

University of Nebraska Medical Center Clinical Laboratory Science Program
Nebraska Methodist Hospital Medical Technology Program
CLS 431 - Clinical Laboratory Management II

Laboratory Cost Analysis

In the current healthcare environment, the laboratory manager is challenged to provide high quality services for the lowest possible price. The manager must balance the cost of providing services with regulatory requirements and with reimbursement received from Medicare/Medicaid and insurance companies, which often limit the dollar amount paid based on the patient's diagnosis. **Cost accounting** (or managerial accounting) consists of defining, calculating, measuring and examining the financial components associated with producing a billable test or service. It assists the laboratory manager in determining budget needs, assigning staff, projecting revenue, justifying the outlay of capital, and analyzing laboratory services. With an accurate accounting of the laboratory's financial condition, the manager is in a better position to price the laboratory's services competitively, negotiate contracts for obtaining service from suppliers, obtaining reimbursement from payers, and for offering services to the laboratory's clients.

Having a clear picture of the laboratory's finances also allows the manager to set goals for future programs/expansion. These goals may differ, depending on the profit status of the organization. In a **for-profit** organization, the primary goal is to generate revenue, which is distributed to the owner/investors. Profits generated by the organization are taxable. The primary goal of a **non-profit** organization is to provide service to a community. Any profits generated are retained to further the mission of the organization. These profits are not taxable. While non-profit organizations do not have "owners" to which they are accountable, there is usually a board of directors or government entity that has oversight regarding policies, planning and operations.

Key Terms in Cost Accounting:

Billable test/service: A test or service that is to be paid by either an individual patient, Medicare/Medicaid or a private insurance company. This is in contrast to a **non-billable test**, which must be performed and contributes to the total cost per test, but is not reimbursable by a payer. Examples of non-billable tests are controls, calibrators, repeats, etc.

- Cost:**
1. The amount of money needed to provide a billable test/service. May be used interchangeably with **expense**.
 2. An asset that has been purchased, but has yet to be utilized. For example, a stock of laboratory supplies in a storeroom.

- Expense:**
1. The amount of money needed to provide a billable test/service. May be used interchangeably with **cost**.
 2. The outgoing assets used to provide a service, such as the reagents and labor required to perform a test. Expenses are accounted for as they are incurred.

Financial ratios: Tools used by managers to evaluate finances by making data comparisons.

Examples of financial ratios used by laboratory managers include:

- a. Cost per billable test
- b. Billable tests per labor cost
- c. Billable tests per patient admission
- d. Revenue per billable test
- e. Operating margin per billable test

Operating margin: The excess revenue generated by providing services. The operating margin, or profit margin, measures **the revenue remaining after paying direct costs, but before paying indirect costs.** (See description of direct and indirect costs in the section “Determining Cost per Test”.) The lower the cost of providing service the greater the operating margin. This is particularly important in managed care systems, where a set dollar amount is paid according to the patient’s diagnosis, regardless of the actual cost of providing service to a particular patient. The laboratory that can provide the service at a lower cost will have a larger operating margin to invest in other areas.

Sample Problem 1:

“ABC Lab” and “XYZ Lab” both provide services to patients insured by “Big Guy Insurance Company”. “Big Guy” is willing to pay \$3.00 per CBC with automated differential. Both “ABC” and “XYZ” perform approximately 2500 CBCs with automated differentials each month. “ABC Lab” has a cost per test of \$1.25 while “XYZ Lab” has a cost per test of \$1.50. What is the operating margin for this test for “ABC”? For “XYZ”?

Each laboratory will be paid $2500 \times \$3.00 = \7500.00 by “Big Guy”.

“ABC” is spending $2500 \times \$1.25 = \3125.00

Their operating margin is $\$7500.00 - \$3125.00 = \$4375.00$

“XYZ” is spending $2500 \times \$1.50 = \3750.00

Their operating margin is $\$7500.00 - \$3750.00 = \$3750.00$

By performing each test for less, “ABC” will have \$625.00 a month more than “XYZ” (a total of \$7500.00 more annually) which “ABC” can invest/spend on other projects.

