

The Clinical Laboratory Practitioner

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OBJECTIVE: This study was designed to investigate potential areas of practice for the clinical laboratory scientist (CLS) and to propose a graduate curriculum to prepare the practitioner for an advanced level of practice.

DESIGN: Meta-analysis of PharmD, physician assistant, physical therapy, and nurse practitioner curricula focusing on academic and clinical advanced practice was used to develop an educational model and curriculum for a professional doctorate in clinical laboratory science (CLS).

MAIN OUTCOME MEASURE: 1) New educational model for CLS advanced practice; 2) A proposed curriculum for a Doctorate of Clinical Laboratory Science degree.

RESULTS: A new curriculum model was adapted from established healthcare educational models.

CONCLUSION: Although there is a need for a baccalaureate degree in CLS there is also a role for expanded education and responsibilities for CLS practitioners. The CLS Advanced Practitioner design focuses on moving students from the baccalaureate level to the doctoral level and prepares the individual to become an integral part of the healthcare team.

ABBREVIATIONS: CLP = clinical laboratory practitioner; CLS = clinical laboratory science/scientist; IOM = Institute of Medicine; PharmD = Doctor of Pharmacy.

INDEX TERMS: advanced practice; clinical laboratory science; curriculum; laboratory personnel; professional doctorate.

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At this time, a BS degree is the entry-level for the CLS. However, educators have gained interest in pursuing development of a graduate curriculum for those students who wish to advance their scope of practice.^{1,2} It is the intent of the authors to provide evidence that the development of an expanded role for the CLS could provide economic benefits to healthcare and promote patient safety. Clinical laboratory services provide approximately 60% to 70% of the objective information used in clinical decision-making.³ In 1999, the Institute of Medicine (IOM) reported that an estimated 98,000 Americans die each year from preventable errors.⁴ Although the report does not focus on laboratory errors as a major problem, it would appear that any efforts to promote patient safety would be advantageous. The American Society for Clinical Laboratory Science (ASCLS) supports IOM's recommendation of healthcare professional collaboration and promotion of effective team functioning to raise awareness in preventing laboratory errors.^{4,5} Through an interdisciplinary team approach, the clinical laboratory practitioner (CLP) would positively impact patient outcomes and provide cost savings to the healthcare system by providing valuable and reliable clinical based knowledge regarding laboratory testing that fosters accurate and timely diagnoses. This further supports the IOM's report that recommended improved access to accurate and timely information as a way to prevent errors and improve patient safety.⁴ The advanced practice CLP may increase efficiency, facilitate patient management outcomes, and improve access to accurate laboratory information by participating in patient care activities. CLSs have extensive knowledge regarding laboratory tests and data and, with advanced training, may help clinicians choose appropriate laboratory studies based on the physiological clinical situation while maximizing clinical benefits and reducing the number of negative outcomes. The impact of positive and cost-effective benefits will need to be established through outcomes research data to determine the best role for the CLP in disease management.

Some allied health programs, including physical therapy and occupational therapy, now require a master's prepared entry-level. Audiology is transitioning toward a doctorate level of entry for practice. Pharmacists now require a PharmD degree as entry level. Several studies have examined the effectiveness of a PharmD on patient outcomes.⁶⁻¹⁰ Following the direction of the PharmD education model, we propose a graduate level curriculum for clinical laboratory personnel. To prepare for the CLP's expanded role, the curriculum is designed to require students to complete a professional doctoral level degree. In addition, a certification examination and state licensure must be developed and implemented.

MATERIALS AND METHODS

The educational model was developed after reviewing several PharmD, physician assistant, physical therapy, and nurse practitioner programs. The PharmD programs offered a curriculum that appeared to follow what we believed our course expectations for the CLP should be. We, therefore, structured our curriculum using the PharmD model as a guide. The PharmD curriculum focuses on the importance of academic and clinical background necessary for advanced practice.

