Educating Medical Laboratory Technologists: Revisiting Our Assumptions in the Current Economic and Health-Care Environment

Regina Linder
Medical Laboratory Sciences Program, Hunter College of CUNY, New York, NY 10010

Health care occupies a distinct niche in an economy struggling to recover from recession. Professions related to the care of patients are thought to be relatively resistant to downturns, and thus become attractive to students typically drawn to more lucrative pursuits. Currently, a higher profile for clinical laboratory technology among college students and those considering career change results in larger and better prepared applicant pools. However, after decades of contraction marked by closing of programs, prospective students encounter an educational system without the capacity or vigor to meet their needs. Here discussed are some principles and proposals to allow universities, partnering with health-care providers, government agencies, and other stakeholders to develop new programs, or reenergize existing ones to serve our students and patients. Principles include academic rigor in biomedical and clinical science, multiple points of entry for students, flexibility in format, cost effectiveness, career ladders and robust partnerships.

INTRODUCTION

Statement of the problem

At a time of widespread unemployment in the U.S., reaching across the educational spectrum, allied health professions, and particularly the medical laboratory, occupy a unique environment. US News and World Report’s “50 Best Careers of 2011” included 13 health careers, stating “Clinical lab technicians and technologists are the unsung heroes of the healthcare industry” (19). Personnel shortages in the diagnostic lab, long a concern to leaders in the profession (6) are reported in mainstream media (3, 8, 9). The laboratory community, in order to prepare the talented youngsters now motivated to enter our typically low-profile profession, must restore educational systems that have been diminished and/or lost in recent decades (6, 11). It is estimated that the academic capacity for the medical lab is able to provide approximately one-third of the projected need though 2014 (3).

Pathways to medical technology—history

Professional societies devoted to the science and practice of diagnostic laboratory testing, such as the American Society for Clinical Pathology (ASCP, www.ascp.org) and American Society for Clinical Laboratory Science (ASCLS, www.ascls.org) trace their origins to the early 20th Century. Following reorganizations and mergers, The National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) is the major nongovernmental accrediting educational programs, and the ASCP for certification of practitioners (20).

The education of medical technologists in the U.S., while not completely uniform, has been largely based in university–hospital affiliations, employing NAACLS accredited curricula, and leading to practitioners designated “MLS (ASCP).” Medical laboratory professional accreditation of academic programs is voluntary, and alternatives have developed over the decades (U.S. Dept. of Education Database of Postsecondary Institutions and Programs, http://ope.ed.gov/accreditation). Among these are university-based and -designed curricula (typically termed Clinical or Medical Laboratory Sciences, or MT). Compared with 479 NAACLS accredited programs (www.NAACLS.org) 230 (16) were accredited by regional academic accrediting organizations. In addition, government agencies such as state departments of health or education may both accredit curricula and provide professional certification to practitioners.

Diagnostic laboratory credentialing in New York City is an instructive example, albeit unusual as it derived from a municipal rather than a state agency. The NYC Dept of Health and Mental Hygiene (DOH, http://nyc.gov/doh) was founded in 1805 to address epidemics of infectious disease such as yellow fever and cholera, and over time acquired broad authority in the health of NYC residents. In the 1950s, a credentialing system for clinical lab professionals was developed within the DOH, including a training network...
of discipline-specific labs, examination-based career ladder, and boards of professionals, reporting to an Assistant Commissioner of Health for labs. In this background academic programs such as Hunter College Medical Lab Sciences (HC/MLS) and others developed. Local accountability assured high standards and the participation of educators and lab leaders in curriculum and training, distinct from the NAA-CLS network. Passage of federal legislation in 1988 (Clinical Laboratory Improvement Act, CLIA, http://www.cdc.gov/cla regs/toc.aspx) caused the DOH personnel system to be effectively “decommissioned.” However, the educator/training network, developed over decades, helped to “support” a lobbying campaign that led to NYS licensure for clinical lab professionals in 2005, and a system for evaluation and approval of educational programs to prepare candidates for licensure (http://www.op.nysed.gov/prof/clt/).

