Laboratory Productivity

The single item that impacts the cost per test the most is the price of labor. Labor costs go beyond the “paycheck” to include the value of benefits, such as vacation pay and insurance, along with the cost of recruiting employees, training them, and expenses associated with termination of employment. Management of labor costs impacts not only institutional finances, but quality of service as well.

One means of monitoring labor costs has been measuring laboratory productivity. Productivity is a measure of the amount of work produced within a given time frame, often minutes or hours. Expressed as a calculation,

\[
\text{Productivity} = \frac{\text{total work}}{\text{time}}
\]

Several methods have been used to measure the amount of work performed.

For many years, the laboratory standard was the College of American Pathologists (CAP) Workload Unit (WLU) program, an example of a weighted workload program. With this program, each test was assigned a WLU value. This value was derived from time motion studies, where the test under study was broken down to its elemental tasks, and each task was timed. For example, the ABO test performed by tube method may be broken down into the following: processing specimen (judging acceptability and centrifuging), labeling tubes, preparing cell suspension, adding reagents and specimen to tubes, centrifuging, and reading, recording and reporting results. Only the “hands on” time was recorded, i.e. if the specimen was centrifuged for 5 minutes, only the time it took to load and unload the centrifuge was recorded, not the 5-minute spin time. Several time measurements were made, to account for variability between technologists, time of day, workload level, etc. Time spent on instrument set-up and routine maintenance was included in the measurements.

Time studies were performed at a variety of laboratories throughout the country. These labs submitted their data to CAP, where the results were averaged together to determine the WLU for a certain test, by a specific method. One unit was equal to one minute. To determine productivity, the number of tests performed was multiplied by the WLU and then divided by the number of minutes worked. For example: Two technologists in Blood Bank perform 20 ABO/Rh determinations in 3 hours. If the workload value for ABO by tube is 3 minutes, and the Rh by tube (no weak D) is 2 minutes, the productivity calculation would be:

\[
\frac{20 \text{ tests} \times (2\text{min} + 3\text{min})}{2 \text{ techs} \times 180 \text{ minutes}} = 27.8\%
\]
Not only could laboratories use this information to determine their own productivity, they could compare their productivity with peers using the same methodology, and compare between methodologies when evaluating new equipment/reagents. In the previous example, the WLU may be different if the gel method was employed, rather than the tube method. Likewise, if the weak D test was necessary for some determinations, the calculation would need to be adjusted to account for the additional steps.

Notice that the CAP method captures activity throughout the workflow. In 1990, the Clinical and Laboratory Standards Institute (CLSI), formerly NCCLS, proposed breaking this down into three phases, in order to better capture areas where labor expenses are incurred. The current CLSI guidelines suggest:

1. **Preexamination procedures**: Time spent ordering tests, preparing the patient for testing, and procuring, transporting and processing the specimen.
2. **Examination procedures**: Time spent performing tests, calculating results, verifying test performance (i.e. performing quality control and instrument maintenance), and interpreting test results.
3. **Postexamination procedures**: Time spent reporting results, and storing specimens.

Using these guidelines makes it easier for a manager to staff more effectively, improve workflow and turn around times, and choose more cost efficient methods and equipment.

A common method for measuring productivity, used by many laboratories today, is billable tests per hour. According to CAP’s Laboratory Management Index Program (LMIP), a standard billable test (SBT) must meet all of the following criteria:

- Be ordered by a physician or caregiver
- Be associated with a CPT code
- Generate a result, product or billable phlebotomy procedure
- Be performed by laboratory personnel

This standardization has removed some of the original bias as to what should be counted as a “test” i.e., is a chemistry profile one test, or seven different tests? Some technologists object that this method doesn’t account for different methodologies, or additional quality activities, in the manner that the CAP WLU method did. However, as illustrated by Varnadoe in *Medical Laboratory Management and Supervision*, government and third-party payers see laboratory results as a commodity, and are only willing to pay the fee assigned to the CPT code, regardless of the methodology used. It is up to the laboratory manager to make wise decisions that will maximize reimbursement, and maintain laboratory quality and efficiency.

