Using Performance Tasks Employing IOM Patient Safety Competencies to Introduce Quality Improvement Processes in Medical Laboratory Science Education

KAREN GOLEMBOSKI, CATHERINE N. OTTO, SUSAN MORRIS

LEARNING OBJECTIVES

1. Define critical thinking.
2. Characterize performance tasks with respect to teaching critical thinking skills.
3. Explain one method to develop performance tasks for teaching critical thinking.
4. Describe the components of a rubric to evaluate student performance.

ABSTRACT:

In order to contribute to improved healthcare quality through patient-centered care, laboratory professionals at all levels of practice must be able to recognize the connection between non-analytical factors and laboratory analysis, in the context of patient outcomes and quality improvement. These practices require qualities such as critical thinking (CT), teamwork skills, and familiarity with the quality improvement process, which will be essential for the development of evidence-based laboratory science practice. Performance tasks (PT) are an educational strategy which can be used to teach and assess CT and teamwork, while introducing Medical Laboratory Science (MLS) students at both baccalaureate and advanced-practice levels to the concepts of quality improvement processes and patient outcomes research. PT presents students with complex, realistic scenarios which require the incorporation of subject-specific knowledge with competencies such as effective team communication, patient-centered care, and successful use of information technology. A PT with assessment rubric was designed for use in a baccalaureate-level MLS program to teach and assess CT and teamwork competency. The results indicated that, even when students were able to integrate subject-specific knowledge in creative ways, their understanding of teamwork and quality improvement was limited. This indicates the need to intentionally teach skills such as collaboration and quality system design. PT represent one of many strategies that may be used in MLS education to develop essential professional competencies, encourage expert practice, and facilitate quality improvement.

ABBREVIATIONS: CT – critical thinking; IOM – Institute of Medicine; MLS – Medical Laboratory Science; PBL – problem-based learning; PT – performance task(s); DCLS – Doctorate in Clinical Laboratory Science

INDEX TERMS: Critical thinking; Medical Laboratory Science/education; instructional strategies; Medical Laboratory Science/expert practice; patient outcomes; interprofessional teamwork; evidence-based practice

Clin Lab Sci 2013;26(4):205

Karen Golemboski, Ph.D., MLS(ASCP)CM, Bellarmine University, Medical Laboratory Science Department, Louisville KY

Catherine N. Otto, PhD, MLS(ASCP)CM SH(ASCP)CM DLM(ASCP)CM, Salisbury University, Medical Laboratory Science Program, Salisbury, MD

Susan Morris, MPH, MLS(ASCP)CM, St. Luke's Magic Valley Medical Center, Twin Falls, ID

Address for Correspondence: Karen Golemboski, Ph.D., MLS(ASCP)CM, Associate Professor, Bellarmine University, Medical Laboratory Science Department, 2001 Newburg Rd., Louisville KY 40205, 502- 272-8387, kgolemboski@bellarmine.edu

INTRODUCTION

Enhanced quality in healthcare requires that practice in multiple professions is integrated in an evidence-based manner to improve patient outcomes. This is emphasized by the Institute of Medicine report, Healthcare Education: A Bridge to Quality, which defines five core competencies for healthcare professionals (quality improvement, evidence-based practice, patient-centered care, use of informatics, and interprofessional teamwork).[1]

Medical Laboratory Science (MLS) professionals, like other healthcare practitioners, will need to master the five IOM core competencies in order to effectively deliver quality healthcare. Improving quality will depend upon the ability to connect patient-centered aspects of healthcare (i.e., non-analytic components) with analytic performance, followed by evaluation of patient outcomes. This will require critical thinking skills which extend beyond the application of discipline-specific knowledge to analysis or diagnosis. Teamwork will be especially critical for laboratory scientists in the pursuit of improved patient outcomes; since opportunities for direct patient contact are limited, virtually all interventions will require collaboration with other healthcare professionals. Development of interprofessional educational opportunities is a priority in medical education, but basic teamwork skills such as effective communication and conflict resolution are not intuitive; competency in this area does not automatically result from group assignments and will require intentional instructional techniques.[2]

As the laboratory profession expands to incorporate advanced practitioners, it will be important to provide curriculum experiences in critical thinking and teamwork at all practice levels, and to effectively model the development of evidence-based practice and quality improvement with contributions from both baccalaureate and advanced-practice, doctoral level laboratory professionals (DCLS).[3]

