Use Authorization

In presenting this thesis in partial fulfillment of the requirements for an advanced degree at Idaho State University, I agree that the Library shall make it freely available for inspection. I further state that the permission to download and/or print my thesis for scholarly purposes may be granted by the Dean of the Graduate School, Dean of my academic division, or by the University Librarian. It is understood that any copying or publication of this thesis for financial gain shall not be allowed without my written permissions.

Signature_____

Date 07-19-2017

Establishing professional learning centers within critical access hospital laboratories in the State of Idaho

By Hollie Ann Bearce

A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Science in the Department
of Medical Laboratory Sciences
Idaho State University
Summer 2017

Acknowledgements

First, I would like to thank my thesis advisor Rachel Hulse, director of the Medical Laboratory Science program at Idaho State University. Whenever I had questions, concerns or needed feedback, she was quick to respond and always steered me in the right direction. I am grateful for her never-ending support, sage advice and for keeping me on track.

I would also like to acknowledge Dr. Kathy Spiegel, emeritus director of the Medical Laboratory Science program at Idaho State University. Her initial support of this thesis project was exactly what I needed to have the confidence to pursue it. I am gratefully indebted to her for her valuable input on this thesis.

A special thank you to Abby Siebert & Jennifer Englesby for your feedback. To Sandra Jussel, for encouragement and willingness to allow me to do this project at St. Luke's Wood River. To Diana Thompson, for unconditional encouragement, professional mentorship and for helping me realize the potential this project had. To St Luke's Healthcare System for providing necessary resources to make this project a success. To the clinical laboratory staff at St. Luke's Wood River for indulging me during my academic journey.

Lastly, but most importantly, I would like to acknowledge my husband and family for their constant support and sacrifice. Without their unfailing support, this thesis would not be possible. I have only accomplished as much as I have due to their belief in me.

Thank you.

Sincerely,

Hollie Ann Bearce

Committee Approval

To the Graduate Facility:

The members of the committee appointed to examine the thesis of HOLLIE ANN BEARCE find it satisfactory and recommend that it be accepted.

_____

Rachel Hulse,

Major Advisor

_____

Dr. Kathleen Spiegel,

Committee Member

_____

Richard Wagoner,

Graduate Faculty Representative

TABLE OF CONTENTS

APPENDICES

Appendix A1 – ASCLS Survey

Appendix A2 – ASCLS Survey Results

Appendix B1 – CAH Survey

Appendix B2 – CAH Survey Results

Appendix C – ASCLS Workforce Shortage Issue Brief

Appendix D – SLWR Resource Center

List of Figures

List of Tables

List of Abbreviations

CAH: Critical Access Hospital

CE: Continuing Education

CLS: Clinical Laboratory Science

CLT: Clinical Laboratory Technician

DEU: Dedicated Educational Unit

MLS: Medical Laboratory Science/Scientist

MLT: Medical Laboratory Science/Scientist

NAACLS: National Accrediting Association for Clinical Laboratory Science

SLWR: St. Luke's Wood River

ABSTRACT

Clinical laboratory science will face a workforce crisis within the next decade as 40% of the workforce in the United States will retire, workforce demand will increase due to the aging population, and 70% of NAACLS-accrediting clinical laboratory science academic programs have closed since the 1970s. Further compounding this issue is the increased need for advance degrees and specialized training due to the increasing complexity of laboratory testing. It has never been more imperative that new professionals receive the highest level of education and robust training. The unique geography and distribution of the state's population also complicates this issue. Over two-thirds of the hospitals in the State of Idaho are designated as critical access hospitals; in this setting, clinical laboratories operate on a skeleton crew in which laboratorians are required to work alone for several hours and maintain competency over all disciplines of clinical laboratory science.

