Laboratory Results

Timeliness as a Quality Attribute and Strategy

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Abstract

Although timeliness of results reporting has not been a major focus in clinical laboratories, there is increasing pressure from clinicians to report results rapidly. Even though there are only sparse data, timeliness in reporting of laboratory results undoubtedly affects clinician and patient satisfaction as well as length of hospital stay. Improving turnaround time (TAT) is a complex task involving education, equipment acquisition, and planning. All the steps from test ordering to results reporting should be monitored and steps taken to improve the processes. Various strategies to improve TAT at each step in the testing process are discussed.

World class service industries are characterized by their attention to reducing waits and delays. In contrast, timeliness of results reporting has not been a major focus in clinical laboratories.[1-3] While laboratory professionals often overlook timeliness as an important attribute, clinicians judge the adequacy of laboratory services by the speed with which results are reported.[4] A few studies have explored the wishes, wants, and needs of clinicians for the time frame in which laboratory results are reported, and, for the most part, these studies indicate laboratories do not meet clinicians' expectations.[5] Moreover, the rapid growth in point-of-care testing demonstrates that clinicians are seeking faster test results even though point-of-care tests may be more costly, subject to a variety of interferences, and less precise.[6-8] For example, the cost of point-of-care glucose testing can be many times greater than the cost in the central laboratory, and point-of-care glucose measurements are subject to variation in the patient's hematocrit.[6,8] At the same time, performance of glucose meters does not meet the precision goals of the American Diabetes Association, even in the hands of experienced operators.[9] What is the reason given for the proliferation of point-of-care glucose measurements? The answer is the timeliness of the availability of results.

Why then do laboratory professionals not make timeliness of results reporting a major priority? The simple answer is that improving turnaround time (TAT) is a difficult task. Hemoglobin and potassium TATs have been unchanged for almost a decade, as shown by data for the emergency departments of more than 600 hospitals.[2,10] Perhaps this occurs because TAT improvement does not come as a turnkey system. Improving TAT requires education of a wide variety of individuals, long-term planning, and completion of innumerable tasks. Small investments in the clinical laboratory

resources may improve TAT and greatly improve clinicians' efficiency, as well as help reduce required days of hospitalization for patients. Overall cost reduction, however, may be difficult, if not impossible, to prove. With limited exceptions, studies to date fail to show that decreased TAT improves the length of hospital stay or patient care.[3,5,11,12] If this is the case, why then should clinicians insist on rapid TATs? Perhaps the answer lies in the increasing pressures on clinicians to provide more care at less cost along with the increasing burden of documentation. Practitioners thus need to become more efficient. From the clinicians' viewpoint, it is easy to see the benefits of rapid return of results. With the appropriate information available, laboratory results can be explained to the patient and treatment adjusted all in one encounter, thus increasing clinician efficiency and patient satisfaction. If laboratory results provide essential information for patient diagnosis and treatment, it follows that more timely results will improve patient care. Patient outcomes undoubtedly are affected by delays in diagnosis.[13] It is important to remind those who allocate resources that laboratory results must be available not only for diagnostic use but also before many treatments and procedures can be implemented. Thus, despite the lack of data, it is reasonable to assume that timeliness of laboratory results affects physician efficiency and hospital length of stay. Therefore, monitoring and enhancing timeliness of results reporting are fundamental to laboratory quality improvement.

TAT Benchmarks

Laboratory professionals generally believe intralaboratory TATs of up to 60 minutes are appropriate; clinicians do not agree.[1,2] Clinicians consider TAT from the time the test is ordered to results reporting, whereas laboratory professionals usually use specimen receipt to reporting of results as the TAT.[14]

