget variance:

1. price changes in the individual cost components comprising overhead costs;
2. quantity changes in individual items within overhead cost components; and
3. estimation errors in segregating variable and fixed costs.

Efficiency Variance

The **efficiency variance** is the difference between the flexible budget for the actual activity base and the flexible budget for the standard activity base allowed for actual units of product produced. Because fixed overhead costs are identical in both budgets, the efficiency variance consists only of differences in variable overhead costs. Therefore, we have an alternate means of calculating the variance. The formula is similar to that used for materials usage and labor efficiency variances: standard variable overhead rate per hour times the difference between the actual activity base and the standard activity base allowed. For Zaner Medical Supplies, the efficiency variance is unfavorable because the workers used more than the standard hours allowed to complete the 10,000 units.

The term "efficiency" is in some sense a misnomer because it does not measure the efficient or inefficient use of individual overhead items. These are included in the spending variance. The efficiency variance measures the additional overhead costs incurred or saved as a result of inefficient or efficient use of the overhead activity base. That is, overhead must be incurred to support the cost driver. If the cost driver is inefficient, overhead costs are incurred to support inefficiency.

When direct labor hours are the measure of activity, a relationship exists between the labor efficiency variance and the overhead efficiency variance—they move in the same direction. If labor hours are inefficiently used, the labor efficiency variance measures the labor costs incurred for that inefficiency; the overhead efficiency variance is the additional overhead cost incurred to support the inefficient labor. A favorable labor efficiency variance indicates the overhead efficiency variance must be favorable also. Consequently, to find the causes of an overhead efficiency variance for a direct labor activity base, look for the causes of inefficient or efficient labor.

Four-Way Analysis

Some managers prefer an additional level of detail. We already know that an efficiency variance involves variable cost only and a capacity variance involves fixed cost only. Since the spending variance can be split into variable and fixed components, we have four variances: variable overhead spending, variable overhead efficiency, fixed overhead spending, and fixed overhead capacity. These variances are also shown in Figure 13.4.

Case Study: Smith Hospital System

Smith Hospital System is a large hospital system located in Denver. It provides services to 10,000 patients per year in its emergency room. However, with increasing competition and a higher public emphasis on quality, the company has been searching for ways to maintain quality and cut costs. Art Saul, hospital planner, suggested that starting at the beginning of 20X4, the hospital invest in higher-quality medical supplies and hire more experienced nurses at a slightly higher pay rate. Physician costs are billed directly by physicians. Costs for other departments, such as laboratory and radiology, are billed separately to the patient accounts.

(continued)

Case Study: Smith Hospital System *(continued)*

The company has used a standard cost system for the past 5 years. The current standard costs for one patient, based on a patient volume of 10,000, are as follows:

Medical supplies	$600
Direct labor (4 hours at $40)	160
Variable overhead (based on labor)	20
Fixed overhead (based on labor)	8
Standard cost per patient	$788

David Weissmann, the president, is skeptical about decreasing costs by increasing medical supplies and labor costs. However, after much debate, he agrees to try the changes for 1 year beginning with January 20X4. Because the exact costs of changes were not known at the beginning of 20X4, the existing standard costs were retained. Therefore, the changes will be in the variances from standard costs.

During 20X4, the emergency room served 9,500 patients because the marketplace showed a decreasing demand. The following data show the actual results for 20X4:

a. Medical supplies costing $6,175,000 were purchased and used. No usage variance existed, so any differences were due solely to price changes.
b. Direct labor was $997,500 for 23,750 direct labor hours.
c. Actual variable overhead totaled $163,000.
d. Actual fixed overhead totaled $80,000.

Mr. Weissmann was pleased with the results. Even though patient demand was down by 500 patients, the difference in costs was significant. He would like to know why.