Professional Medical Laboratory Scientists have an obligation to ensure the competency of newly hired staff and a duty to support and supplement the education of current students. A learning center established within clinical laboratories would enrich the careers of current professionals and assist in the training of students and new professionals as well. Survey results reveal that clinical laboratories are sitting on a trove of resources and materials that, if curated appropriate, could be of great benefit, not only to the individual laboratory but to the hospitals staff itself, and to the profession as a whole.

Establishing professional learning centers within critical access hospitals

I. INTRODUCTION

Problem Statement

Clinical laboratories across the United States are understaffed and struggle to find applicants to fill open positions; as a result, many Medical Laboratory Scientists consistently work more than 40 hours per week, or work more than one job to meet the workforce need. The current graduation rate of students from clinical laboratory science academic programs is insufficient to meet the current professional job demands. Further compounding this issue, approximately 70% of NAACLS-accredited clinical laboratory science education programs in the United States have closed since 1970. Historically, the State of Idaho had 6 different clinical laboratory science programs that graduated a total 32 students per year; at present, there is only one NAACLS-accredited program in the State of Idaho.

Within the next decade, it is estimated that 40% of the current clinical laboratory science professionals will retire. Newly hired professionals do not affect the median age as most learn about the profession later in their careers and return to earn a post-bachelor's degree; the median age of the clinical laboratory science workforce is 50. In short, the profession is facing a workforce shortage crisis. New professionals will be expected to be more competent when entering the workforce and to take on greater responsibility than previous graduates.

The training received during the transition from student to new professional is critical; however, hospitals throughout the United States have become reluctant to accept students for clinical rotations due to budget constraints, a reduction in available resources and workforce shortages. Furthermore, Idaho hospitals face unique

challenges given the rural nature of the state; the majority of hospitals are Critical Access Hospitals (CAH) and operate on a lean budget and small laboratory staff. The consistency and the quality of student's experience during clinical rotation can vary drastically from one laboratory to the next.

Research Questions

- How are MLS students trained at critical access hospitals during clinical rotations?
- What training materials or other resource materials are used at critical access hospitals?
- To what extent are clinical laboratorians involved in designing, implementing and educating staff in regards to laboratory related subjects?

Definitions

Clinical Laboratory Science (CLS): for the purpose of this paper, clinical laboratory science will refer to the body of knowledge studied by clinical laboratorians. Professional titles are given to clinical laboratorians, which reflect the different levels of education they have earned.

Clinical Laboratory Technician (CLT): for the purpose of this paper, clinical laboratory technicians are professionals with very limited responsibility within the clinical laboratory; they are unable to perform highly complex testing. They may have some college education but not specific to CLS.

Critical Access Hospital (CAH): a designation by the Center for Medicare and Medicaid Services (CMS) to essential rural hospitals that meet specific criteria designed to reduce the financial risk experienced by rural hospitals and improve access to healthcare in these areas. The designation was established by Congress as part of the 1997 Balance Budget Act in response to the closures of multiple hospitals in the 1980s and 1990s.

Medical Laboratory Scientist (MLS): clinical laboratory scientists who have earned a 4-year degree from a NAACLS accredited university and have passed the ASCP board of certification.

Medical Laboratory Technician (MLT): clinical laboratory personnel who have earned a 2-year degree from a NAACLS accredited university and may have taken the ASCP board of certification. Different clinical laboratories allow these employees to perform a wide range of tasks, but they are not often allowed to work without the supervision of an MLS. Depending on the accrediting agency and the preferences of the laboratory management, these individuals may not be allowed to perform highly complex testing.

Phlebotomist: for the purpose of this paper, phlebotomists are defined as clinical laboratory personnel who do not have a college degree. Their primary duties are to perform phlebotomy and collect laboratory specimens.

Assumptions

There are many inherent assumptions that accompany survey-based research. Of particular importance is the assumption that the participants comprehend the intent of

the question and that their responses are truthful. Another key assumption is that the participants complete the survey without omission due to self-censorship or ambiguity. Additional assumptions are made when the survey is anonymous as opposed to confidential in nature. First, it must be assumed that the participants of the survey are comparable and that they meet the inclusion criteria of the research. Second, that no follow up will be needed as it is not possible in an anonymous format. Finally, it must be assumed, regardless of the type of survey conducted, that the survey participants accurately reflect the target population as a whole.

