

# Distance Education in the Clinical Laboratory Sciences: Part of the Solution to the Professional Labor Shortage

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## **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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## **ABSTRACT**

The purpose of this paper is introducing research conducted about issues related to influences and barriers to the potential use of distance education for mitigating the clinical laboratory sciences labor shortage. Diagnostic careers such as those in the clinical laboratory sciences remain a mystery to many people because they do not have the same prominence or visibility associated with therapeutic careers. Clinical laboratory science courses often have both didactic and laboratory components. Coursework with laboratory components require additional faculty time for preparation. When health care education is offered in traditional university or college settings not affiliated with a teaching hospital or clinical setting, laboratory costs are higher due to purchasing supplies, reagents and media. Issues are further explored in a brief series of papers addressing them. Using DE for delivering diagnostic clinical educational is a potential viable solution for addressing national diagnostic labor shortages.

**Keywords:** *Diagnostic careers; labor shortages; clinical education; laboratory components, interprofessional education; allied health education; distance education.*

## 1. INTRODUCTION

Hospitals are experiencing a shortage of qualified laboratory professionals[1-8]. This shortage includes both Medical Laboratory Scientists (MLS), and Medical Laboratory Technicians (MLT) [2,9]. Increasing numbers of graduates from clinical laboratory science programs is one solution to resolving the labor shortage. Academic rigor and quality of educational offerings are issues requiring consideration for a profession impacting patient health and its associated outcomes[10,11]. One solution to the labor shortage includes transforming educational programs from traditional to distance education (DE) for didactic program delivery. Following an exploration of the problems in pursuing diagnostic clinical careers, this review focuses on how using DE can be a practical part of the solution to resolving this area's health care labor shortages. The purpose of this short report is introducing research conducted about issues related to influences and barriers to the potential use of distance education for mitigating the clinical laboratory sciences labor shortage.

### 1.1 Problems

The need for MLS's and MLT's in diagnostic departments is projected to increase thirteen percent by 2026[9]. Data indicates a labor shortage of qualified laboratory professional[1-3, 5, 7, 9]. Reasons for these labor shortages include: 1) increased retirements of laboratory professionals; 2) fewer individuals pursuing degrees in diagnostic clinical occupations; 3) closure of traditional clinical laboratory science academic training & educational programs; and 4) aging populations requiring medical care[1-3, 5, 7, 9].

### 1.2 Diagnostic Retirements

Many diagnostic specialists are retiring or nearing retirement age, compounding the existing labor shortage[1,3, 4,5,7]. Retirement rates are projected to increase in various areas of diagnostic medical laboratories for both non-supervisory and supervisory staff[4]. The significance of these numbers when related to direct patient care includes timeliness of sample collection, its' processing, quality assurance, and performance improvements. All these areas could significantly be impacted by labor shortages [4]. Table 1 illustrates retirements.

### 1.2.1 Career visibility & awareness: diagnostics vs. therapeutics

Diagnostic careers such as those in the clinical laboratory sciences remain a mystery to many people because they do not have the same prominence or visibility associated with therapeutic careers. This lack of awareness has in part led to clinical laboratory science program closures[5, 12-14]. Individuals may not consider diagnostic careers because they lack knowledge of the options available. Therapeutic careers with more direct patient contact such as nursing, pharmacy, rehabilitation, dentistry, physician assistants, nutritionists, speech pathologists, mental or behavioral health and social workers have a higher degree of public recognizability than diagnosticians[15].

Clinical laboratory scientists often have limited patient contact resulting in the general public lacking knowledge of career options available in diagnostics. Regrettably this circumstance often extends to students, parents, secondary school career counselors and teachers[13]. Support staff typically obtain and transport specimens directly to the laboratory eliminating or reducing potential contact with laboratory personnel. Patients rarely go directly to the clinical laboratory to provide samples. Unobtrusively working as part of an interprofessional team in a consultative role providing therapeutic practitioners with laboratory results for making clinical diagnoses has resulted in a decided lack of awareness of this career cluster of professions amongst students, parents, educators, and career counselors[13]. Exposing students during career exploration late in elementary or early in secondary school to the possibilities the clinical laboratory sciences offer through social media platforms, technology driven presentations, and direct interaction thru career exploration could develop publicity for diagnostic professions[5]. Unless students have a meaningful encounter, they may not be interested in pursuing a diagnostic career even with increased visibility and career exploration within public schools. Even if career exploration is even partly successful, this exposure is only one part of a potential solution for addressing the labor shortage. Counselors and educators whom know little about diagnostic careers available compared to therapeutic options cannot offer students and parents advice about the educational preparation students in middle, junior and high school could be taking in preparation for career & educational training programs[13].

