The Roles of the Clinical Laboratory Scientist: Educator, Consultant, Advocate

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ABSTRACT: Advances in clinical laboratory medicine have created an opportunity for clinical laboratory scientists to assume a new role--the role of educator in the integrated healthcare system. A gap created between critical laboratory test results and medical decisions requires the translation of laboratory results into meaningful clinical guidelines. This article suggests three ways the clinical laboratory scientist can fill this gap.

INDEX TERMS: computerized provider order entry system, implementation strategies, interpretive reports, system thinker, education

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CASE HISTORY

A 38-year-old married, monogamous female came to the emergency department with aseptic meningitis. She was admitted to the hospital and was seen by a hospitalist who suspected that the patient might have acute HIV and ordered a quantitative HIV by PCR. The test result was positive with a viral load of 32,000 copies/ml, but a note on the report indicated that the batch was "defective" and the test needed to be rerun. The hospitalist never received a report or followed up on the results. The hospital released the patient. Neither the patient nor personal physician knew that an additional HIV test was pending. Six months later the hospitalist found the original test report while cleaning out a desk. The aseptic meningitis was the first manifestation of acute HIV seroconversion. The consequences of this delay caused major emotional distress and the possibility of spreading HIV to her partner due to unprotected sex.[1]

This case illustrates a disconnect between healthcare professionals and patients. It is also a good example of how the clinical laboratory scientist can be engaged in improving patient care. Even though laboratory tests are now able to predict the progression of diseases and to establish more personalized treatment plans, there is a gap between the clinical laboratory test order and the practitioner's clinical decision.

Clinical laboratory tests are included as part of evidence-based clinical practice guidelines across the 23 main condition/disease categories, but the translation of these test results is often ineffective in supporting patient care.[2] Clinical laboratory scientists have the skills to provide accurate and reliable test

results, and these skills can create a new role that has been missing in the patient continuum. With the current crisis in healthcare, the clinical laboratory scientist has an opportunity to step forward and show how the profession can contribute to the new integrated healthcare system. The time has come for the clinical laboratory scientist to move outside of the laboratory walls and begin translating these critical tests into meaningful information. How many times has the laboratory professional dealt with a similar problem as discussed in the previous case? Clinical laboratory scientists must make sure the correct test is ordered, the correct results reach the correct practitioner(s), and the results have meaning for the practitioner. Day after day, the laboratory professionals provide quality test results, but often they are overshadowed by problems within the pre- and post-analytical phases. The public image of the clinical laboratory scientist is created by the problems that arise when the wrong test is ordered, a wrong sample is collected, or the test results are not clear to the clinician. The clinical laboratory scientists must get involved in all phases of clinical laboratory testing that reflect the quality of their work.

This article will discuss three ways the clinical laboratory scientist can take an active role as an educator in the new healthcare system. First, the creation of educational tools can improve communication between the laboratory professionals, nursing units, practitioner, and patients. Secondly, the clinical laboratory scientist as a consultant can establish learning events for other healthcare professionals. Lastly, the laboratory professional participating on multidisciplinary teams can provide an educational role and communicate critical information at the point of care. All three of these approaches used consistently can engage the clinical laboratory scientist, physician, nursing staff, and other healthcare providers in a dialogue that will contribute to improved medical decisions.

CREATION OF EDUCATIONAL TOOLS

The first step is to create educational tools that are immediately available to answer the healthcare professional's questions. The rapid advancement of scientific research has provided specific testing which gives the clinician more knowledge about patient outcomes and treatment plans. The challenge for the clinical laboratory scientist is to create learning tools that ensure they can order the correct test, receive correct results, and that the results give meaning to the patient treatment plan. In discussing the characteristics of a community of practice, Wenger found that adults do not learn in isolation but in a social and cultural environment.[3] The socio-cognitive demands of the workplace also shape the daily learning needs. The busy practitioner needs information in a quick and precise manner. The creation of educational tools that will meet this environment should be multi-dimensional. The tools should create collective and collaborative processes that include all the stakeholders.