Climate for change

Specific factors in the current health care and economic climate motivate a fresh look at the educational system that prepares medical laboratory professionals, and encourage the development of innovative and flexible approaches. These include:

1. **State licensure.** Licensure of clinical lab technicians and technologists has been adopted in 12 states (www.ascls.org). The process of establishing licensure includes consultation with the laboratory community, as requirements are examined in the light of current practice and translated to law, and fosters dialogue among lab practitioners, educators, unions and legislators. The complex and sometimes contentious process of license implementation in NYS has therefore been informed by a strong professional network, yielding a system for which most stakeholders feel some sense of “ownership.”

2. **Health care and insurance reform.** The emphasis on preventive medicine and evidence-based practice associated with national health-care reform predicts both increased workflow, and a relative increase in outpatient- vs. hospital-based testing, as well as innovations such as direct-to-patient reporting (12).

3. **Reorganized labs and advances in underlying science.** Many diagnostic laboratories no longer adhere to traditional organization based in pathologi-cal subdivisions (e.g., Microbiology, Chemistry, Hematology). Analytical technology is often the organizing principle, with routine Hematology and Chemistry testing largely automated in core facilities, while molecular/genomic tests become incorporated into newer laboratory subdivisions, such as Molecular Diagnostics. The distinction between diagnostic and clinical research laboratories may be blurred, especially in tertiary-care medical centers. Sophisticated tests under investigation migrate to patient laboratories, and technolo-gists in both environments need the skills (and clinical credentials) to incorporate new technol-ogy. Hepatitis C (HCV) testing is an example of a rapidly advancing diagnostic and therapeutic protocol. Before the definition of the HCV virus in 1989, this diagnosis was a rule-out of Hepatitis A and B (NANB) by routine immunochemistry. Subsequently recognized to impact the health of more than 1% of the US population, diagnosis and therapeutic monitoring of new antiviral therapies requires complex molecular testing (e.g., viral load measurement by polymerase chain reaction, PCR), and continued change is predicted to be rapid (18).

Such analyses demand sophisticated knowledge of emerging science and technology, and suggest altered educational assumptions. Rigorous instruction in fundamental and biomedical science, rather than an exhaustive menu of existing tests, may better prepare students for learning throughout their careers, and equip them to accept profession-al advancement. It is instructive to recall that flawed predictions from the 1980s, that robotic analysis would dominate testing and sharply reduce dependence on highly skilled professionals, were in part responsible for the contraction of the lab education infrastructure in the U.S. (6).

It is the goal of this discussion to explore strategies by which educators can draw on proven practices, even as we develop updated models to address the emergent personnel shortage. While not uniquely based on the more than 40-year experience of the MLS Program (http://www.hunter.cuny.edu/mls) of Hunter College (CUNY), its principles reflect the approach of Dr. Irwin Oreskes, its founder, and the achievements of the more than 1,200 technologists welcomed into the lab community of NYC. Ours was found to be the largest clinical technology program in NYS during the review process of licensure implementation. As long-anticipated personnel shortages impact health care across the U.S., we hope to spark discussions that will benefit educational and health-care institutions.

**Educational principles to address current and future needs**

Desirable characteristics of newly designed or reinvigorated curricula/academic programming include:

- academic rigor and scientific breadth
- flexibility of format (e.g., clinical as well as university-based instruction, use of educational technology, accelerated options, multiple points of entry, enrollment goals to meet employer’s needs)
- expanded training networks
- strategic partnerships with entities that depend upon and support the lab
• varied professional outcomes and provision for career ladders

Discussed below are alternative approaches in these categories that may pertain to different geographic and clinical environments, educational institutions, and student populations.

**Academic organization and curriculum**

**Credentialing and course of study**

To seek accreditation by a professional lab organization with prescribed academic content, or alternatively to develop departmental curriculum accredited as part of the larger university, is a key determinant of structure. This decision depends in part on the establishment of state licensure. In the absence of licensure, professional accreditation (most often by NAACLS) stresses comprehensive diagnostic testing, providing a reliable path for graduates to obtain employment in clinical labs. Graduates emerge with a credential recognized around the U.S. When the course of study derives from the department, the curriculum may be broader, emphasizing fundamental biomedical science with applications in diagnostic testing. Students are exposed to scientific inquiry and to diverse role models among their teachers. They may opt for alternative paths after graduation. While about 70% of graduates from HC/MLS stay with their goal of diagnostic technology, some alter their educational goals as they study, entering Ph.D. programs, other clinical, or research paths upon graduation. Students are often poorly informed about career options prior to applying to professional degrees. Some report that flexibility in career goals early in their professional education was an inducement to the major.