Although it is difficult to monitor each of the steps from ordering a test to reporting the results, and often laboratory professionals are not in control of many of the processes, it is important to view TAT from the clinicians' viewpoint. TAT should be monitored on a regular basis, not only for the mean TAT, but also for results reported well beyond the average TAT (ie, outliers). Various measurement parameters have been used to express TAT, including proportion of acceptable results.[15] Mean and median TATs are not affected significantly by outliers, and, thus, they are not good statistical indicators for laboratories with good performance that want to improve further.[16] Identifying outliers and looking for the root cause of these problems is an excellent approach to understanding and eventually eliminating untimely reporting of results. Another approach is to monitor inpatient test availability for morning rounds.[4] Through the College of American Pathologists Q-Probes and Q-Tracks programs, national databases on a number of TAT parameters have become available. Recently, the College of American Pathologists offered 2 Q-Tracks TAT monitors: Stat Test Turnaround Time Outliers and Morning Rounds Inpatient Test Availability.[17]

At present, TATs for most stat clinical laboratory tests are less than 1 hour and 2 working days for most routine surgical pathology cases.[18-20] Using report inquiry for CBC count reports as an indicator, data show that most reports for inpatients and outpatient tests ordered stat are requested within 4 hours.[21,22] Others make the point that timeliness in reporting early morning routine clinical laboratory test results is an important parameter. It is important to choose TAT goals that lead to improved patient care and clinician efficiency and to improved satisfaction for both patients and clinicians. Ideally, all common laboratory tests should be reported as rapidly as possible by methods yielding high quality results, and this currently means an hour or less from order entry to results reporting under optimal conditions. For effective management of resources and improvement in patient satisfaction, it is especially important to report outpatient results promptly.

Improving TAT

To meet TAT goals, all aspects of the laboratory testing process must be considered, ie, everything from order entry to results reporting. Technologic advances should be taken advantage of at each step, and TAT should be monitored routinely **Table 1**. Test ordering via computer is efficient for clinicians and can ensure meeting the compliance guidelines of the Office of the Inspector General.[24] Patients' whereabouts must be updated in a timely manner (computer admission-discharge-transfer function) for efficient use of a phlebotomy team. All information regarding laboratory tests such as the required collection tubes and specimen handling should be readily available to the clinicians by electronic means. Specimen collection errors should be traced and corrected to improve TAT. For emergency department stat testing, the type of personnel collecting the specimen and the method of specimen transport are the most important factors affecting TAT.[18]

Long periods between obtaining and processing specimens are associated with deterioration of a wide variety of analytes. Thus, improving specimen transport and delivery not only improves TAT but also decreases preanalytic variation. As feasible, the specimen should be transported by automatic systems and accessioned rapidly via bar code readers. However, automated specimen transport does not

Table 1
Improvement of Turnaround Time (TAT)

Step	Element	Actions to Consider for TAT Improvement
Test selection and order entry	Test request	• Standardize nomenclature for easy lookup[23] • Customize screens for rapid ordering • Enable providers to order electronically (Note: location of devices and backup procedures)[24]
Specimen collection and delivery	Appropriate information and handling	• Ensure accuracy of admission, discharge, transfer data updates (for patient location) • Consider patient location tracking • Automate lookup of information on volume, container, and special precautions for obtaining and handling specimens[25]
	Phlebotomy	• Scrutinize phlebotomy practices[18,26]
	Specimen labeling	• Use bar codes (for more information http://www.hibcc.org)
	Specimen delivery	• Consider pneumatic tube, dumbwaiter, or conveyor belt–type system[2728]
	Specimen type	• Review use of plasma and serum separator tubes and whole blood[29,30]
Accessioning	Specimen arrival	• Use bar code readers
	Specimen transport within laboratory	• Consider pneumatic tube, robots, dumbwaiters, or conveyor belt–type systems[27,28]
	Specimen sorting	• Evaluate use of front-end automation: sorts, centrifuges, decaps, and prepares aliquots[31,32] • Sample directly from specimen container (as appropriate)
Testing	Instrumentation	• Consider total laboratory automation[33] • Evaluate throughput • Ensure minimal downtime and adequacy of backup • Use automatic repeats (for abnormal results) and dilutions for results exceeding linearity • Consider automatic verification of results within reference limits • Use incomplete test list frequently
	Quality control	• Adopt efficient quality control procedures[34]
Reporting	Posting of reports	• Interface instrumentation to computer • Generate preliminary reports (eg, microbiology, anatomic pathology) • Transmit reports via computer, broadcast (electronic board), pager, and/or Internet[35] • Consider automatic printing for locations such as intensive care units • Provide assistance with results and interpretation (help desk, interpretive reports, reflex testing)
For each step		• Monitor and improve TAT (mean, median, percentage meeting criteria and/or outliers) • Evaluate specimen flow to maximize efficiency • Track and eliminate errors