Profit: Revenue minus all expenses

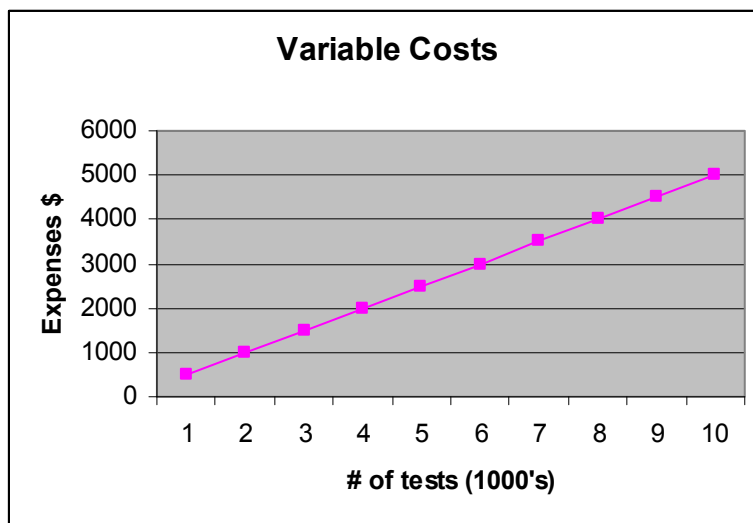
Revenue: Money that the laboratory receives (or is owed) for services provided. Revenues need to provide enough money to cover expenses in order for the laboratory to be financially successful.

Determining Cost per Test:

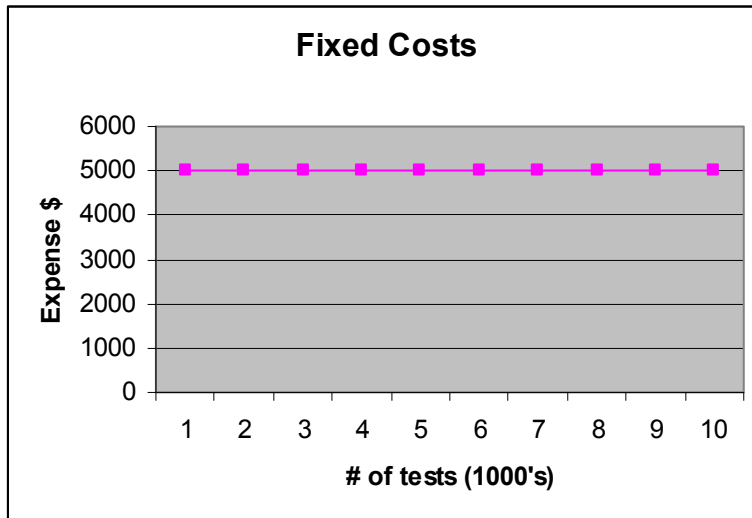
When asked what contributes to the cost of laboratory testing, the first thing that comes to mind for most laboratorians is reagents. Some will include the cost of instrumentation, disposable supplies such as test tubes, cuvettes or pipettes, and the cost of labor for testing personnel. (Wages and benefits are the largest expense in the laboratory budget.) These are but a few of the items that are included in calculating the cost of a laboratory test. Other expenses that must be taken into account when calculating the cost per test include:

Calibrators, standards, controls	Equipment maintenance
Repeat/Duplicate testing	Training and education
Salaries of administration and support staff	Proficiency Testing
Utilities	Office supplies
Regulatory compliance/Accreditation	Equipment repair & depreciation
Dues & Subscriptions	Travel

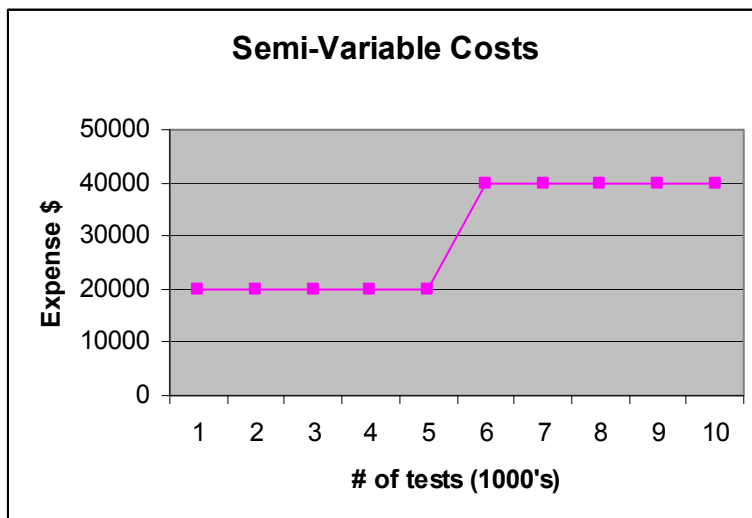
Expenses that apply to one specific test, such as reagents, controls, and consumables (pipettes, sample cups, media plates, etc.) are called **direct costs**. Generally direct costs are considered **variable costs** because the more tests one performs, the greater the total expense incurred. There is a **proportional relationship** between the number of tests performed and variable costs.



