SPECIAL FEATURE

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# How to Utilize Benchmarking in the Clinical Laboratory

ABSTRACT: Benchmarking of clinical laboratory activities has become a tool used increasingly to enable administrators and managers to obtain an independent evaluation of the performance of the laboratory and identify opportunities for improvement. Benchmarking is particularly important because of the diversity and complexity of the various sections of the laboratory. The critical component of laboratory benchmarking is peer comparison, as solutions to shortcomings or problems can be titrated and planned through this process. The reliability of benchmarking must be supplemented and modified by the input of the manager's detailed understanding of local circumstances. At this critical moment, the changes in peer review strategies instituted by JCAHO, CAP, CLIA, and individual states create an urgent opportunity to assist medical directors and laboratory managers in maintaining an overview of the performance and quality of laboratory operations. Unannounced site visits will require prompt reports and alerts of undesirable changes in performance. The future goals of benchmarking must expand to include surveys of laboratory test utilization and patient outcomes as ultimate measures of test utility in the clinical process and important assessments of the quality of patient care.

A manager who chooses to begin benchmarking his or her department's functions is like a naval captain who directs his helmsman to steer his ship away from the dock. By using a global positioning system (GPS) to determine the initial position of the ship, along with appropriate maps and a compass, the future direction of the ship may be plotted. With radar and a radio in hand, the ship is officially seaworthy. During the voyage, however, the captain must do more than rely on charts, maps, and numbers to get his ship where it needs to go. He needs to apply his knowledge and experience to take into account unexpected obstacles and weather conditions as necessary to reach the desired target. Benchmarking, as with a GPS, compass, charts, radar, and radio, is a tool, but it decidedly cannot be relied on in its entirety to plot the course for a department.

The literature on the subject of benchmarking as a management tool in the clinical laboratory is sparse. Travers outlined the process of laboratory management in great detail, but she does not refer to benchmarking specifically.[1] Wilkinson and Reynolds described the problems caused by differences between the various benchmarking systems and provided ways to evaluate divergent results that they consider to be "the true test of a manager's skill."[2] Valenstein et al outlined the use of benchmarking as a tool for determining optimum staffing of a laboratory and trends in productivity and utilization.[3,4] They stated

that it is impossible for a manager to take into account every relevant factor that may help in arriving at a "scientifically determined" staffing target. Indeed, they were skeptical about "rigid, formulaic approaches" to staffing "because they ignore intangible considerations that should properly affect staffing decisions." We agree with the conclusions and considerations of these authors. We consider benchmarking an important means to assess a very complex production environment but only as part of the overall solution.

Without benchmarks, peer comparisons, and the evaluation of changes over time to help assess the effectiveness of the management system (and therefore help identify and deal with problems), a clinical laboratory enterprise might flounder and eventually founder. The goal of this article, therefore, is to address the role of the laboratory manager and medical directors in planning and executing specific benchmarking functions.

### Early Experience in the United States

The College of American Pathologists (CAP) unveiled its workload recording system more than 30 years ago, providing one of the earliest benchmarking tools available to laboratorians. Adopted by many laboratorians in the 1970s and 1980s, CAP's product only allowed the user to interpret test volumes within the confines of "test" definitions. As a result, the basic unit of measure was not standardized, and laboratorians were quick to point out that peer comparisons were invalid because of this issue. The tool was useful for internal benchmarking purposes and led to laboratory performance improvements over time, but the workload recording system was not considered a valid external benchmarking tool and CAP eventually discontinued the program.