**Alternative pathways and outcomes**

To provide avenues for career change during a time of constrained opportunities benefits individuals as well as institutions with unfilled positions. Accelerated, clinically based curricula provide an opportunity for well-prepared individuals with adult responsibilities to regroup at a difficult juncture. The NYS licensure program (http://www.op.nysed.gov/prof/clt/) provides a route for baccalaureate degree holders in science to achieve licensure, and encourages program development by universities. Nationally, examples are emerging from a range of accreditation models employing distance and independent learning (www.bld.msu.edu, www.aruplab.com/weber), and commercial partnerships. A recently implemented graduate degree at Hunter College (http://www.hunter.cuny.edu/mls/graduate/advanced-certificate-in-medical-technology) is linked to NYS licensure, and combines guided independent study with an extensive training rotation. Qualified applicants exceed openings. Approaches that do not demand large investments in infrastructure and personnel can be plastic in enrollment, increasing capacity to fill positions, and preserving universities’ resources when shortages are alleviated.

Clinical technologists often express disappointment at the lack of access to professional advancement after several years at the bench. Morale is impacted, and able practitioners are lost to the lab, some returning to school in nursing or other clinical professions. Those technologists who achieve positions of management may do so without benefit of formal education for the unique challenges of laboratory leadership. Strategic development of graduate degrees (master’s, advanced certificates, on-line curricula) can serve the expanding biomedical lab industry, while providing incentives for ambitious young people to enter the primary profession of lab technology. Career ladders to management, clinical trials administration, safety management, and related areas promise a brighter future for lab practitioners.

**Practical training**

Likely the biggest barrier to expanded education for the diagnostic lab is the lack of training capacity in professional labs (13, 17). Personnel shortages that motivate expansion also discourage training by overworked staff. The culture of apprenticeship that served current practitioners is often not available to students. In our experience, persistent network-building among colleagues encourages labs to include students in the daily routine. Hospitals, large and small proprietary labs, reference and public health facilities, each contribute unique qualities to the education of new personnel. Incentives include access to pre-screened personnel to fill positions, and the revitalized culture that students bring to the workplace. Inducements such as tuition benefits for staff can be persuasive as well.

It is critical for educators and clinical preceptors to be mutually respectful partners. Educators provide the academic model and didactic content that may vary with different credentialing systems. The widespread use of such educational software as Blackboard allows the university to maintain both student contact and instructional support. The clinical site provides practical learning and an introduction to the culture of patient care. Auxiliary institutions such as labor unions and government agencies can be valuable partners. They may provide incentives, including funds for trainees, equipment, and public recognition for institutions that participate in the education of their next generation of employees.

**Students**

A recent study by Barfield et al. (2) addressed factors that influence students to enter programs in allied health, and analyzed opportunities and shortages across the professions. Career awareness, mentoring, the desire to achieve financial stability, and the opportunity to impact the health of patients were cited as particularly significant. Reflecting the mature values of prospective students, these data suggest that our curricula should provide academically demanding content, multiple points of entry, workplace experience, as well as graduate options to serve a range of students and outcomes.
Demographic diversity characterizes some allied health professions, especially in urban areas. The more rapid economic recovery of foreign born as opposed to native born Americans is related by investigators to the strength of the health-care sector in the U.S. economy (7). The average salary for a medical lab professional with a baccalaureate degree is approximately $70,000 (14). As a component of CUNY, the HC/MLS student body is largely composed of minorities and recent immigrants, and the high profile of the clinical laboratory profession in the developing world helps to motivate their career choices. As a result, for example, Latina women in HC/MLS (8%) exceed their representation in mainstream higher education, particularly in science (1). Strategies to strengthen diversity include strong student support, faculty mentoring, maintenance of alumni networks, and the self-perpetuating nature of inclusiveness.