Other expenses, such as administration salaries, utilities, and office supplies apply to the lab in general, as a part of routine operations. These expenses, termed **indirect costs** or overhead, are divided among all laboratory tests. Usually indirect costs are **fixed costs** – the expense incurred remains the same, regardless of test volume.



Certain expenses are **semi-variable**. The cost remains the same until a critical point is reached, at which time additional expenses are incurred. The additional expense is **not proportional** to the increase in test volume. An example of this could be labor expenses. If there is currently one technologist handling the workload on the night shift, but the workload is gradually increasing, there will eventually come a point when the workload is too much for one person, and another technologist will be hired, resulting in a “jump” in labor costs.



All of these expenses (variable, semi-variable and fixed) must be recouped when setting the price charged for a test. In its simplest form, the formula for determining the cost per test is:

$$\frac{\text{Fixed costs} + (\text{variable costs} \times \text{number of tests})}{\text{Number of tests}} = \text{cost per test}$$

Sample Problem 2:

A laboratory performs approximately **1800** urine dipstick exams per month. The fixed costs are **\$500**. The variable costs (dipsticks, urine tubes and paper towels) total **\$1.50** each time a test is performed. What is the cost per test?

$$\frac{\$500 + (\$1.50 \times 1800)}{1800} = \frac{\$500 + \$2700}{1800} = \$1.78$$

Sample Problem 3 (more complex):

Your laboratory bills for **50,000 cholesterol tests** each year. Reagent cost is **\$0.95** per test. Because you buy reagent in bulk, calibration is performed **twice a year**, running **6 calibrators** each time. **High and low controls** are tested **once each day**. On average, **12 tests per month must be repeated** due to linearity limitations or problems with the analyzer. The analyzer is leased, with the cost of the lease included in the reagent price. There is a \$6000 annual service contract on the analyzer, which tests a total of 650,000 tests per year. Disposable supplies (pipettes, wipes, etc.) for this analyzer cost \$5000 per year.

The total number of billable tests for the laboratory is 1,750,000 annually. Expenses for the laboratory included the following fixed (indirect) expenses:

Salaries and benefits: \$3,360,000

Utilities: \$85,000

Non-medical supplies: \$60,000

Regulatory compliance (includes dues, proficiency testing, etc.): \$52,000

Travel and education: \$23,000

What would be the cost per billable test for this cholesterol test?

Direct costs for the cholesterol test:

$$\text{Reagents: } \frac{\$0.95(50,000 \text{ billable tests} + 12 \text{ calibrators} + 730 \text{ controls} + 144 \text{ repeats})}{50,000 \text{ billable cholesterol tests}} = \$0.967$$

Additional direct costs for all tests performed using this analyzer include:

Maintenance: \$6000 / 650,000 tests performed on the analyzer = \$0.009

Disposables: \$5000 / 650,000 tests = \$0.008

Fixed costs that must be divided among all billable laboratory tests:

Salaries and benefits: \$3,360,000 / 1,750,000 total billable tests = \$1.920

Utilities: \$85,000 / 1,750,000 tests = \$0.049

Non-medical supplies: \$60,000 / 1,750,000 tests = \$0.034

Regulatory compliance: \$52,000 / 1,750,000 tests = \$0.030

Travel and education: \$23,000 / 1,750,000 tests = \$0.013

$$\text{Cost per billable cholesterol test} = \$0.967 + \$0.009 + \$0.008 + \$1.920 + \$0.049 + \$0.034 + \$0.030 + \$0.013 = \$3.03$$

An alternative method of determining cost per test is by using **Relative Value Units**. In this method, a numerical figure is assigned to a test, based on historical data, the level of test complexity (when compared to other tests) and tech time required to perform the test. A dollar amount is determined for 1 RVU. To determine the cost of a test, the RVU for that test is multiplied by the fixed dollar amount.

Sample problem 4:

If 1 RVU is assigned a “price” of **\$2.50**, and a CBC with automated differential is assigned **3** RVU, then the cost per test is **3 x \$2.50 = \$7.50**.

A third method of pricing tests is the surcharge/cost plus method. With this method, the actual cost per test is determined using cost accounting techniques and then an extra fee (surcharge) or percentage is tacked on in order to generate profit.

Sample problem 5:

If a lab decides to markup each test by an additional **50%**, then a test that costs the laboratory **\$10** to perform will be billed to the patient at \$15 [**\$10 + (\$10 x .5)**].