Other means of calculating productivity include hours paid per patient day, or hours paid per patient visit (admission).
When calculating productivity, one must be clear about which values are used in the various formulas. Paid (total) productivity includes not only hours worked, but items such as paid breaks, sick time, vacation, jury duty, and funeral leave. Worked productivity is only hours worked, including overtime. Education and training are usually classified as worked hours.

For example: Helen Hematology has had a very productive day, generating a total of 450 billable tests during her shift, 6:30am to 3pm. She had one 30-minute breakfast break, for which she was paid, and one 30-minute lunch break, for which she was not paid. To calculate her paid productivity, the calculation would be 450 billable tests / 8 hours = 56.25 tests/hour or 56.25 tests/ 60 minutes = 93.75% productivity. Helen’s worked productivity would be 450 billable tests / 7.5 hours = 60 tests/hour, or 100% productivity. Notice in the worked productivity calculation, the time Helen spent on her breakfast and lunch breaks are NOT included, since she was not actively involved in patient testing during those times.

Productivity calculations can also be used to determine the staff size required to carry out the workload. A staff member who works 40 hours a week, 52 weeks a year (2080 hours) is one Full-Time Equivalent, or 1.0 FTE. A staff member who works 1040 hours in a year is 0.5 FTE. Divide productivity hours by 2080 hours to determine staffing levels.

For example: This year, your laboratory had a total of 55,800 paid hours, and 47,430 worked hours. The total number of employees needed to staff the laboratory is 55,800 / 2080 = 26.8. The number of productive employees is 47,430 / 2080 = 22.8. In other words, your laboratory needs a minimum of 22 full time and one 0.8 FTE employees to staff the laboratory (but no one can be sick or go on vacation) or 26 full time and one 0.8 FTE employees to staff your lab and cover benefit hours.

Calculations such as these can be a tool for forecasting future staffing and financial needs. Consider the following example from Varnadoe:

**Current year**

<table>
<thead>
<tr>
<th>Test volume</th>
<th>Salary expense: $399,942</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. paid hours: 39,520 hrs</td>
<td></td>
</tr>
<tr>
<td>No. benefit hours: 3,596 hrs</td>
<td></td>
</tr>
<tr>
<td>No. worked hours: 35,924 hrs</td>
<td></td>
</tr>
</tbody>
</table>

Paid productivity: 373,332 tests / 39,520 hrs = 9.5 tests/hr
Worked productivity: 373,332 tests / 35,924 hrs = 10.4 tests/hr
Average hourly rate: $399,942 / 39,520 hrs pd = $10.12/hr pd
If the projected test volume for next year is 408,237 tests, and there will be a 5% salary increase, calculate the projected average hourly rate, Paid FTE, Worked FTE, and salary expense for next year.

**Average hourly rate:** $10.12 \times 1.05 = $10.63/hr pd

**Paid FTE**

\[
\frac{408,237 \text{ tests}}{9.5 \text{ tests per hr}} = 42,972 \text{ pd hrs}
\]

\[
\frac{42,972 \text{ pd hrs}}{2080} = 20.7 \text{ FTE}
\]

**Worked FTE**

\[
\frac{408,237 \text{ tests}}{10.4 \text{ tests/hr}} = 39,254 \text{ worked hrs}
\]

\[
\frac{39,254}{2080} = 18.9 \text{ FTE}
\]

**Salary expense**

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42,972 \text{ pd hrs} \times $10.63/\text{hr} = $456,792
\]

In conclusion, productivity figures can be used to assess laboratory efficiency, evaluate methods and instruments, and provide financial data for the budgeting process. Care must be taken when making comparisons using this data, that the original data was collected in an identical manner. Regulatory issues may not be reflected in productivity data, but still must be complied with.

**References:**


College of American Pathologists, Web site (www.cap.org) Laboratory Improvement Index Program section.