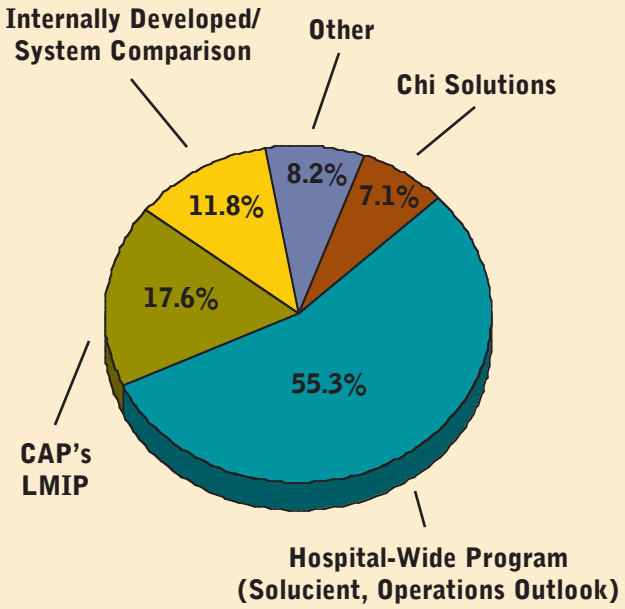
After CAP's system failure, many laboratorians became skeptical of all benchmarking products and perhaps would have shunned them forever if not nudged from above. In the 1980s, health-care administrators increasingly began to look for methods and tools by which they could determine how their laboratory performed against its peers. From their perspective, the benchmarking product they desired needed to offer a high-level view of laboratory operational comparisons — the details were left for the laboratory to deal with. As a result of this approach, we currently have two types of benchmarking products in the laboratory:

1. Those developed for hospital administrators that show high-level operational comparisons

2. Those developed for laboratory managers and directors that provide detailed operational comparisons.

**FIGURE 1**

**BENCHMARKING PROGRAM UTILIZATION**




Source: Chi Solutions, Inc. Fifth National Outreach Survey. 2006.

The use of benchmarking in laboratories is increasing in popularity. A recent survey conducted by Chi Solutions indicates that 56.5 percent of hospital clinical laboratories utilize benchmarking to some extent.[5] Outreach activities are included in 58.7 percent of these systems. As indicated in Figure 1, of the surveyed facilities, 11.8 percent use benchmarking systems developed internally while 55.3 percent use laboratory benchmarking as part of total hospital benchmarking assessments. The remaining 32.9 percent use subscription services. These statistics indicate a significant increase in overall benchmarking usage compared to a previous Chi survey. Even with the increased acceptance of benchmarking as an improvement tool, many laboratorians remain skeptical. Some, in fact, have become critical of the use of benchmarking, although they rarely have any recommendation for a better way to obtain comparable information.

### What Comprises a Good Benchmarking Product?

To be useful to laboratory managers and directors, a benchmarking product must ensure that the peer comparison data provide as close a fit to their operation as possible. To accomplish this, the product must extract raw data and minimize the ability of the user to modify data or information.

The benchmarking product must incorporate a process to ensure that a standardized approach is taken with each data set and be able to determine if any manipulation of the data has occurred within the submission group. In total, a good benchmarking product removes concern about the submitter's ability to manipulate the system and enhances the overall credibility of the product.