Significance

Professional Medical Laboratory Scientists have an obligation to ensure the competency of newly hired staff, and a duty to support and supplement the education of current students. A better understanding of the operations of CAH laboratories can shed light on practices that could be improved, and highlight areas that are working well. The information gained from this research can also help improve the way that students are trained, help prepare them for competency expectancies when they enter the workforce, and better equip students for clinical rotations.

Hospital based education departments traditionally focus on clinical areas that directly involve patient care; they are most often managed by nursing staff and focused on nursing personnel. While attempts are made to incorporate auxiliary departments, such as the clinical laboratory, the material covered only involves areas of direct patient care (point-of-care testing, phlebotomy, order of draw, etc.). The body of knowledge that a clinical laboratorian is expected to remain competent in is not within

the scope of a traditional clinical education department. Establishing a professional learning center within critical access hospital laboratories, designed and maintained by current professionals can help meet the educational needs of MLS students and supplement the training and competency evaluations of current professionals.

II. REVIEW OF LITERATURE

BACKGROUND

The clinical laboratory will face a shortage of qualified Medical Laboratory Scientists, resulting in a work-force crisis. According to the Department of Labor and Statistics, over the next ten years, approximately 40% of the workforce is scheduled to retire and the demand for clinical laboratory personnel will increase due to the aging of the United States population (ASCLS Legislative Symposium, 2015). McCauley accurately predicted that there would be a demand for 150,000 new clinical laboratory science professionals in 2016, of which 68,000 would be entirely new positions (McCauley, 2011).

According to the retirement trajectory and workforce information, if the number of new professionals entering the workforce remains static, by 2021 there will be a shortage of more than 150,000 (n=154,416) clinical laboratory science professionals in the United States (see Figure 1 below) (US Department of Labor and Statistics). The majority of the personnel shortage will be experienced among the Medical Laboratory Scientists who are employed in clinical laboratories in hospitals, reference labs and medical research. Supportive clinical staff and laboratory assistants lack the qualifications to offset this deficit, and more importantly, do not have the appropriate qualifications to perform highly complex testing. This is paramount given that clinical laboratory science is becoming increasingly more complex as healthcare becomes increasingly personalized.