To understand the clinical laboratory scientist's role as educator we can use the pre-analytical phase of testing as a good place to begin. In a study by Howanitz including CAP's Q-Probes and Q-Tracks program data, the error rates of the pre-analytic and post-analytic phases were higher than the analytic phase.[4] A questionnaire given to 70 primary healthcare centers and laboratories demonstrated the pre-analytical phase was associated with a greater risk of errors affecting patient safety.[5] The pre-analytic phase is very complex and involves the clinician, nursing staff, phlebotomists, and laboratory staff. A pre-analytical event is the practitioner's request for a laboratory test. The hospital's specific mnemonic is not easy to access. Accurate test identification is difficult because it changes and varies between healthcare institutions. To address this issue and other laboratory related problems, Centers for Disease Control and Prevention (CDC) has established a professional workgroup. One goal of the work group is to formulate a single test naming system, so the non-laboratory staff can use the same test mnemonic from one institution to another.[6] The universal test mnemonics could be a helpful educational tool to reduce patient errors.

An educational tool the clinical laboratory scientist could create is an improvement in the computerized provider order entry (CPOE). The clinician would input a specific evidence-based clinical practice guideline, and a template could assist in the selection of the correct test profile. The clinical laboratory scientist would maintain a current listing of tests with research references and additional information guiding the clinician through a decision tree format. In the event a newer test is placed on the laboratory's test menu, a pop-up window could give additional information on why the older test will be replaced with specific research references, and the date it will be removed. To avoid duplicate test orders, the clinician can see the previous tests ordered on the patient, and a warning that a duplicate test is being ordered within a set timeframe. The system will also ask if the practitioner wants to order a duplicate test referencing the additional healthcare cost. Some healthcare institutions already have some form of electronic test ordering. The information system needs to be refined to make ordering a test easier and reduce incorrect orders that increase healthcare costs and extend hospital stays. To get acceptance of the new system the inclusion of all stakeholders in the creation of the CPOE is vital.

In the earlier case study, the practitioner ordered a HIV quantitative PCR instead of a HIV ELISA. The HIV PCR is usually ordered to monitor the viral load of a known HIV positive patient receiving therapy. The HIV ELISA is the initial diagnostic test ordered because it provides faster turn-around-time. Healthcare costs are reduced by selecting this test as the initial step. If the HIV ELISA is positive, the practitioner receives notification and further testing can be requested for confirmation. Educational tools are the way clinical laboratory scientists can eliminate these patient care issues. If research evidence shows that false negative results occur in the HIV ELISA test due to delay in seroconversion, then have a question that asks if the HIV ELISA is being ordered for an initial diagnosis and reference research data on the seroconversion issue. How long will clinical laboratory professionals continue to look at the incorrect test order problem as belonging to someone else? The laboratory information system should be reevaluated if information is unclear. The lack of appropriate educational tools plus the absence of collaboration does affect healthcare costs and patient safety.[7]

The computerized provider order entry provides a learning tool because it occurs when the learner needs the information. Daley demonstrates that learning activities should cause the learner to gain access to their experiences by social activity enhanced by shared inquiry.[8] When using an interactive computerized provider order entry system not only is a test ordered correctly, but also new knowledge is received. Daley's research also demonstrates that reflection and metacognition are aspects of constructing new knowledge and meaning. The test ordering activity will reinforce the new knowledge and give meaning to the experience each time it is repeated. The role of the laboratory professional is to disseminate, synthesize, and identify the information into an accessible and practical format (educational tools) that encourages the practitioner to use it. An additional educational strategy is to create a quick and easy on-line training program to demonstrate the ease of test ordering. A follow-up reminder via text messages or emails could be helpful in encouraging the practitioner to begin using the electronic order system.

If the clinician continues to write orders then another educational opportunity occurs. How can the clinical laboratory help the nursing staff order the correct test? The continuous telephone request for interpretation of a clinician's order that is unclear has been a long-term issue. The test order may require further information that the nursing staff may not have, thus delaying patient care. The nursing unit has to receive information in an efficient manner that will positively influence test ordering. A pre-analytical event is the introduction of new tests that requires complex changes across hospital services in patient preparation and specimen collection.

In the past, clinical laboratories provided an actual laboratory manual for the nursing unit and quickly found it was not an efficient learning tool. The manual is placed on a shelf where it remains and quickly becomes outdated. Another educational tool, the electronic, interactive laboratory manual, provides the staff member with immediate information that is more inclusive and current. The manual can include directions on collection of the test, patient preparation, and specimen handling. If the order is still unclear, the next educational tool is a call to a laboratory professional to clear up the questions. The nursing unit can log into an electronic call center to get answers. In most laboratories, the person representing the laboratory and answering questions has limited knowledge on the laboratory ordering protocols. Even though this is a cost cutting measure for the laboratory, it can eventually create additional healthcare costs for the patient. A clinical laboratory scientist answering these questions can provide correct information as well as establish a collaborative relationship with the nursing staff. A call log will also indicate repeat questions over time and provide additional educational interventions. A quality indicator of a certain number of calls in two days from the same nursing unit concerning the same ordering question would create a short electronic educational note to the nursing unit, thus reinforcing the information provided by the call center.