### The Benchmarking Process and Its Application

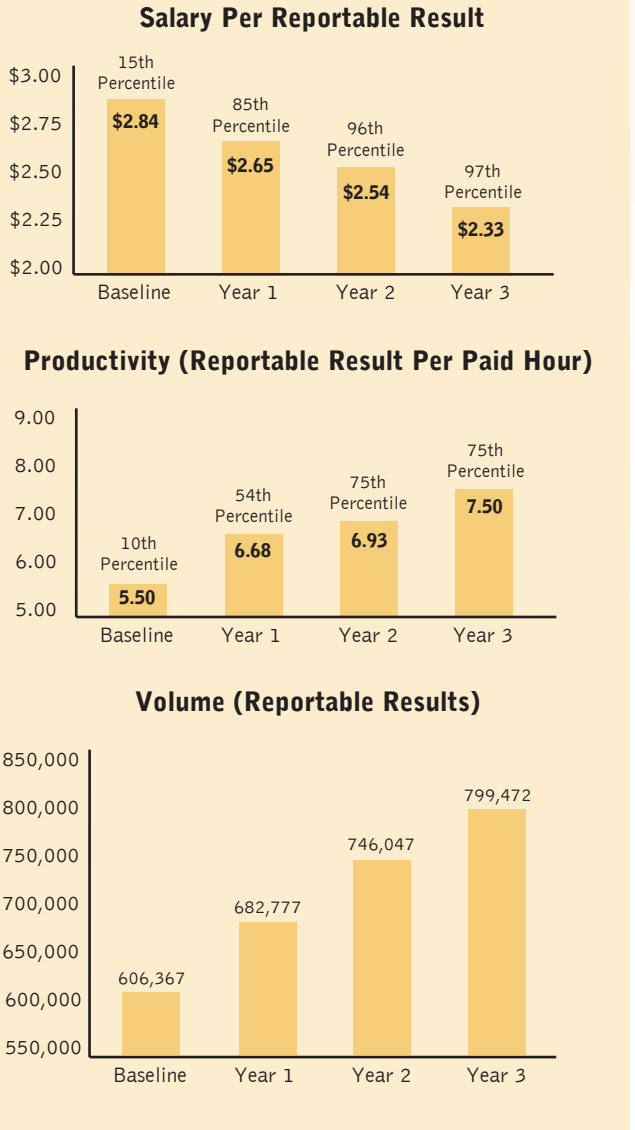
Chi Laboratory Systems (the forerunner of Chi Solutions, Inc.) embarked upon the development of a sophisticated laboratory benchmarking system in the early 1970s. The system was intended to characterize, in detail, the operation of specific clinical laboratories and identify departmental deficits and flaws that were potentially remediable by appropriate action. From the outset, it was understood that the benchmarking metrics utilized must be absolutely accurate and uncontestable to allow for the advice of a hired consultant, which would be based in part on the data, to be unimpeachable.

The term "benchmarking" is actually a misnomer when applied to clinical laboratories. The system of performance measurement was initially designed for use by inexperienced trade guild apprentices. The master carpenter or metalworker would "mark the bench" with the desired length of a piece of metal or wood that needed to be cut. They required — and indeed, mandated — that no judgment be applied to the cutting on the part of the apprentice. This process, in some ways, is similar to Lean thinking today, which focuses on the use of templates or standardized processes to help reduce errors. The use of benchmarking in today's world has clearly evolved from its roots and is now intended to provide information to the "masters" — department directors, managers, and supervisors or consultants — rather than the workers.

The introduction of benchmarking subscription services in the clinical laboratory arose in part as a result of the enactment of the Tax Equity and Fiscal Responsibility Act (TEFRA) and Diagnosis Related Groups. Following the passage of TEFRA in 1982, hospital administrators realized that they would be faced with dramatic reductions in revenue. In many cases, consultants were called in to provide benchmarks on various hospital operations, such as nursing services, operating rooms, ancillary services, and ICUs. Armed with these figures and basing their theories on the success of benchmarking in industrial engineering, administrators presented benchmarks to their staffs and expected them to adhere rigidly to the improvement targets set. When a benchmarking consultant suggested that the laboratory was overstaffed by, say, 20 Full-Time Equivalents (FTEs), the administrator expected that the laboratory manager would reduce staff accordingly.

**FIGURE 2**

**BENCHMARKING TRENDS FOR A SMALL COMMUNITY HOSPITAL LABORATORY**




This assumption, unfortunately, ignored some critical realities:

1. The clinical laboratory is a complex operation comprised of several different disciplines, each with significantly different characteristics and activities. Therefore, unspecified staff reductions are likely to have a very different impact on Chemistry than on Microbiology or Blood Banking.

2. Benchmarks were often produced by analysts who failed to inspect the actual laboratory they were hired to evaluate. As such, they often neglected to take into account performance-affecting factors such as the laboratory floor plan design, qualifications and experience of staff, the degree of production automation, excessive demands for services by the clinical staff, and others.

3. Our studies have indicated that the single largest cost differentiator between laboratories is the test menu. The more complex the test menu, the higher the unit cost. Benchmarking products that do not adjust for test complexity may draw erroneous or inappropriate comparisons and conclusions.

4. In some situations, particularly in small hospitals, staffing may need to be determined predominantly by the user service needs rather than the achievement of optimum productivity goals.