Critical thinking

The IOM competencies require development and use of critical thinking skills. Although a standard definition for critical thinking (CT) has been elusive, most versions acknowledge a combination of analysis, evaluation, and synthesis. CT may encompass abilities such as the logical application of subject-specific knowledge in the context of an ongoing situation, the ability to creatively consider more than one solution to a complex problem, and the willingness to recognize and reflect on sources of bias, among others. Correlation of CT with expert practice in nursing and in the clinical laboratory includes technical capability, professional accountability, priority setting, judgment, and managing tasks in a changing environment.[4,5]

Teaching critical thinking

Appropriate educational methods to develop increased critical thinking have been debated. Results on standardized CT assessments have not consistently correlated with General Education grades,[6] and critical thinking assessments which were not subject-specific did not correlate with professional competency[7] suggesting that CT instruction and assessment should occur during discipline-specific education. In nursing and allied health education, methods such as concept mapping,[8] case studies[9], and problem-based learning[10,11] have been shown to enhance critical thinking, as measured by a variety of assessments. Incorporating behavioral, affective, and contextual domains in addition to the cognitive suggests that problem-based learning (PBL) may be the most appropriate instructional strategy in medical laboratory science.[5] Problem-based learning traditionally refers to student-centered, small group-based instruction that combines learning in cognitive domains with social and professional components such as research, teamwork, and communication skills.[12]

Teaching and assessing critical thinking with team-based performance tasks

Performance tasks (PT; also referred to as authentic assignments) represent a pedagogical and assessment strategy that shares some characteristics with PBL. PT incorporate the following characteristics:

- inclusion of discipline-specific knowledge
- replication of workplace challenges, using a realistic context
- requirement for judgment to solve a problem or to make a recommendation in a situation for which there may be more than one correct response
- requirement to review evidence, consult resources, and incorporate feedback

The inclusion of these components allows the

assessment of students' ability to use acquired skills and knowledge to complete a task. The Collegiate Learning Assessment, developed by the Council to Aid Education, employs standardized performance tasks as a means to measure critical thinking outcomes at an institutional level,[13] but these assignments can be constructed to mirror tasks required of entry-level practitioners in any field (using subject-specific content) to serve as a classroom instructional tool.

Construction of PT and examples

PT can be developed using a process called backward design.[14] Backward design employs outcome-based methodology to determine content and pedagogical approach. Learning outcomes are identified, then a PT scenario is constructed which requires students to demonstrate those outcomes (including both discipline-specific and higher-order thinking skills). Course content delivery is then structured to ensure that students have learned, or have access to, the information they need to complete the task, and a rubric is developed to allow assessment of student performance (by both students and instructors). The PT provide a means both for teaching the CT skills necessary for entry-level professionals and for assessing those skills, along with an opportunity to provide feedback.

PT, by virtue of their flexibility and adaptability, are well-suited for instruction and assessment of the core competencies designated by the IOM for healthcare professionals (delivering patient-centered care, employing evidence-based practice, focusing on quality improvement, use of informatics, and interprofessional teamwork), as well as the IOM's six aims to improve healthcare quality (safe, effective, patient-centered, efficient, timely and equitable).[1] Following are examples of PT which would address both discipline-specific knowledge and the IOM quality domains:

- Work with clinical dieticians and pharmacists to develop an educational approach for patients with iron-deficiency anemia or anemia of chronic inflammation, including dietary guidelines and what to expect in terms of testing and treatment. Patient understanding and compliance could be evaluated before and after the program. (Hematology; Effective, Deliver Patient-centered care, Quality improvement, Interdisciplinary teamwork)
- Review published studies describing advances in *in vitro* allergy testing. Work with allergist physicians to implement relevant new methods and develop testing algorithms. Advanced practitioners could compare test ordering patterns prior to and after implementation. (Immunology; Effective, Evidence-based practice, Quality improvement, Interdisciplinary teamwork)
- With Infection Prevention practitioners, develop or revise an antibiotic resistance response plan. Evaluation could include antibiotic use or healthcare-associated infection rates before and after introduction. (Microbiology; Effective, Efficient, Safe, Interdisciplinary teamwork)
- Work with physicians to prepare an informational presentation for medical staff to describe a testing protocol for Vitamin D. Test ordering patterns could be compared prior to and after implementation. (Chemistry; Effective, Efficient, Safe, Evidence-based)
- Research and prepare a recommendation for or against a facility of a given size and transfusion volume applying for FDA approval to use blood from therapeutic phlebotomies for transfusion. Follow-up documentation could determine the financial impact of the decision. (Immunohematology; Efficient, Evidence-based Medicine, Quality Improvement)