Faculty

It is challenging to recruit and retain full-time faculty and leaders for clinical laboratory programs. Ideally, individuals come with a clinical background, doctoral preparation, strong research skills, and experience. However, this is not a typical profile: experienced clinicians may not present with backgrounds that will be recognized for academic tenure and promotion, while biomedical researchers may lack experience in the diagnostic lab. In our experience approaches to address this apparent disconnect yield an uncommonly able and dedicated academic team.

Basic biomedical scientists teaching in a diagnostic area related to their scholarship quickly develop knowledge of clinical science, a commitment to teaching, collegial relationships with clinicians, and pride in the professional success of their students. Part-time (adjunct) faculty, drawn from diagnostic labs, are an invaluable complement to the full-time faculty, bringing the content and culture of the clinic to the classroom, and providing training and job placements. Technical lab staff, often clinically experienced, support successful lab education. In CUNY, these faculty-level positions assure that complex class exercises reflect patient pathology and always work! The oft-cited army of technologists soon to retire (13, 19) can provide an alternative source of adjunct faculty/academic mentors, especially in non-traditional curricula involving guided self-study and distance education.

Funding and infrastructure

University administrators may share the public’s lack of appreciation of allied health careers, especially the clinical lab. Facilities and personnel costs are higher than other majors. Persuasion may be necessary to restore, expand, or create new programs in health care. In the current climate, focus on personnel shortages, and access to stable, well-paying jobs for graduates can be effective arguments. Innovative uses of existing spaces (i.e., weekend laboratories and partnering with clinical institutions), are good interim solutions as programs grow and prove their value. Efforts to engage local partners (e.g., proprietary clinical labs/health providers, insurers, suppliers, instrument manufacturers) can yield resources, including equipment, materials, scholarship support, and training sites, as businesses participate in alleviating their own personnel shortages.

The most persuasive argument for enhanced educational programming is the success of alumni in the communities where they work. More than other professionals, allied health practitioners are likely to remain in the geographic area where they were educated, in part because health-care employers are relatively ubiquitous. Maintaining ties with graduates via electronic communication tools, meetings, and informal networks allows the accumulation of data on employment, opportunities for graduates, and recruitment of adjunct faculty. Alumni are proud of their accomplishments and are usually eager to support the students who follow.

Larger context of higher education

Persistent unemployment, exploding cost and debt associated with college education, and lack of opportunity for graduates in many disciplines motivate a current national discussion of higher education (5, 10, 15). Are preprofessional health programs merely another example of frustrated hopes after college? Evidence suggests that allied health education provides a relatively cost-effective path to stable and well-remunerated careers (www.bls.gov/ces). A recent study by Georgetown University (4) showed that the level of academic degree often does not correlate with lifetime earning potential. Holders of bachelor’s degrees in biomedical science were among the five top earning professions in that degree category, while this discipline did not appear among high-earning graduate degrees. The medical laboratory is among few science curricula yielding entry-level positions after the BS, while other allied health careers (e.g., physical therapy, speech and hearing sciences, occupational therapy) have moved to graduate entry level, often involving costly clinical doctorates (http://explorehealthcareers.org/).

Debate among and within educational institutions is often laden with unhelpful language, characterizing, for example, pre-professional education as “vocational,” even as the liberal arts are called “ivory tower.” Students deserve the best of both; preparation for lifetime learning and culture, as well as the knowledge and skills to enter professions that are valued in the economy. Four years is a long time, and it is incumbent upon educators to design curricula that will serve comprehensive goals. Allied health educators, and perhaps uniquely those dedicated to the medical lab, can be models for other disciplines. Ultimately it is the patients we serve who will benefit from the vibrancy of the educational system we build.

ACKNOWLEDGMENTS

I am grateful for the support of Workforce Development Initiative grant, “New Pathways to Careers in the Medical
Laboratory” from the City University of NY for the 2010-2011 academic year. The author declares that there are no conflicts of interest.

REFERENCES


8. **Landro, L.** 2009, May 13. Staff shortages in labs may put patients at risk. Wall St. J. DI.