Sample Problem 6: What effect does running a test more frequently have on cost per test?

The laboratory receives approximately **5 specimens each day** for CMV antibody testing. Currently the laboratory performs testing for CMV antibodies on **Tuesdays and Fridays**. Each “batch” of tests has a **positive and a negative control that are tested in duplicate** (one set of positive/negative controls at the beginning of the run, and one set of controls at the end of the run). Because the hospital is starting a kidney transplant program, the laboratory has received a request from the transplant physician to test for CMV antibodies each day, **Monday through Saturday**. Reagent cost is **\$2.50** per test.

What is the impact on cost per billable test of performing the test more frequently? (Assume that there are no repeats, no consumable costs, etc.)

Current system:

35 patient specimens (*billable tests*) per week (7 x 5)

8 controls per week (4 on Tuesday & 4 on Friday)

43 tests/week x **\$2.50**/test = \$107.50 /week (total cost of weekly testing)

\$107.50 / 35 billable tests = \$3.07 per test

Proposed system:

35 patient specimens (*billable tests*) per week (7 x 5)

24 controls per week (4/day x 6 days)

59 tests/week x **\$2.50**/test = \$147.50 (total cost of weekly testing)

\$147.50 / 35 billable tests = \$4.21

Performing the test more frequently will increase the cost per billable test by 37%! The cost per billable test may decrease, if the new transplant program generates more patient specimens that will absorb the cost of the additional controls run each week. Even without an increase in workload, the laboratory manager may decide to comply with the wishes of the transplant physician, as a matter of customer service/good patient care.

Sample Problem 7: Should the laboratory perform this test or send it to a reference lab?

A local trucking company is willing to pay the laboratory **\$25** per employee for a drug screen, if they can have the results within 24 hours. The trucking company estimates that there will be **10** new employee drug screens and **2** drug screens following accidents each month. After performing a cost analysis, the laboratory manager determined the direct cost per drug screen was **\$20**. Overhead cost is **\$2** per screen. A reference laboratory in the next town can perform the screen for **\$18** per test. They promise results within 12 hours, but the cost of the express courier to get the specimen to that laboratory is **\$5** per run, regardless of the number of specimens being sent. The trucking company says new employees start each week on Mondays. The specimens following the accidents would need to be sent immediately. Should the laboratory run the test in-house, or send it to the reference laboratory?

Twelve (**12**) drugs screens will be performed each month, generating revenue of **\$300**.

Performing the screen in-house will cost $12 \times (\$20 + \$2) = \$264$, leaving a profit of \$36 each month (**\$300** - \$264).

Sending the screen to the reference lab will cost $12 \times (\$18 + \$2) = \$240$.

[Notice that you must still include the overhead cost... Remember that overhead expenses are fixed; they are incurred regardless of the number of tests performed in-house!]

Add to this the cost of the courier, at 6 runs each month (4 new employee runs and 2 accident runs). $6 \times \$5 = \30

$\$240 + \$30 = \$270$, leaving a profit of \$30 each month (**\$300** - \$270).

Although either option will turn a profit, the profit will be larger by performing the test in-house. The laboratory will also avoid complications from transporting the specimen to the reference laboratory or problems receiving results from the reference laboratory within the promised time-frame.

Break Even Analysis:

Once the cost per test has been determined, another question the manager must consider is, "What is the volume of testing that can be expected for this analyte?" It will be necessary to run a set number of tests in order to generate enough income to cover the expenses related to performing those tests. A **break even analysis** may be performed to determine the minimum number of tests that must be performed to cover these expenses. This figure may be used by the manager when considering whether to perform a test in-house, or send the test to a reference laboratory.

The formula for the break-even analysis is:

$$\text{Number of tests} = \frac{\text{Fixed costs} + \text{Net Income}}{\text{Revenue} - \text{Variable Costs per Test}}$$

Remember that when you want to “break-even”, the net income is \$0!

Sample problem 8:

Your laboratory wants to win the contract for performing West Nile testing for the state Department of Public Health. The laboratory has bid \$25 per test (revenue). Fixed costs for the test are \$10,000. Variable costs per test are \$12. How many tests would the laboratory need to perform to break even?

$$\text{Number of tests} = \frac{10,000 + 0}{25 - 12} = \frac{10,000}{13} = 769 \text{ tests}$$

What would happen if the laboratory wished to make a profit by performing this test?