Keeping these factors in mind, a savvy laboratory manager can use benchmarking to improve the performance of his or her laboratory. As shown in Figure 2, benchmarking of a small community hospital laboratory found that it was overstaffed by approximately 30 percent. As compared to other laboratories of similar size and complexity, salary costs at this community hospital were in the 15th percentile while productivity was in the 10th percentile. The laboratory was not involved in any outreach activities; all efforts were focused on meeting the service-intensive needs of the hospital's inpatient population.

To address their deficiencies, the laboratory reduced staff through attrition during a three-year period. Each time an employee left his or her position, existing resources were reapportioned to fill the gap. In addition, the laboratory started an active outreach program to increase volume and introduce new revenue to help cover their fixed hospital costs. The net result is that, during this three-year period, the laboratory improved performance dramatically (improving from the 15th to the 97th percentile for salary cost per reportable result and from the 10th to the 75th percentile for productivity) by using benchmarking as a management tool to monitor performance and take corrective actions. This laboratory, initially viewed as a poor or marginal performer by administration, became one of the most efficient in the hospital. Based on the improvements, the laboratory won the support of hospital executives to remodel the department and further expand its outreach program. In this case, the use of benchmarking as a management tool transformed a "sleeper" into a "star" department.

**FIGURE 3**

**STEPS IN THE BENCHMARKING PROCESS**

1. Characterization of workload (using standardized definitions) and clinical requirements for service delivery

2. Assessments of human, technologic, and communications resources of the lab

3. Assessment of complexity of testing and indexing of all measurements to this complexity

4. Evaluation of automation

5. Determination of the number and experience of technical and support staff

6. Measurement of technical staff productivity

7. Evaluation of practices relating to the send-outs of testing

8. Evaluation of budgetary resources and their allocations

9. Understanding of the operation's organizational structure with emphasis on location (e.g., space design, multi-centricity, or geographic dispersion of operations)

### Benchmarking Needs

Conventional benchmarking is essentially a retrospective process centered around an assessment of the adequacy of resources and economic performance. Laboratory processes and quality issues are traditionally excluded from benchmarking assessments. The dimension of clinical impact is also inadequately assessed.

To be convincing, benchmarking must be comprehensive and detailed. Furthermore, the increasing complexity of the health-care environment, along with changes in technology and performance requirements, mandate an increasing degree of accuracy and sensitivity from benchmarking products. The fundamental process of laboratory benchmarking involves several complementary steps, as identified in Figure 3.

Benchmarking consultants may be needed if, in the judgment of the laboratory management and directorship, there is either a lack of experience to make critical decisions in-house or disagreements between laboratory operators and hospital administrators require an outside arbiter.

**Our Benchmarking Experience**

Chi Solutions currently has a repository of data from approximately 700 hospitals of various sizes and with various missions. This has enabled us to use historical information mining as a means of identifying peers that closely resemble laboratories currently being benchmarked and assessing their performance in comparison with those peers. These data are being kept up-to-date through regular industry surveys.