always guarantee the fastest TAT.[18] As with each of the technologic advances, care must be taken to monitor the effect of the change on TAT to maximize gains. Another approach has been use of "front-end" automation: this equipment centrifuges, decaps, prepares aliquots, and sorts specimens. Specimen transport throughout the laboratory often still is done manually, because of its flexibility. Other approaches include transport to laboratory areas by pneumatic tubes, dumbwaiter, robots, or conveyor belt–type delivery systems.

Equipment should be chosen and personnel deployed to maintain TAT at a minimum. Backup instrumentation must be chosen carefully. Another time-saver is quality control rules that minimize false rejection rates. Automatic dilutions with analyte remeasurements when results are beyond the linearity of the method and automatic rerunning to confirm critical results are important time-savers, especially for critically ill patients with markedly abnormal results. Instrumentation using whole blood specimens for analytes such as glucose, electrolytes, lactate, and ionized calcium and for renal function tests can yield results within 1 to 3 minutes after specimen receipt.[30] Laboratory professionals should consider maximizing computer use, for example, interfacing instruments, automatically verifying results, and making results available via computer. Results can be sent to a display device (eg, in the operating room), sent directly to a handheld computer or beeper, or made available to clinicians via the Internet. For some locations, such as intensive care units, it may be advantageous to set up automatic printing of results. Computer downtime procedures should undergo scrutiny to minimize the impact on TAT. Much less literature is available dealing with issues in anatomic pathology, but the same principles apply. Recently, efforts have been made to decrease TAT for cytologic (Papanicolaou) smears by applying industrial engineering and organizational development tools.[36]

TAT as a Strategy

TAT as a strategy means all activities that are performed are optimized to improve TAT and that trade-offs should not

be made. Trade-offs are tempting because of inflexibility of instrumentation, personnel, and systems. Because optimizing TAT is complicated, the process can take many years. Strategy is about keeping TAT in mind when choosing everything from blood collection procedures to instruments and computer systems. Ideally, one activity reinforces another in achieving optimal TAT. For example, an incomplete test list is used to ensure that no specimens are overlooked, but if it is called up in real time, the list can help improve TAT because the likelihood of finding a missing specimen improves with early awareness of the problem. Activities that complement one another have several other advantages: improvement in one activity can benefit another, and poor performance in one area degrades performance in other areas, thus making problems apparent.[37] Timeliness as a strategy involves careful planning and decision making, including not only what to do but also what not to do. For example, the cost of producing stat results can be more expensive than generating routine results, but slow results reporting, even for routine testing, has a number of adverse effects. In addition to physician and patient dissatisfaction, slow TAT can lead to duplicate test requests and increased stat testing.[20] Stat testing, however, tends to interrupt work flow and can lead to ever-increasing numbers of stat requests. This occurs because the interruption in work flow degrades the TAT for routine tests, ultimately leading to clinicians increasing the number of tests they order as stat. Thus, it is prudent to evaluate processing all specimens and performing testing as the specimens arrive in the laboratory regardless of test priority.[1] The driving force behind point-of-care testing is the rapid availability of test results.

Thus, many have predicted that the use of point-of-care testing will increase, but the question remains whether point-of-care testing is the most efficient and effective means of producing test results.[38] Currently, technologic advances are occurring that can make large improvements in central laboratory TAT a reality. Now is the time to improve timeliness not only as a strategy but also as a duty to all of our customers, clinicians and patients alike. There are constant pressures to make trade-offs, to compromise, and to change strategy. Timeliness of results reporting is too important an issue to fall prey to these pressures.

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