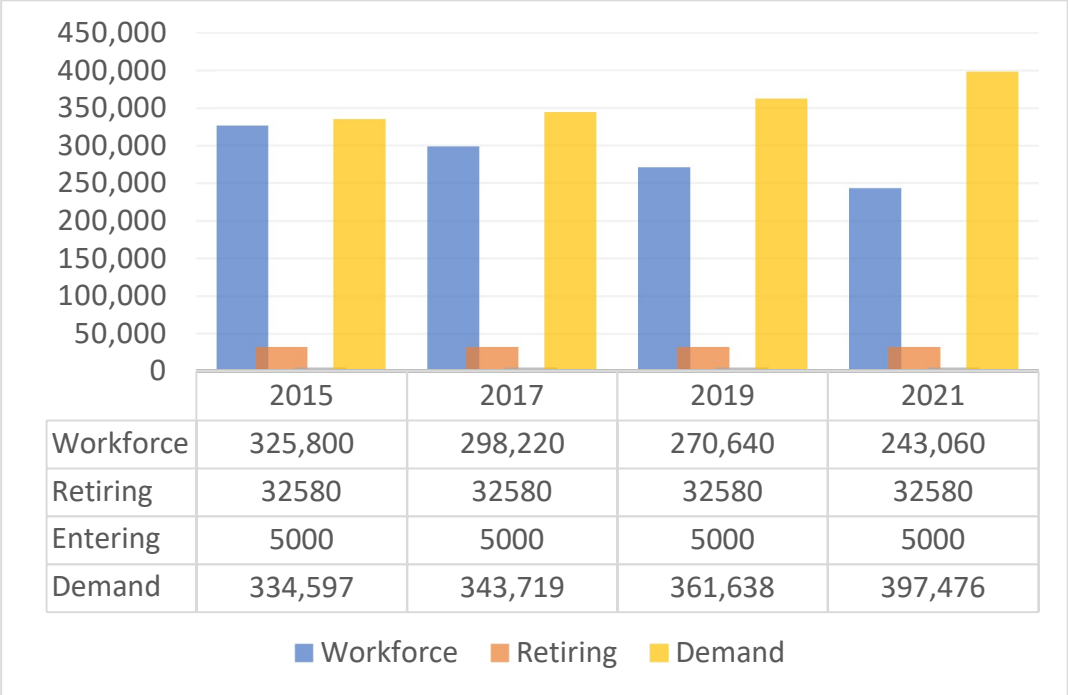


Figure 1 – CLS Workforce Projection
According to the current professional workforce trajectory, there will be a CLS workforce shortage of 154,416 individuals by 2021 (which accounts for 39% of the workforce demand in 2021). The US Department of Labor and Statistics estimates that 40% of the current CLS workforce will retire in the next 10 years; due to the significant decline in CLS academic programs the current rate of new professionals cannot meet the anticipated job demand.

According to a study published by the Health Resources and Services Administration, NAACLS-accredited educational programs for clinical laboratory science have declined drastically since the 1970s (see Figure 2). The study notes that program closures were a direct result of several factors including budget cuts, increased expenses, decreased interest in the profession attributed to lack of knowledge of the program, and the beginning of the 33 prospective payment system (Ward-Cook, 2005). Hospital-based programs suffered the most during this period of program closures as their budgets were severely impacted by the 33 prospective payment system, which changed the way hospitals received reimbursement for laboratory tests. It is worthy to note that hospitals are again facing a change in reimbursement methods with the advent of the Affordable Care Act and changes to

the laboratory fee schedule established by the Center for Medicare & Medicaid Services (CMS).