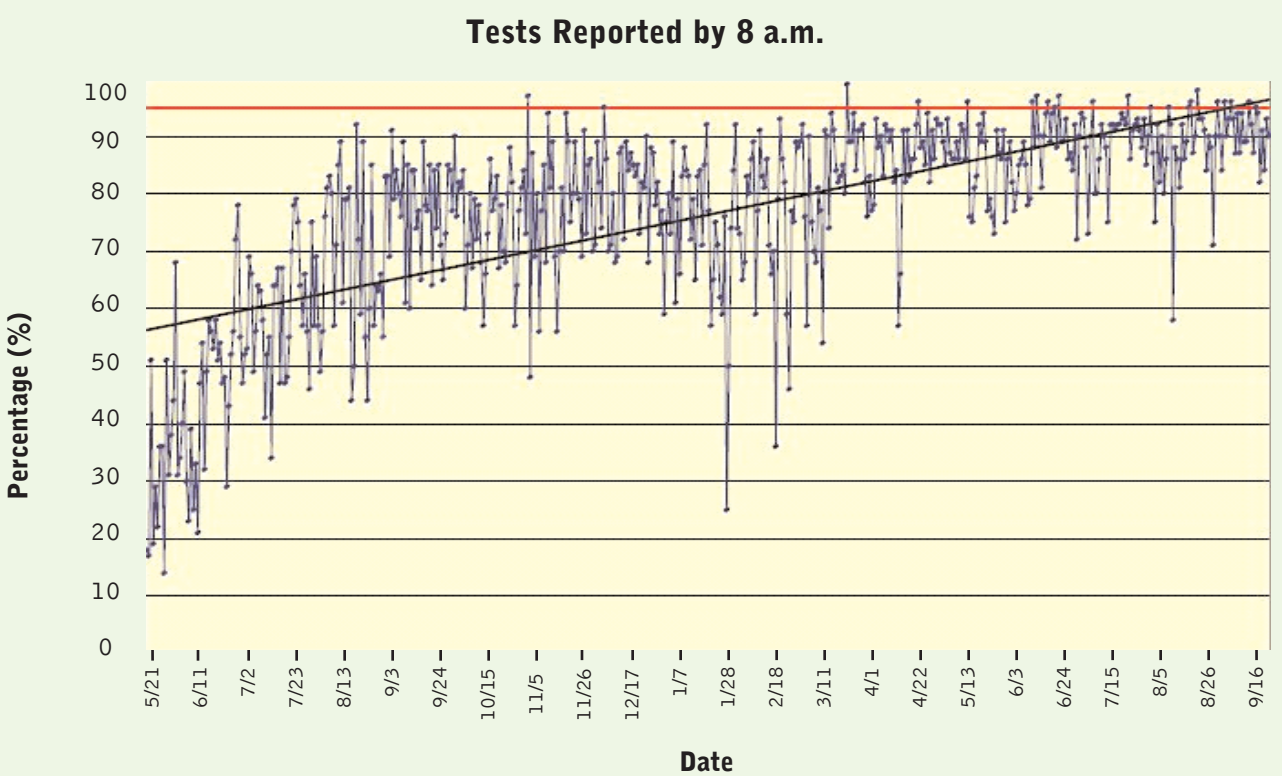
Since peer comparison has increasingly become the critical element of the benchmarking process, our selection of peers is based on comprehensive, accurate, and up-to-date comparable data. This was rather difficult to gather, as many institutions would almost invariably claim that they were "the best of breed" and that they had no peers. Furthermore, the emergence of integrated, multi-institutional delivery systems made peer comparisons more difficult because of the idiosyncratic arrangements of each of these systems. In these integrated delivery systems, the internal peer comparison was used by administration on the assumption that, if hospital A in the system had certain optimal benchmarks, institutions B, C, and D should be capable of achieving the same levels of performance. This assumed a certain homogeneity of circumstances that was rarely the case.

Critical aspects of any benchmarking application include the ability to measure changes in performance over time, to recognize trends, and to measure progress toward the achievement of targets set by the initial benchmarks. Ideally, these aspects need to be evaluated and updated at six- or 12-month intervals.

Lastly, when hospital laboratories began to take on revenue-generating activities in the non-hospital sector of

**FIGURE 4**

**EARLY MORNING TURNAROUND TIME TRENDING GRAPH**




Source: MAST™ (Management, Accountability, Staffing & Service Tracker). Management Decision Systems, Inc., Holden, MA. Sept. 16, 2005.

communities (outreach), the operations of these business ventures had to be accounted for, their impact on in-house operations assessed, and their success or failure evaluated as part of the benchmarking process. This represents a significant problem, since some of these outreach patients are indeed registered as outpatients while others are considered to be non-patients. Calculations of revenue and profitability of outreach enterprises are consequently somewhat inaccurate. In the future, this will require some standardization before the results can be fully relied upon for comparative purposes.

**The Clinical Laboratory Oversight Toolset**

Recent, well-documented events at Maryland General Hospital alerted clinical laboratory accrediting agencies to the risk of serious performance and process violations that were previously undetected by conventional oversight strategies. This led to significant changes in the accreditation process, including unscheduled visits by inspectors and attention to the execution of responsibilities by medical directors and others to whom the director may delegate such authority.

Continuous oversight of operations in integrated delivery networks with multiple laboratory units, including point-of-care and rapid response laboratories, core laboratories, and other specialized laboratory units, require regular assessments of operations, staffing, and economic performance. Special attention should also be paid to efficiency and error-free performance.