METHODS

A PT was used in a baccalaureate-level MLS program; specifically, in a seminar course which included all students enrolled during that semester (second semester juniors and second semester seniors in the undergraduate program, as well as first- and second-semester post-baccalaureate students). This one-credit course, offered every semester, focuses on a different topic (such as research or ethics) each semester and also includes student and senior capstone presentations. A PT assignment was developed as part of an instructional unit covering the IOM quality domains. According to the principles of backward design, the first steps were to determine what the students were expected to learn as a result of the unit, and to select an objective which would form the basis for the PT. An objective related to patient-centered care was selected: Communicate effectively with patients regarding their testing and results. Next, it was necessary to establish PT performance level criteria. The specific outcomes chosen

were:

Students (or entry-level professionals) should be able to:

- describe appropriate patient preparation for testing.
- determine effective method(s) of communicating with patients, which might or might not involve direct contact with laboratory personnel.
- design materials which provide necessary information in an understandable format.

Additionally, since this activity was presented as part of a unit covering patient safety, students were asked to consider how their completed assignment incorporated the quality aims and the core competencies for Healthcare Professionals identified by the IOM.

A PT scenario was designed which incorporated the selected outcomes:

> The outpatient collection center has noted that many patients who arrive for their appointments are non-fasting. Patients are often upset when told that they must reschedule and complain that they didn't know they needed to fast, or that coffee with French vanilla creamer "counted as food". The laboratory manager has asked your team to develop patient educational materials and to determine the best way to communicate the information.

Rubric development

A rubric was developed to facilitate evaluation of student performance (Figure 1). Rubrics define expectations of performance, with descriptions of multiple levels of quality. Ideally used as both formative and summative assessment tool, a rubric allows self-evaluation and peer-review. Students may use the rubric to evaluate and improve their performance as they work on the assignment; instructors can use rubrics to facilitate objective review of completed assignments. Development of a rubric focuses on measurable outcomes related to the learning outcomes for the assignment, with a range of scoring levels.[15] To create a rubric for this specific assignment, the outcomes associated with the task were listed in the left-hand column (in this case: appropriate patient preparation, effective method of communication, materials with necessary information for patient use, and incorporation of IOM aims and competencies). For each of these outcomes, three levels of quality were designated and descriptive terms for each level (e.g., excellent, good, needs improvement) were composed. Each level included additional differentiation (for example, the "excellent" category could be scored from 23 to 25 points, reflecting the extent to which criteria were met or exceeded). Depending upon course structure and assignment value, these descriptors could be directly

	Excellent (23 – 25 points)	Good (21 – 22 points)	Needs improvement (18 – 20)	Score
Describe appropriate patient preparation for testing	All fasting tests are represented and instructions for fasting are correct.	One test is missing, OR the instructions have minor errors.	More than one test has been omitted, and/or instructions have significant errors.	
Determine effective method(s) of communicating with patients	Method(s) identified are feasible and consider patient convenience.	Method(s) are not feasible OR would be inconvenient for patients.	Method(s) are neither feasible nor convenient.	
Design materials which provide necessary information in an understandable format.	Materials are patient-friendly, clearly designed, and easy to understand.	Materials are usable but may be difficult for patients to use or understand.	Materials are not likely to be helpful to patients.	
Consider IOM Aims and Challenges	Identified and addressed applicable aims and challenges.	Identified and addressed some, but not all, applicable aims/challenges.	Did not identify or address any applicable aims/challenges.	
Total score				

Figure 1. Rubric designed to assess student performance.

correlated to an overall grade (e.g., A, B, C, etc), or each could represent a particular point value that combine for the total score.

The next step in PT construction is to determine what materials are required to complete the assignment. For this assignment in the MLS seminar course, it was decided that, since at least one student in each group had completed courses in Clinical Chemistry, the groups should already have access to the necessary information or references regarding preparation for fasting specimen collection and would not require additional instruction on that topic. Students would receive an introduction to the concepts of patient safety, for context, as well as the core competencies for healthcare professionals identified by the IOM. There would be no specifications as to the nature of the patient education materials that were to be developed.