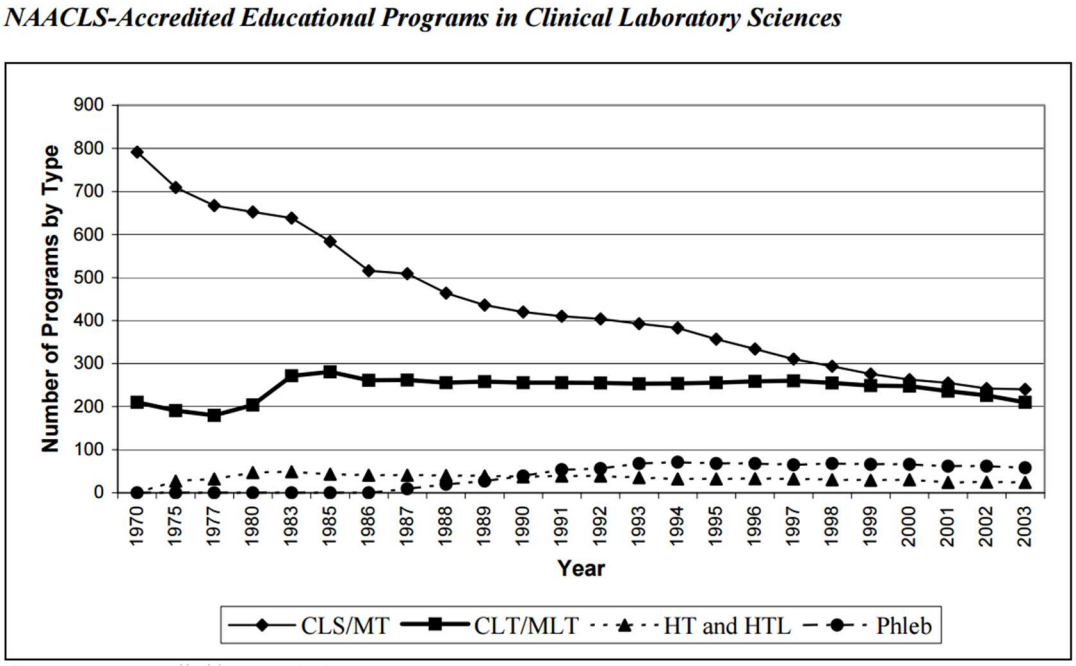


Figure 2. Source: Ward-Cook, K., Chapman, SA, et. al. (2005). The Clinical Laboratory Workforce: the changing picture of supply, demand, education and practice.

Due to closures of nearly 70% of Medical Laboratory Science programs throughout the United States since the 1970s, the current graduation rate of Medical Laboratory Scientists from NAACLS accredited programs is not adequate to meet today's workforce shortage and will be grossly insufficient to meet the impending job demand as the baby-boomer generation ages and retires (Ward-Cook, 2005, ASCLS Legislative Symposium, 2016). Hospital-based programs, like university programs, have also suffered from budget constraints; a change in reimbursement models have forced many hospitals throughout the United States to be reluctant to place students in required clinical rotations to complete their their bachelor's degree programs, thereby compounding the challenges universities already encounter.

Over the past decade, increased use of point-of-care testing, hiring support staff with less education and fewer credentials and the use of traveling Medical Laboratory Scientist staff has helped to bandage the workforce shortage experienced in clinical laboratories (Ward-Cook, 2005). These measures, however, are not a solution to the growing workforce shortage and do little to address the projected workforce crisis. Given the state of the profession, new Medical Laboratory Science (MLS) professionals entering the workforce will be required to master skills quickly and independently, be fiercely independent, competent, and to take on more responsibility sooner than any other generation of Medical Laboratory Scientists (Hammerling, 2012). A learning center within the clinical laboratory, established and maintained by active MLS professionals, can help new professionals achieve these daunting goals.

Credentialed Medical Laboratory Scientists have an obligation to ensure the competency of new hires and a professional duty to support and supplement the education of current students; thus, ensuring the continuity and security of the profession (McCauley, 2011, Kasper, 2006, Laudicina, 2011). A learning center established within clinical laboratories can help achieve such goals and will enrich the careers of current professionals as well. The vast majority of hospitals across the country have an established clinical education department within their organizations; however, it is operated by nursing staff and is primarily targeted to the professional needs of nursing staff (Hunt, 2015). While attempts to incorporate the laboratory have been made, only the areas that also directly involve patient care have been incorporated: point-of-care testing, heel sticks, order of draw, pre-analytical errors

etc. A professional learning center dedicated to clinical laboratory science is missing in hospital settings, which puts the clinical laboratory staff and other clinical personnel at a disadvantage.

The establishment of a hospital-based laboratory learning center needs to be a collaborative effort by all staff to reduce the financial burden currently experienced by laboratories. The learning center must become an integral part of every Medical Laboratory Scientists duties and not add an additional constraint on an individual's daily tasks, and the material should be accessible for quick reference. Learning centers should be a tool designed to help students and staff meet their continuing education requirement for certification maintenance, competency and training requirements.

It is time for the clinical laboratory profession to take ownership of their own department within the hospital setting, take responsibility for the reputation of their profession and supplement the educational needs of current professionals and students (McCauley, 2011, Laudicina, 2011). To address the impending workforce crisis, in a time when healthcare reform has reduced hospital reimbursements and education funding has been cut to university programs, credentialed Medical Laboratory Scientists must take a more active role. Too many hospitals throughout the country feel overly burdened when supporting students through a delicate and much needed clinical rotation; they are short staffed & ill-prepared to dedicate the time that students require for their rotations.