### **1.2.2 Confounding factors: career advancement and salaries**

Compounding the effect of a lack of awareness of diagnostic careers are negative perceptions about career advancement and salaries[12,13]. For individuals interested conceptually in direct patient contact, therapeutic care careers may provide a more attractive career pathway than one in the clinical laboratory sciences. Therapeutic careers have multiple opportunities for professional advancement and the potential for diversity in work settings[9]. Career laddering allows individuals to move from entry level to highly specialized careers, making a wider range of employment settings, specializations and geographic areas available for employment.

Individuals choosing clinical laboratory sciences as a career may not intend to stay in the field, but rather treat it as an entry point on their intended career pathway[13]. Job security, networking opportunities, the benefit of practical experience, and developing professional references may initially be why individuals pursue diagnostic careers [13]. These steps may strengthen future chances of moving toward more specialized careers and motivate diagnosticians to continue advanced education via alternative, advanced career pathways [12,13]. If individuals are unaware of career advancement possibilities this may also be a contributing factor in the diagnostic labor shortage[12,13].

Both the clinical laboratory sciences and nursing are female dominated professions[2,16]. Salaries are notably lower than therapeutic practitioners such as nursing even though both groups have similar educational requirements [9,13]. Comparisons of the median annual salary of a MLS with a bachelor's degree to a registered nurse is substantially lower especially for highest earners[2,16].

The combination of these issues may also be compounding the potential for attracting individuals to diagnostic laboratory careers.

### **1.3 Program Closures**

Diagnostic preparatory programs have been closing. Various factors impacting program closures include lack of career awareness, negative career perceptions, and high costs associated with offering diagnostic career education[2,3,5,7,12,13,14]. Nearly two thirds of the original diagnostic clinical laboratory science

programs in the US have closed in a span of thirty years[2]. Program closures have also significantly impacted production of the number of clinical laboratory science graduates, resulting in a net loss of nearly 66% of the potential workforce[2].

Clinical laboratory science courses often have both didactic and laboratory components. Coursework with laboratory components require additional faculty time for preparation. When health care education is offered in traditional university or college settings not affiliated with a teaching hospital or clinical setting, laboratory costs are higher due to purchasing supplies, reagents and media. Diagnostic programs receiving donations from clinical affiliates, may reduce, but not eliminate, the financial liability associated with running them. If diagnostic preparatory programs are financially considered as too expensive to offer within the respective university or college they may be considered for discontinuance. This could be especially true during a time of uncertainty within higher education where projections slate half of institutions offering higher education may close within the next 10 years[17]. This circumstance further compounds the problem of reduced numbers of institutions providing education for clinical diagnostic careers, in turn adding to the labor shortage.

### **1.4 Aging Population**

Populations in developed countries are living longer due to advancements in medical care, treatment and prevention[18]. Extended lifespans, however, do not come without potential consequences. People are living longer with multiple comorbidities including hypertension, heart disease, and diabetes[19]. Care of these patients often requires clinical laboratory services. Physicians often rely upon objective laboratory results for diagnosing and managing complex disease states requiring performance and accurate interpretation by skilled laboratorians.

## **2. RESULTS AND DISCUSSION**

There are several ways the professional labor shortage in diagnostic clinical laboratory careers could be addressed. One, increasing the number of academic programs available nationally, is not necessarily viable or realistic due to cost, access and recognition of its need. A second solution, one of increasing student enrollments in existing

programs, is possible and feasible, but requires a refocus by program directors about how it could be accomplished on a national scale with accrediting bodies, with educational institutions, and educators. The third solution, addressed in this review, is the most likely and practical of the three solutions proposed, using a different way to deliver diagnostic career preparation: distance education.

Some of the top factors which could be considered as solutions noted by diagnostic program directors are illustrated in Table 1.

Interestingly, directors recognize using DE as an access solution to educational programming. Those with more experience comprehend the opportunities to reach more students, enhance flexibility and autonomy, while enhancing and diversifying teaching skills and abilities. These data reflect how applying alternative delivery models to educate global workforces in diagnostic and allied health care professions impact faculty and staff doing so. Subsequent papers will illustrate other barriers and motivational factors to using alternative educational delivery systems for developing an interprofessional diagnostic and allied health workforce.