The nurse education model was used for the educational design of the proposed program. The nurse education model consists of varying educational opportunities at a particular

level. Students are given the option to choose among various education opportunities to obtain a nursing degree at the associate degree or baccalaureate level. At the masters of nursing level, the RN has the preference of selecting the nurse practitioner, educator, nurse manager, or nurse executive role and course of study. Within the nurse practitioner focus, the student may choose among neonatal, pediatric, family, or acute care. The proposed CLP program is designed to offer similar educational tracks. The proposed entry-level clinical laboratory doctorate is a three-year post-baccalaureate degree that prepares students for advanced clinical practice. The knowledge and skills obtained from the baccalaureate degree in CLS are intended to serve as prerequisites.

RESULTS

The education and curriculum models utilize a conceptual approach to identify essential learning opportunities for the CLP. Figure 1 describes the educational model of progression for the clinical laboratory professional. Utilizing the knowledge gained in prerequisites, we began to identify areas of study and clinical experiences that are essential to the development of a competent practitioner. Table 1 demonstrates a core educational base consisting of basic, science, and clinical courses, which develops as the student progresses throughout the program. Courses are designed to build upon one another and the student is expected to incorporate knowledge gained into future courses and clinical experiences. Courses in communication and health assessment help the student acquire interpersonal skills necessary for effective communication with patients as well as members of the healthcare team. The student will be able to monitor and evaluate efficacy of laboratory testing by taking patient health histories, observing patients, performing limited physical assessments, determining laboratory tests to order, and performing any appropriate point of care testing.

Advanced courses in the sciences and clinical laboratory provide background to assist the student with diagnostic interpretation and disease management. The clinical curriculum is intended to apply didactic content into the patient care setting and promote critical thinking. Discussions enhanced by seminar courses provide for a continuous sharing of experiences and foster critical-thinking. Students have an opportunity to take up to nine (9) elective hours of coursework to explore their personal interests and varied clinical laboratory opportunities.

Figure 1. Model of the curriculum interaction

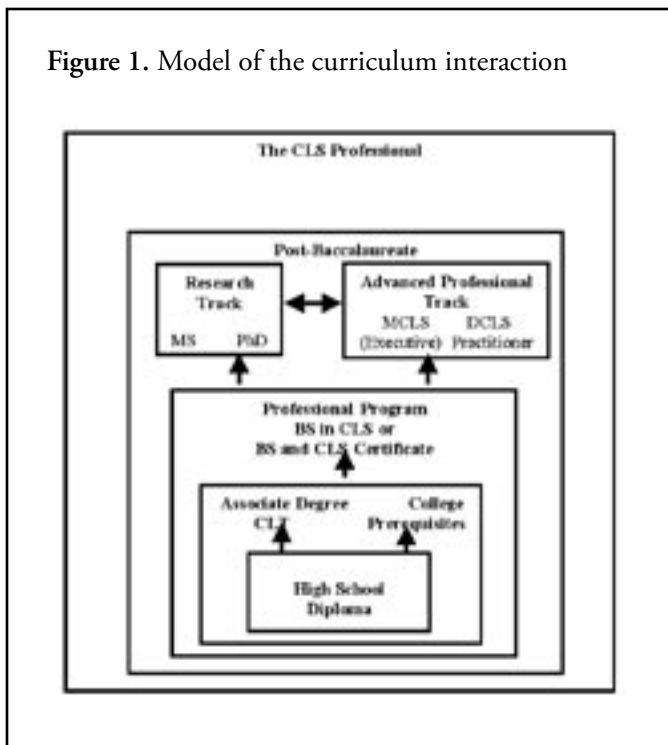


Table 1. Curriculum for the Doctorate of Clinical Laboratory Science

Semester	Course Title	Credits
1st year		
Fall	Pathophysiology	4
	Legal Ethics	3
	Communications	<u>2</u>
		9
Spring	Pharmacology	3
	Research Methods—Statistics	<u>3</u>
		6
Summer	Health Assessment	2
	Health Policy	<u>3</u>
		5
2nd year		
Fall	Pathologic Concepts for Clinical Decision Making I	3
	Hematopathology and Flow Cytometry Issues in CLS I	3
	Elective	<u>1</u>
		<u>3</u>
		7 – 10
Spring	Molecular Diagnostics	3
	Pathologic Concepts for Clinical Decision Making II	3
	Issues in CLS II	1
	Elective	<u>3</u>
		7 – 10
Summer	Point of Care	2
	Elective	<u>3</u>
		2-5
3rd year		
Fall	Clinical Laboratory Diagnosis I	4
	Issues in CLS III	1
	Clinical project	<u>1</u>
		6
Spring	Clinical Laboratory Diagnosis II	4
	Issues in CLS IV	1
	Clinical project	<u>1</u>
		6
Total hours		48 – 57