PRESENT-DAY STATUS OF CLINICAL LABORATORY SCIENCE

Medical Laboratory Science programs in the United States have been forced to make cuts to their program requirements either from budget restraints or the ability to attract students (often due to the lack of knowledge of the program). Traditionally, MLS programs were a rigorous undergraduate program that required a 4+1 undergraduate program with an additional year of an unpaid clinical rotation. Currently, many programs have gone to an intensive 4-year degree program and have reduced the clinical rotation requirement to the minimum 3-month requirement established by the American Society of Clinical Pathologists for the Medical Laboratory Science Board of Certification Exam. Over the years, due to the limited career growth and lower compensation compared to other clinical staff (pharmacy, nursing & respiratory therapy), undergraduate Medical Laboratory Science programs have experienced a steady decline in prospective students (Ward-Cook, 2005). Technology has allowed universities to offer MLS programs in an online, flexible format and increased their ability to reach additional students (Russell, 2007). Idaho State University was one of the first clinical laboratory science programs to offer an online MLS program.

Current students often begin their MLS programs knowing very little about clinical laboratory science, the state of the profession and what to expect as a new professional; most students discover the degree years after completing their undergraduate studies and chose to return to school and pursue a post-bachelor's degree. The mean age of practicing Medical Laboratory Scientists is 50 years and entering professionals are doing little to move the median age as they are,

themselves, advanced in age (Russell, 2007, Ward-Cook, 2005). Fortunately, with the onset of online education, enrollment numbers in Medical Laboratory Science programs are on the rise, but are still insufficient to meet current workforce needs. Additionally, online programs have demonstrated that they are as effective as traditional classroom-based programs in producing competent graduates who are able to pass their certification exam and obtain gainful employment (Russell, 2007).

University programs partner with a variety of clinical laboratories to offer tours and on-site experiences for the educational enrichment of their students (Kasper, 2006). While this experience is vital to the university-based programs, online students who are remotely based often miss these opportunities. Some programs offer their distance-learning students informational CDs and virtual laboratory experiences (Jones, 2006, Conway-Klaassen, 2012a). Additional resources that help online instruction include digital microscopes, cooperative learning and web-based conferencing (Castillo, 2012, Conway-Klaassen, 2012a, Bose, 2004). While these educational tools are irreplaceable and should be continued to be utilized, traditional students and online students would both benefit from more interaction with the professional clinical laboratory prior to graduation and entering the workforce.

Much research has been done to evaluate online programs (educational models, retention & graduation rates, certification passing scores, best-practices, etc.). However, little research has focused on the role that the professional clinical laboratory has in supplementing the education of online students or the impact that a robust partnership between rural-hospitals and university programs has in meeting the needs of distance learners.

As clinical laboratory professionals begin to realize their importance in the role in educating and equipping the next wave of MLS, it is important that they implement established "best practices" for education and stay closely connected to the university programs in their area.

In her article*, Dedicated education units: An Innovative Model for Clinical Education,* (2015) Deborah Hunt outlines the advantage of education units dedicated to nursing students & the benefits the participating professionals also received from participation. Hunt argues that clinical rotations are a staple to nursing programs, much like MLS educational programs. She notes that clinical rotations began in the 1990s as a way to foster high quality care for patients. In her model, a dedicated education unit (DEU) is a unique partnership between academia and the healthcare profession in which collaborative instruction between current professionals and educators. The partnership encourages peer-lead teaching and also allows the clinical workforce to have a better understanding of newly graduated students' knowledge (Hunt, 2015).

The DEU model varied between the different hospital organization sites, but relied heavily upon experienced nursing volunteers to precept students. The flexible model was key to the success of a DEU as not all professionals are gifted with the ability or the patience to handle students. In current practice, MLS students are assigned the shadow whoever happens to be scheduled for that particular shift regardless of the mentoring capability of the laboratorian. This practice leads to vastly different experiences in clinical rotations and can have devastating effects on

the student's moral, confidence and successful performance on the board certification exam.