### 2.1 Changing Educational Paradigms in Allied Health and Diagnostic Disciplines

Limited numbers of clinical laboratory science programs are using DE modalities for offering

access to didactic career preparation [20,21]. Training diagnostic practitioners for staffing urban and rural communities acute care settings by using alternative educational delivery methods is a key solution for providing education addressing occupational shortages[1-8].

Clinical laboratory science program numbers compared to therapeutic allied health programs using DE are still relatively small. Using the disruptive innovation[17] DE offers increases opportunities for students' ability for accessing diagnostic care education and careers. Academic and practical performance comparing face to face, traditionally trained diagnosticians versus those trained using DE for curriculum delivery have little to no measurable differences in performance, including grades and standardized test performance[10, 11, 14, 22-25].

The clinical laboratory science profession has been slower to adopt to using DE for delivering academic education compared to other allied health professions. Nearly half of Bachelor of Science in Nursing (BSN) completion programs were offered completely online in 2016[26]. Nearly thirty percent of Dental Hygiene (RDH) undergraduate degree completion and graduate programs are also available via online distance modalities[27]. Comparatively, there are 21 online MLS programs, 18 online MLT programs, and 25 MLS/MLT online degree completion programs[20,21]. These program numbers are small compared to the total number of diagnostic

**Table 1. Top factors for directors with and without distance education experience**

Rank	With experience	Without experience
1	Ability to reach students who cannot come to campus (Mean = 3.52; SD = 0.61; n = 88)	Greater course flexibility for faculty ( Mean = 3.25; SD = 0.74; n = 68)
2	Greater course flexibility for students (Mean = 3.52; SD = 0.64; n = 89)	Opportunity to enhance/expand my teaching experience (Mean = 3.20; SD = 0.75; n = 71)
3	Greater course flexibility for faculty (Mean = 3.30; SD = 0.75; n = 89)	Greater course flexibility for students (Mean = 3.16; SD = 0.80; n = 69)
4	Opportunity to diversify program offerings (Mean = 3.24; SD = 0.72; n = 86)	Opportunity to diversify program offerings (Mean = 3.14); SD =0.86; n = 65)
5	Overall job satisfaction (Mean = 3.00; SD = 0.77; n = 86)	Ability to reach students who cannot come to campus (Mean = 3.07; SD = 0.88; n = 60)
6	Opportunity to enhance/expand my teaching experience (Mean = 2.99; SD = 0.64; n = 86)	Personal motivation to use technology (Mean = 2.99; SD =0.80; n = 70)
7	Opportunity to diversify my teaching (Mean = 2.97; SD = 0.77; n = 87)	Opportunity to diversify my teaching (Mean = 2.96; SD = 0.81; n = 70)

Note. SD = Standard Deviation; n = number of respondents. .05>p

programs nationally available[28]. Online programs can offer students access to educational opportunities otherwise not available due to geography, personal responsibilities, and cost[29]. Numbers of non-traditional students returning to school is increasing as individuals consider changing or pursuing different careers[30]. Using DE for career preparation can provide distinct advantages over traditional programs using face-to-face delivery, especially when utilizing asynchronous formats[31]. Some program directors and educators within the clinical laboratory science disciplines are recognizing this trend and the number of programs using DE for program delivery are slowly increasing[14]. Changing program delivery modalities requires changing educational paradigms. This concept extends to program directors, educators, and administrators throughout organizations. Administrators need to recognize the investment in health care career educational training such as the clinical laboratory sciences is higher [2] due to accreditation requirements, specialized equipment needs, student/faculty ratios and infrastructure for offering laboratory portion of program curriculum compared to liberal arts programs. Administrators and program directors need to also recognize offsetting costs for didactic and laboratory education. Using DE and asynchronous online learning for delivering the didactic portion of academic program curriculum can reduce expenses while expanding access to people seeking diagnostic career training.

### 3. CONCLUSION

Academy administration, program directors and faculty need to be willing to consider implementing DE as a viable solution to reducing professional laboratory labor shortages. If administrators and program directors willingly embrace this option, it still falls to educators having a willingness to be adaptable in modifying educational curriculum, using DE teaching methodologies for delivering program content, and applying different means to assessing students' performance. Educational institutions are often slow to change, and an educational paradigm shift of this magnitude is typically not well received by traditionalists. Recognizing the need for change versus implementing changes for a variety of reasons can be difficult for colleges and universities. Using alternative educational delivery systems like DE are allowing people a variety of more affordable and accessible options to educational and training programs than ever before.<sup>17</sup> Distance education

can provide one solution for meeting today's changing educational and career training needs, in turn providing a solution to accessing training to prevent further diagnostic professional labor shortages.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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