During one 50-minute class period, the IOM quality domains (safety, efficacy, efficiency, timeliness, equity, patient-centeredness) and the application of each to the Total Testing Process and to laboratory practice[16,17] were discussed. The following week, students were assigned to groups of three or four students. Each group included at least one junior, and one senior undergraduate or post-baccalaureate student, who was designated the group leader and was subsequently expected to give (or lead) the group's presentation. Each group received the same assignment, with 2-3 weeks to complete their work before presenting their solution to the class. Students also received a copy of the assessment rubric and were advised that they would complete a confidential evaluation of group members' teamwork performance after their assignment was concluded. No specific instruction in teamwork was presented at this time.

RESULTS

The student groups demonstrated significant creativity in conception of materials for patient communication: "products" included a short video, a keytag (Figure 2), a mock smartphone application (Figure 3), reminder bracelets, and a countdown wristwatch. Multiple groups planned text messaging reminders regarding when patients should fast, as well as emails; one group proposed an extensive list of customizable patient information sheets (which, they suggested, could be provided to patients by clerical personnel). One group explained that their initial idea had been to set up a social media site to communicate with patients, but they realized that this could result in privacy violations. All except one group provided patient materials in more than one language.

Figure 2. Student-designed key tag.

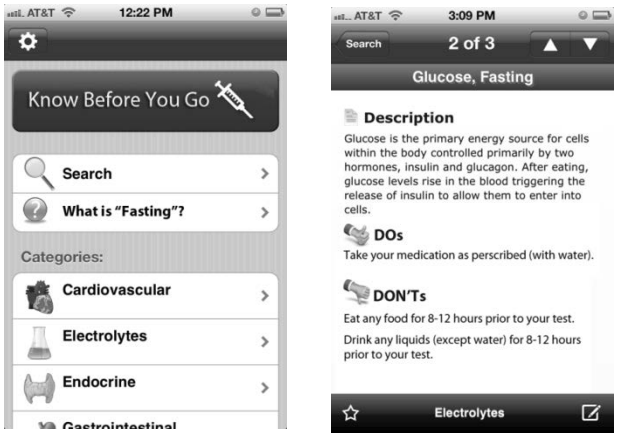

Figure 3. Mock smartphone application screens

Most groups also produced pamphlets or brochures with instructions for fasting. None of the student groups located patient information already available online (such as the products available on the ASCLS Patient Safety website). Interestingly, in more than one case, the students to whom brochure preparation was delegated were those who had not yet completed Clinical Chemistry, suggesting that groups did not appropriately assess member strengths prior to assigning tasks. In addition, inaccuracies in the final products indicated that most groups did not work together to refine the contributions of individual members.

The student groups projected that their strategies for improved patient communication regarding the importance of fasting and specific instructions for doing so would result in fewer patients who arrived inappropriately prepared for venipuncture and/or fewer rescheduled appointments. None of these groups proposed an assessment step, confirming that a more intentional instruction in the complete cycle of quality improvement is needed for students to recognize opportunities to document improved outcomes.

Another surprising result was the complete lack of suggestions to consult with any other medical professionals regarding the patient materials or implementation of processes (despite the inclusion of "interdisciplinary teams" as one of the IOM core competencies, and even though some of their proposed methods involved other healthcare professionals). This serves as a reminder that interprofessional teamwork does not happen spontaneously and will require deliberate and specific preparation from educators and managers.

CONCLUSIONS

In addition to the scientific information that encompasses the body of medical laboratory science knowledge, MLS students at all levels must also develop core healthcare professional competencies (participate in interprofessional teamwork, deliver patient-centered care, employ quality improvement methodologies, practice evidence-based medicine and use appropriate information technology). Application of critical thinking and teamwork skills in practice settings can contribute to improved patient outcomes and, ultimately, to superior healthcare quality. Educational programs do not always anticipate or address desirable behaviors, however; for example, although teamwork is highly valued in healthcare, and poor teamwork skills contribute to preventable medical errors, education of healthcare professionals is still focused primarily on individual performance.[2] The development of these competencies must be intentionally addressed during professional education, using strategies such as PT which allow students to practice, evaluate, and improve their skills. Optimal use of authentic, problem-based strategies such as PT should include carefully-selected groups that receive instruction to improve the effectiveness of their collaboration, assignments with both group and individual accountability, and opportunities for early and frequent feedback to allow for review and revision of behaviors.[19,20] If these assignments are presented in the context of a quality improvement process, both entry-level and advanced practitioners will benefit from increased familiarity with the method. To contribute to improved healthcare quality and to maintain professional credibility, Medical Laboratory practitioners cannot afford to fall behind other healthcare disciplines in attainment of core professional practitioner competencies. Incorporation of educational practices that focus on the application of critical thinking and teamwork skills to quality improvement will ensure that future laboratory professionals are prepared to engage in 21st century healthcare.