Case Study Exercises

1. Compute all appropriate variances for the following categories:
   a. medical supplies.
   b. labor.
   c. overhead.
2. Explain how any of the variances interrelate (have the same basic cause).
3. Explain which of the variances are controllable.
4. Assuming that the actual cost results for 20X4 represent the new standard performance. Calculate the new standard cost per patient, showing separately the medical supplies, labor, and overhead components. (Normal production is still based on 10,000 patients.)

Key Terms

attainable standards Standards that can be achieved with reasonable effort.

budget variance The difference between actual overhead costs and the flexible budget for actual units produced.

capacity variance The difference between the budgeted fixed overhead and the fixed overhead costs to products by the use of the predetermined fixed overhead rate.

controllable variance The difference between actual overhead costs and the flexible budget for actual units produced.

cost control Comparing actual performance with the standard performance, analyzing variances to identify controllable causes, and taking action to correct or adjust future planning and control.

efficiency variance The difference between the overhead budget for actual hours used and the overhead budget for the standard time allowed for the work.

favorable variance The situation in which actual cost is less than the standard cost.

flexible overhead budget A budget based on a formula that expresses the budgeted overhead costs at any point within the relevant range.

idle capacity The difference between the practical capacity and the actual production for a given period.

labor efficiency variance The difference between the actual and standard time required for production multiplied by the standard labor rate.

labor rate variance The difference between the actual and standard labor rates multiplied by the actual hours worked.

loose standards Standards that can be achieved with very little effort.

management by exception A philosophy of emphasizing the exception, highlighting only areas that deviate from the plan and that require management's attention.

measure of activity The factor that best expresses how costs change as volume changes.

medical supplies price variance The difference between the actual and standard medical supplies prices multiplied by the actual quantity of medical supplies.

medical supplies usage variance The difference between the actual and standard quantity of medical supplies multiplied by the standard medical supplies price.

price standard A generic term that means a standard price for medical supplies, rate for labor, and rate for factory overhead.

quantity standard A generic term that means a standard quantity for medical supplies, time for labor, and activity or volume for factory overhead.

spending variance The difference between the actual overhead cost and the budgeted overhead cost for the actual hours of operation.

standard cost The combination of a price standard and a quantity standard.

standard cost sheet A summary of the cost for each category of direct medical supplies used; the cost of each direct labor operation employed; and the cost of all overhead tasks, operations, processes, and support functions applied to a unit of final product.

strict standards Standards set at a maximum level of efficiency, representing conditions that are very difficult to attain.

unfavorable variance The situation in which actual cost is greater than the standard cost.

Review Questions

The following questions relate to several issues raised in the chapter. Test your knowledge of these issues by selecting the best answer. (The odd-numbered answers appear in the answer appendix.)

1. Explain the significance of profit analysis for an organization.

2. Define a standard cost. Explain what constitutes the components of a standard cost.

3. Point out advantages and disadvantages of following the principle of management by exception.

4. Which level of standard (tight, attainable, or loose) will give the lowest standard cost per unit? Explain.

5. A standard cost sheet is a key component of a standard cost system. Describe a standard cost sheet and explain why it is significant.

6. In purchasing medical supplies, what amounts are recorded in Accounts Payable and what amounts in Medical Supplies Inventory? What happens to the difference?

7. The departmental supervisor assigned three people with a labor rate per person of $10 an hour to a project with a standard labor rate of $9 an hour. Each person spent 70 hours on this project. What effect will this have on the labor rate variance?

8. List five causes of a labor efficiency variance.

Exercises

1. **Labor rate and efficiency variances.** Medical Equipment Repair Shop fixed 550 units during the year, using 1,447 direct labor hours. Repairs, on average, should take 2.5 hours to repair. The standard direct labor rate is $19 per hour, while the actual rate averaged $18.60 per hour.

   a. Compute the labor rate variance and the labor efficiency variance.