Using the West Nile example above, how many tests would have to be performed in order to generate a profit of \$5,000?

$$\text{Number of tests} = \frac{10,000 + 5,000}{25 - 12} = \frac{15,000}{13} = 1154 \text{ tests}$$

By comparing the number of tests that must be performed to break even with the number of tests currently being requested for a given analyte, the manager can justify the decision to perform the test in-house or send it to an outside laboratory. Note that other non-financial factors such as turn-around-time may be considered when making this decision.

Purchasing Capital Equipment:

The purchase of equipment over a set dollar amount (as determined by each institution) is termed capital equipment. The laboratory manager must evaluate whether it is in the best interest of the laboratory to make an outright purchase or lease the equipment from the vendor. A **lease** may be used to spread out the cost of equipment over a set number of months, rather than pay upfront as with a purchase. A common lease option involves a commitment by the laboratory to purchase a given volume of reagent for a set price, with the vendor “giving” the laboratory the analyzer in return.

Sample Problem 9: Should the laboratory purchase or lease this piece of equipment?

The laboratory is evaluating a coagulation instrument. The new instrument costs \$75,000 to purchase outright. The laboratory would also purchase a service contract that would cover 5 years of service for \$1,500/year. Reagent cost is \$0.90 per test. The laboratory performs an average of 650 coagulation tests each day.

The vendor is also offering a lease option, based on reagent purchase. If the laboratory agrees to purchase reagent at a cost of \$1.25 per test for 5 years, there will be no charge for the instrument or for service.

Should the laboratory purchase the instrument, or lease it?

	Purchase	Lease
Instrument	\$75,000	\$0
Service	\$ 7,500 (\$1500 x 5 years)	\$0
Reagent	<u>\$1,067,625</u> (5 yr x 365days/yr x 650 tests/day x \$0.90/test)	<u>\$1,482,812.50</u> (5 yr x 365 days/yr x 650 tests/day x \$1.25/test)
Total	\$1,150,125	\$1,482,812.50

In this example, it would benefit the laboratory to purchase the instrument and service agreement rather than lease the instrument.

When opting to purchase the equipment, it may be necessary for the laboratory manager to defend the large outlay of cash at one time. Depreciation and payback analysis can assist the manager in decision making.

Depreciation:

Depreciation allows businesses to assign value to an asset as it ages, or to determine tax value. The purchase price of the asset is divided by the useful life of that asset. In the laboratory, depreciation usually applies to capital equipment, such as laboratory analyzers and instruments.

Sample problem 10:

The Blood Bank wants to buy a new platelet rotator at a cost of \$5000. The average lifetime of a platelet rotator is 25 years. What would be the annual depreciation of the new platelet rotator?

$$\text{\$5000}/25 = \text{\$200}/\text{year}$$

Payback Analysis:

When justifying major expenditures (such as purchasing new equipment or offering a new service), it may be necessary to show how long it will take to recoup (payback) the initial outlay of funds. It is ideal to keep the payback time as small as possible, so that funds are not tied up on one project. To calculate, divide the initial expense by the expected annual income generated from using that equipment/service.

Sample problem 11:

CLS student volunteers operate the laboratory in a clinic that serves an underprivileged area. They have observed that there is a high population of diabetics in this community. They would like to purchase an analyzer to perform glucose testing, for a price of **\$3000**. A generous vender has agreed to donate reagents and disposables if the students purchase his company's analyzer. The clinic is open 1 night per week, **52** weeks per year. The students estimate they would test approximately **10** patients each evening. They plan to charge the patients **\$5** per test. If the entire income from this test is applied to the purchase of the analyzer, what is the payback period for this analyzer?

Income: **10** tests/week x **52** weeks/year x **\$5**/test = **\$2600**

Payback = Initial expense / expected annual income
\$3000 / \$2600 = 1.15 years (about 14 months)

In conclusion, understanding the financial process in the laboratory is critical to decision making by the laboratory manager. Awareness of financial components allows for efficient laboratory operation today, maintaining a competitive edge, and the ability to provide for future growth.

Bibliography:

Falcone DM. (2000). Basic financial management for laboratorians. *Medical Laboratory Observer*, 32(8). Retrieved from www.mlo-online.com

Harmening DM. (2007). *Laboratory management: principles and processes* (2nd ed.). St. Petersburg, FL: D.H. Publishing and Consulting, Inc.

Hudson J. (2004). *Principles of clinical laboratory management*. Upper Saddle River, NJ: Pearson Education, Inc.

Varnadoe, LA. (1996). *Medical laboratory management and supervision*. Philadelphia, PA: F.A. Davis, Co.