In the questionnaire sent out by Söderbert, Brulin, Grankvist, and Wallin 60% of the healthcare respondents did not consult the online laboratory manual prior to ordering a test.[5] Another educational tool would be outreach visits to the nursing units that have consistent problems. The outreach visits will need to be a collaborative process with the nursing department and include all staff members. Dissemination of new information to the appropriate nursing managers does not mean the educational goal is complete. The previous examples represent the need for continuous education at different levels and using a variety of learning tools such as electronic reminders, site visits, and advanced CPOE.

EDUCATIONAL CONSULTANT PROVIDING LEARNING EVENTS

The clinical laboratory scientist can be an advocate for the patient by providing consultation to other healthcare professionals as well as educational support. All healthcare professionals should be dedicated to lifelong professional learning and because laboratory medicine is rapidly changing patient care, it is the responsibility of the clinical laboratory scientist to provide learning opportunities. Grol and Grimshaw have done extensive research on effective implementation strategies to improve patient care.[9] They note that complex changes in practice are not easy especially if it requires collaboration between services and change in organization of care. The clinical laboratory scientist knows how vital laboratory medicine is to patient safety, but the important issue is to understand how new knowledge becomes meaningful to other healthcare professionals. The goal should be to develop learning strategies that translate evidence into behavior changes in the clinical settings. To be an educational consultant the laboratory professional must provide continuous learning events that support patient care. The "us versus them" environment is not conducive to resolving patient safety issues.

In the post-analytical stage, the creation of an interpretive report provides additional educational consultation. According to Dupree and Kemp, the narrative interpretation translates data into knowledge and educates the physician at the point of practice.[10] Advanced technology, the IPOD or PDA, can provide the ability to receive patient information when an informed decision is required. Simply giving a numerical result is not providing the best patient care. The current problem is the absence of a software program that can accurately transfer the interpretative report to the electronic medical record (EMR). A PDF format with no reformatting may provide a solution.[11] Visual charts and graphs can provide a quick summary of additional research information. The practitioner can also receive links to websites that may answer specific patient questions. Dupree and Kemp suggest including laboratory

results from previous patient visits using electronic medical records. In the RAND Health Institute Study, 30% to 45% of patients in the U.S. and the Netherlands are not receiving care supported by scientific evidence. The report also shows that 20% to 25% of patient care is not needed or potentially harmful.[2] The clinical laboratory's contextualized patient report could provide at the point of practice more scientific research information assisting in a clinical decision.[12]

How can important new laboratory information be introduced to the clinician or nurse? In a meta-analysis on the effectiveness of continuing professional education the didactic interventions (lecture format) was the least effective.[13] To maximize educational activities we must analyze where the professional learns. The transplantation of performance skills or new information into actual work environments plus reinforcement with discussion is more likely to become a part of the participant's behavior. Active learning events are more effective than passive strategies. Active learning events include simulations, small group discussions, and individual audits.[9]

An excellent example of using active learning events can occur when a new point-of-care test (POCT) is selected for use on the nursing units. The POC coordinator is responsible for educating the practitioner on the importance of quality control procedures and consistent use of the testing instrument or kit. In a historical review of POCT instruments, the first attempts placed many non-laboratory trained individuals into the patient testing arena, and the struggles to provide accurate test results fell on the POCT coordinator following CLIA and CAP guidelines.[14] With the introduction of conductivity and electronic requirements, testing is blocked if the quality control is not completed prior to testing. The quality of POCT has improved with these advancements, but the education of the nursing staff continues to be a challenge due to high volume of retraining, new POCT, and the influx of new employees. The group interactive educational sessions are best for the initial training, but a clear and attractive message adapted to the target audience is essential with this training. There is enough experiential data to support the need for the clinical laboratory scientist to involve a collaborative multi-disciplinary group to identify the training objectives and goals.[15] In most institution "throwing training" at a problem is suppose to eliminate the problem, but unclear training objectives often compound the problem.