2. **Labor efficiency variance**. Gold Laboratory Services is a large medical laboratory facility located in Washington and managed by Randee Menashe. Standards indicate that each laboratory worker should process 100 tests per hour and that

the labor rate is $10 per hour. This month, 263,000 tests were processed in 2,150 hours.

a. What was the labor efficiency variance this month?
b. Why might the laboratory manager be tempted to report to top management a smaller variance than actually occurred?

3. **Labor cost variance**. Lipis & Glinsky Medical Clinic reports the following data related to its labor cost:

Labor efficiency variance	$7,000 favorable
Total labor cost variance	$13,000 unfavorable
Actual wage rate paid	$120 per hour
Standard wage rate	$110 per hour

a. Determine the actual hours worked.

4. **Medical supplies usage variance**. The Glass Surgery center has 3,000 scrubs in inventory, which were purchased by the director, Jack Williams, for a total of $6,600. Each surgery should require a standard usage of five scrubs. During July, 330 surgeries were performed. The total standard cost allowed for the scrubs amounted to $3,762. There was an unfavorable medical supplies usage variance of $800.

a. Compute the standard price for one scrub.
b. How many scrubs were used in July? (Round to nearest whole number.)
c. Compute the price variance for the scrubs used in July.

5. **Budget and capacity variances**. A flexible budget for Mark Fisher's Radiology Center is given in summary form as follows:

Machine hours	60,000	70,000	80,000	90,000
Variable overhead	$240,000	$280,000	$320,000	$360,000
Fixed overhead	480,000	480,000	480,000	480,000
Total overhead	$720,000	$760,000	$800,000	$840,000

The standard rate of usage is x-rays per machine hour, and normal volume has been defined at 80,000 machine hours. The company performed 420,000 x-rays in 70,000 machine hours. Actual variable overhead was $287,000, and the fixed overhead was $475,000.

a. Compute the amount of underapplied or overapplied overhead.
b. Compute the budget variance.
c. Explain the major causes of a budget variance.
d. Compute the capacity variance.
e. Cite three possible reasons for the existence of this capacity variance.

Problems

1. **Labor rate and efficiency variances.** Danburke Medical Supplies Corporation manufactures bandages. The company adopted a standard cost system that has the following labor standards for 1,000 packages of bandages:

Department	Rate	Hours	Standard Cost
Material stretching	$20	100	$2,000
Processing	12	40	480
Cutting	16	20	320
Packaging	12	40	480
Total		200	$3,280
Labor cost per package		$3.28	

During September, the company produced 83,000 packages and had the following actual costs and hours:

Department	Cost	Hours Worked
Material stretching	$159,358	8,400
Processing	52,752	3,820
Cutting	29,172	1,410
Packaging	29,368	2,653
Total	$270,650	16,283

Instructions

a. Calculate the labor rate variance for each of the four departments.
b. Calculate the labor efficiency variance for each of the four departments.
c. Using T-accounts, show the amounts recorded in the Wages Payable account, the Variance accounts, and the Work in Process account.

2. **Materials price and usage variances**. The current year budget for Ed Lynn's Ambulance Service estimated 153,000 miles to be driven by its drivers based on a forecast of 17,000 calls. The standard price of gasoline was set at $1.20 per gallon, and the company expected to drive an average of 22 miles per gallon for its calls. During the year, 18,480 calls were actually made, 165,600 miles were driven, the average price per gallon of gasoline purchased was $1.16, and an average of 24 miles per gallon was achieved for the company's services.

Instructions

a. Compute the materials price variance and the materials usage variance for the current year.

3. **Overhead rates and variances**. Grinzaid Home Nursing specializes in home nursing services. It bases its overhead on the flexible budget cost function of:

$33,000 + ($2.40 × labor hours).

Normal volume is based on 12,000 labor hours. Standards call for two labor hours per patient visited.