DISCUSSION

The CLP can be a valuable member of the healthcare team. After completing the Doctorate of Clinical Laboratory Sciences, the practitioner collaborates with physicians and other healthcare providers in the diagnosis and treatment of patients by ordering, performing, correlating, and interpreting laboratory tests as well as monitoring patient outcomes. The initial practice area will most likely be hospital-based. As stated earlier, 60% to 70% of all clinical decisions are made by laboratory services.³ The CLP is in a unique position to improve patient outcomes while developing and strengthening collaborative relationships among laboratory services and other healthcare providers. The CLP could be responsible for all testing and interpretation along with point of care testing to improve access to accurate and timely diagnostic information while serving as a liaison between nursing units, healthcare providers, and the laboratory to ensure quality and cost-effective laboratory services. We recognize obstacles may be encountered while implementing this CLP model. However, one feasible way of easing transition may be utilizing the CLP in point of care testing. This may strengthen multidisciplinary relationships and provide a portal of entry into the healthcare setting, above and beyond the laboratory. Careful deliberation is necessary to establish the most suitable entry level for the CLP. Routes of entry for the position include an independent consultant, practitioner, or clinical pathology assistant.

Presently, the only educational options in the CLS post baccalaureate are along the research track and include a master's or PhD. The CLS professional education model offers an advanced professional track at a master's level for a management or executive focus or doctoral level for the CLP role (Figure 1). The curriculum model incorporates courses in the CLS practitioner program (Table 1). It is composed of basic, science, and clinical courses. Professional skills are attained from basic and clinical courses. The cognitive skills are developed from basic, science, and clinical components. Assessment skills are primarily acquired from science and clinical courses. Diagnostic skills are acquired from the culmination of all coursework (Figure 2).

We acknowledge that there is still a need for a baccalaureate degree in CLS but an advanced degree option would allow those who wish to advance their education beyond the baccalaureate degree and enhance career opportunities.

CONCLUSION

The American Medical Association recognizes that laboratory testing plays an important role in detection, diagnosis, and treatment of many diseases.¹¹ The proposed CLS educational model is designed to offer an alternative course of educational study for the CLS. The CLS practitioner design focuses on moving students from the baccalaureate level to doctoral level and prepares the individual to fill a particular role as a part of the healthcare team. The CLP can be an integral part of the healthcare team and has the opportunity to implement supportive services at the healthcare delivery level under the direction of a collaborating physician to decrease fragmentation of care, decrease hospital stay, reduce costs, and promote patient safety. Educational preparation and certification will prepare the CLP for expanded responsibilities and curricula must be designed to meet these goals.

After determining the appropriate method of entry of the CLP, funding issues must be addressed. Pilot studies are proposed initially in approximately two or three institutions. Possible healthcare settings may include acute care, emergency department, primary care, or family practice. After obtaining results of these pilot studies, we will have a better understanding of the role expectations and scope of practice and determine the most efficient way to implement the educational model. A potential barrier may be in the implementation of the professional position. Education

regarding role definition and scope of practice will be essential for smooth transition into the patient care setting. Future projects will most likely be needed to help define role expectations.

Issues that must be addressed once pilot studies are complete include specific job description with salary expectations, physician collaboration, certification/licensure, acceptance by other healthcare providers, cost-benefit analysis, professional liability, and healthcare reimbursement. In today's healthcare setting, cost justification and healthcare reimbursement regulations are crucial. The most probable obstacle will most likely be healthcare reimbursement. New healthcare policies will need to be developed through appropriate governmental agencies. Data regarding patient clinical outcomes utilizing the advanced practice CLP will be essential to help support the new role.

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Figure 2. Model of the curriculum interaction