Grol and Grimshaw demonstrate from their research on introducing evidence and clinical guidelines into routine daily practice that barriers to change can come from three levels; individual, team and organization.[9] In the practice environment, barriers such as lack of time or financial reimbursement keep new knowledge from reaching the staff. The social barriers such as opinion leaders not agreeing with the new approach has a major affect on successful implementation. Finally, the professional context will hinder implementation due to information overload and a lack of interest in change. Identification of the barriers is important in creating a change in professional behavior. Program planning by the multi-disciplinary group should develop educational strategies to address these barriers. Clinical laboratory scientists, nursing staff, and nursing leaders can develop educational events that allow for a continual and open discussion of specific barriers that are interfering with quality POCT.

The results of a recent survey of family practice practitioners support the consultant role for the clinical laboratory scientist.[16] In a response to the statement, "My clinical performance would benefit if there was a mechanism for simple and effective consultation on the selection of laboratory tests, particularly the more complex assays" 92% of the practitioner totally agreed. "A lab medicine consult service, involving the provision of advice on test selection and result interpretation needs to be available 24 hours a day, 7 days a week." This statement received 52% of respondents who totally agreed and 32% strongly agreed. The clinical

laboratory scientist's opportunity to provide a consultative role with learning events would certainly be a positive factor for the clinician.

MULTI-DISCIPLINARY TEAMWORK

The previous discussion has presented the need for an integrative approach to delivering valuable laboratory medicine services. This discussion would not be complete without a look at the role of the clinical laboratory scientist on multi-disciplinary teams. Some healthcare institutions have begun to include clinical laboratory scientists on the patient rounding teams. The advantage of having a laboratory professional on the team is the quick resolution of problems that have traditionally taken hours or days to resolve or they never get resolved. In this article, we have examined examples of educational opportunities that involve laboratory services. To have a knowledgeable clinical laboratory scientist immediately available to answer questions or provide solutions to laboratory related problems would establish a learning moment for the other team members and enhance a collaborative relationship. It has been said that the laboratory professional is invisible to the public and other healthcare professionals. First, the laboratory professionals are identified as a place ("the laboratory") and secondly, "the laboratory" is the cause for patient errors because the healthcare team members do not see the clinical laboratory scientist adding to valuable diagnostic information.

The clinical laboratory scientist can become an active member of the healthcare institution's infection control committee, quality improvement team, and hospital safety committee because the CLS's scope of practice will expand the other team members' knowledge on nosocomial infection, quality improvement, and safety. In the ASCLS Scope of Practice (2001), the CLS is responsible for "developing a Quality Management System, correlating and interpreting test data, and promoting awareness and understanding of the use of the clinical laboratory".[17] In a recent ASCLS TODAY article, Mary Ann McLane challenged clinical laboratory scientists to submit real-life scenarios to the AHRQ Web Morbidity and Mortality that demonstrate how important they are in patient safety.[18] As a member of multi-disciplinary teams, the CLS can provide unique skills that can translate the clinical laboratory knowledge essential to patient care.

CONCLUSION

Clinical laboratory medicine is a significant part of evidence-based clinical practice guidelines. The turn-around-time indicators, quality management programs, and other quality measurements are already integral functions of clinical laboratory science. The gap between critical laboratory results and medical care can be reduced by active educational strategies that allow the clinical laboratory scientist to provide vital information to the practitioner and other healthcare professionals. This is the time for the clinical laboratory scientist to take on new roles. New advanced laboratory testing will identify disease progression and individualized patient treatment that is not currently available. Will these advanced tests be utilized properly for the best patient care? Congress appropriated $50 million to the Agency for Healthcare Research and Quality in December 2000 to investigate tools for reducing medical errors.[19] The clinical laboratory scientist can help reduce medical errors by providing support in the form of improved computerized provider order entry, consultation to establish learning events, and multi-disciplinary teamwork. Today with the U.S. healthcare system under critical scrutiny, it is an appropriate time for the clinical laboratory scientist to step forward to promote the valuable resources available through laboratory medicine.

Of course, educational opportunities can only occur if the organization values the contributions of the individual, is open to innovative change, and has decentralized decision-making.[20] A learning organization does not look for the individual who failed but how to improve the system. The clinical laboratory scientist must be a system thinker and look at the pattern of behavior. To achieve long-term change requires reviewing consistent errors to understand

whether a pattern exists and seeking educational solutions that are part of an integrated total system of patient care.[21]

> "The greatest personal revolution is the discovery that human beings, by changing the inner attitudes of their minds, can change the outer aspects of their lives." Someone who wants to change will find a way; one who does not will find an excuse.[22]

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