REFERENCES

1. Greiner AC, Knebel E. Eds. Health Professions Education: A Bridge to Quality. Washington DC: Institute of Medicine, Committee on the Health Professions Education Summit, National Academies Press. 2003.
2. Lerner S, Magrane D, Friedman E. Teaching teamwork in medical education. Mt. Sinai J. Med. 2009;76:318-29.
3. Leibach EK, Russell BL. A typology of evidence based practice research heuristics for clinical laboratory science curricula. Clin Lab Sci. 2010;23(3):Suppl 46-50.
4. Longo MM. Toward a working definition of critical thinking in medical laboratory technology. Canadian Journal of Medical Laboratory Science 1996;58:115-7.
5. Leibach EK. Grounded theory in Medical Laboratory Science: expert practice development. Clin Lab Sci. 2011;24(4):Suppl 37-44.
6. Erwin TD, Sebrell KW. Assessment of critical thinking: ETS's Tasks in Critical Thinking. J Gen Educ 2003; 52(1):50-70.
7. Kenimer EA. The identification and description of critical thinking behaviors in the practice of Clinical Laboratory Science, Part 1: Design, implementation, evaluation, and results of a national survey. J Allied Health 2002;31:56-63.
8. Chabeli MM. Concept-mapping as a teaching method to facilitate critical thinking in nursing education: a review of the literature. Health SA Gesondheid 2010; 15(1) art. #432, 7 pages. DOI:10.4.4102/hsag.v15i1.432.
9. Popil I. Promotion of critical thinking by using case studies as teaching method. Nurse Educ Today 2010;31:204-7.
10. Kowalczyk N. Review of teaching methods and critical thinking skills. Radiol Technol 2011;83(2):120-32.
11. Oja KJ. Using problem-based learning in the clinical setting to improve nursing students' critical thinking: an evidence review. J Nurs Educ 2011;50(3):145-51.
12. Celia LM. Using problem-based learning to promote critical thinking in an orientation program for novice nurses. J Nurses Staff Dev. 2001;17(1):12-9.
13. Shermis MD. The Collegiate Learning Assessment: a critical perspective. Assessment Update 2008;20(2):10 -2.
14. McTighe J, Thomas RS. Backward design for forward action. Educ Leadersh. 2003;60(5):52-5.

15. Moskal BM, Leydens JA. Scoring rubric development: validity and reliability. Practical Assessment, Research, and Evaluation, 2000; (7)10. http://PAREonline. net/getvn.asp?v=77n=10. Accessed May 10, 2012.
16. Otto CN. Patient Safety and the Medical Laboratory: An Introduction. Clin Lab Sci. 2011;24(2):105-7.
17. Otto CN. Patient Safety and the Medical Laboratory: Using the IOM Aims. Clin Lab Sci. 2011;24(2):108-13.
18. Morris S, Otto CN, Golemboski K. Improving patient safety and healthcare quality in the 21st century – competencies required of future Medical Laboratory Science practitioners. Clin Lab Sci. 2013;26(4):199.
19. Snyder, LG. Teaching teams about teamwork: preparation, practice, and performance review. Business Communication Quarterly 2009;72(1):74-9.
20. Goltz, SM. Teaching teamwork and problem solving concurrently. Journal of Management Education 2008;32(5): 541-62.

The Focus section seeks to publish relevant and timely continuing education for clinical laboratory practitioners. Section editors, topics, and authors are selected in advance to cover current areas of interest in each discipline. Readers can obtain continuing education credit (CE) through P.A.C.E.® by completing the continuing education registration form, recording answers to the examination, and mailing a photocopy of it with the appropriate fee to the address designated on the form. Suggestions for future Focus topics and authors, and manuscripts appropriate for CE credit are encouraged. Direct all inquiries to the Clin Lab Sci Editorial Office, Westminster Publishers, 315 Westminster Court, Brandon MS 39047. (601) 214-5028, (202) 315-5843 (fax). westminsterpublishers@comcast.net.