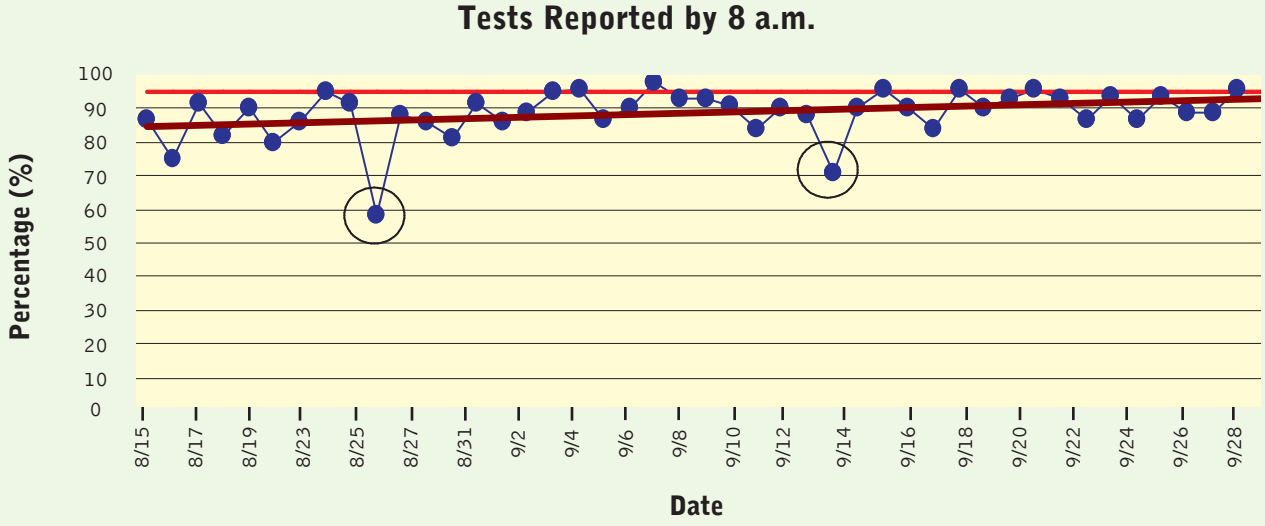
In small hospital laboratories, medical directors are frequently involved in complex anatomic diagnostic activities in addition to their performance of supervisory functions necessary to meet the requirements set out in Clinical Laboratory Improvement Act regulations. Therefore, in today's environment, operations oversight must be automated and provide access to real-time results.

Management Decision Systems, Inc. has developed a system that taps directly into the relevant LIS and HIS laboratory records. This continuous process of data acquisition and information generation is intended to assist laboratory directors, managers, and supervisors to evaluate operations and performance, and to initiate corrective measures rapidly if negative trends or defects in performance are detected. In light of the proposed changes in accreditation surveillance, such interventions will need to be prompt and rapidly effective.

Chi Solutions' use of this tool at Maryland General Hospital generated dramatic results, as illustrated in Figures 4 and 5.[6] Using daily turnaround data and detailed outlier reports, the number of results reported by 8 a.m. improved from 18 percent to 95 percent during the course of 16 months.

**FIGURE 5**

**EARLY MORNING TURNAROUND TIME — IDENTIFICATION OF OUTLIERS**




Source: MAST™ (Management, Accountability, Staffing & Service Tracker). Management Decision Systems, Inc., Holden, MA. Sept. 28, 2005.

We believe innovations that lighten the workload of laboratory personnel are likely to improve the quality of laboratory services in the future.

### The Challenges of the Future

While benchmarking products continue to move toward real-time monitoring of a broader array of performance indicators, the laboratory industry lags behind in correlating the relationship of performance metrics to that most important element of our purpose, i.e., the patient outcome. While some laboratorians began to study patient outcomes related to laboratory services more than 10 years ago, they are still among the vast minority. Considering that pay for performance is focused on patient outcomes, our industry will need to become more sophisticated and find ways to evaluate laboratory services by linking metrics and best practices with optimal and attainable patient outcomes.

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