For the current period, the operating results were as follows:

Actual labor hours worked	11,400
Patient visits	5,800
Actual variable overhead costs	$28,460
Actual fixed overhead costs	$31,950

Instructions

a. Calculate the rates for variable and fixed overhead that would be used to apply overhead to loans.
b. Calculate the underapplied or overapplied overhead for the period.
c. Determine the following variances:
   (1) overhead budget variance.
   (2) overhead capacity variance.
d. How much of the budget variance is due to variable costs and how much to fixed costs?

4. **Favorable and unfavorable variances**. Shenk Hospital Company uses a standard cost system and isolates the following six variances for the appropriate departments:

Medical supplies price variance	Labor efficiency variance
Medical supplies usage variance	Overhead budget variance
Labor rate variance	Overhead capacity variance

The company uses direct labor as the measure of activity for each of the departments.

Instructions

a. For each of the following independent events, indicate which variances would be affected. Briefly explain why they would be affected, and indicate whether the effect is favorable or unfavorable. If more than one variance is influenced in a given situation, limit your discussion to the two or three most important variances for that situation.
   (1) Demand exceeded expectation, and the number of patients treated during the year was much greater than the number planned.
   (2) Because of an improperly adjusted machine, more medical supplies were wasted than anticipated. When the department supervisor requisitioned more medical supplies from the storeroom, no medical supplies were there. A rush order for more medical supplies was placed, and the medical supplies arrived by special delivery before the end of the day.
   (3) A purchasing agent bought substandard medical supplies at a large savings. Because of the lower quality of the medical supplies, more scrap was produced.
   (4) A new union contract at the beginning of the year required an increase in labor rates. Adjustments to the standard wage rates were made as required at the beginning of the year. During the year, the rate of inflation in the economy was lower than what was predicted for the contract wage rates.
   (5) Due to food poisoning in the hospital cafeteria, several highly skilled nurses from one department were sick for 2 days. The department supervisor hired temporary less-skilled nurses to substitute for the skilled workers. The wages for the temporary help were less than standard, and the output was also less than standard.
   (6) Because there were more than the usual x-ray machine breakdowns, repair and maintenance personnel used more supplies than called for in the overhead budgets.

5. **Budget and budget variances**. Elaine Alexander, administrator of Peyton Dialysis Clinic, has estimated overhead costs for the year at an expected operating level of 6,000 dialyzer machine hours. Past experience indicates a rate of cost variability per hour as follows:

Lubrication	$0.75
Supplies	0.30
Power	0.25
Repairs	0.50
Maintenance	0.80

Costs that are fixed are budgeted as follows:

Supervision	$ 4,500
Indirect labor	11,500
Heat and light	3,200
Taxes and insurance	1,600
Depreciation	1,800

During the year, the clinic incurred 5,500 dialyzer machine hours and treated the number of patients that should have been treated in 5,000 dialyzer machine hours. The clinic incurred the following overhead costs:

Lubrication	$3,900
Supplies	1,700
Power	1,500
Repairs	2,800
Maintenance	4,300
Supervision	4,000
Indirect labor	12,000
Heat and light	3,200
Taxes and insurance	1,400
Depreciation	1,600
Total	$36,400

Instructions

a. Prepare a budget of overhead costs for 5,000 dialyzer machine hours.
b. Compare the actual overhead costs with the budget for 5,000 dialyzer machine hours. Show budget variances for each item.
c. Explain what factors could cause the budget variance to arise.

6. **A standard cost sheet**. Glusman Medical Office is currently setting up a standard cost system for its annual physicals. The annual physical requires nursing time, physician time, and supplies.

   A nurse initially spends 30 minutes collecting basic medical information, weighing the patient and measuring vital signs. Nursing labor is calculated at $40 per hour. Supplies used include exam table paper, paper gown, and other basic supplies. The medical office averages supplies for basic exams at $20 per patient. The physician will spend 30 minutes with the patient. Physician time is calculated at $150 per hour.

   The indirect costs include administrative and costs for operating the building. Overhead is applied at the rate of $10 per patient visit.

Instructions

a. Prepare a standard cost sheet that shows all of the elements of cost for a completed annual physical.