While the development of a dedicated learning center is not the same as a DEU, it can serve the same purpose. Students will have an opportunity to be mentored by active professionals, provided clinical samples for case-study analysis, review curated gram stains and hematology blood smears, and have access to all resources available to active clinical laboratorians. Their education is enriched beyond what can be offered in a traditional classroom setting, regardless of virtual enhancement tools. An additional benefit, similar to the Hunt study, is that active professionals will be better prepared to assess the competency of recent graduates, as they will have familiarity with the course material.

A dedicated learning center in the clinical laboratory will also serve as a resource for active professionals. Clinical laboratory professionals have many demands on their time in the clinical laboratory; this is even truer of generalists working in rural-access facilities who are expected to wear many hats. Between running patient samples, evaluating pre-analytical, analytical, and post-analytical errors, validating quality control parameters, documenting critical values, completing competency evaluations/tests, and maintaining their mandatory continuing educational units, it is difficult for MLS professionals to seek additional tasks or responsibilities. Having a repository of materials for technical leads to access for competency evaluations and for other professionals to reference when unusual or uncommon test results occur could reduce the stress endured by time-strapped workers and reduce errors in the laboratory.

Additionally, the material collected in the learning center could be used for inter- and intra-departmental trainings. Being able to document real-life clinical errors that happened within your own organization and the path to resolution can have a true impact on instruction of staff. For example, pictures of hemolytic specimens compared to the redrawn specimen and a comparison of the test results with a discussion of how the test would have impacted patient care had the laboratorian not caught the error. These are not only helpful for training of MLS students but also provide a resource for the organization as well.

SUMMARY AND CONCLUSION

Elizabeth Leibach wrote extensively regarding the development of the clinical laboratory science profession and is a strong advocate of professional involvement in enriching student learning. Leibach argues that it is time for Medical Laboratory Scientists to step up, find their voice and take ownership of their own profession (Leibach, 2007, Leibach, 2008a). In an executive summary, Leibach notes:

> *Missing within the continuity of healthcare are enough scientists and physicians within the clinical laboratory or elsewhere on the healthcare team who are totally dedicated to and who have the breadth of the knowledge and assigned authority essential to the ordering of appropriate laboratory tests, the effective use of laboratory test information, effective consultation with other healthcare team members, direct communication with patients, review of patient records, and interpretations/application of laboratory generated information in reference to clinical signs and symptoms. A clinical laboratory science professional holding a doctoral degree (DCLS) is needed to provide the critical interface across the healthcare system in order to assure improved patient outcomes and cost-effective patient care. (Leibach, 2008b).*

The establishment of a dedicated learning center within the clinical laboratory would be an additional tool for future DCLS staff to ensure the proper education of the clinical laboratory personnel and serve as a repository for their knowledge as well.

It will take a village to make a dedicated clinical laboratory learning center a success. The collaboration of students, educators, hospital administration, laboratory managers and active professionals is key to successful implementation. A learning center dedicated to the clinical laboratory, created and maintained by clinical laboratorians, will increase competency, camaraderie and cultivate learning for both current MLS students and active professionals.

III. RESEARCH DESIGN

Of the 40 non-federally funded hospitals in Idaho, 68% (n=27) are designated as Critical Access Hospitals (CAH) (Kaiser, 2016). CAH is a designation given to hospitals in rural areas that meet certain criteria: less than 25 acute care inpatient beds, more than 35 miles removed from another hospital, provide 24/7 emergency care and maintain an average stay of 96 hours or less (for acute care patients).

CAH face unique challenges based on their physical location and the rugged geography of the State of Idaho. It is estimated that 556,682 (33%) of Idaho residents live in rural areas (US Census, 2015). With the exception of Alaska, Idaho has the most contiguously federally managed wilderness; 2.367 million acres located in the central region of the state. The state roads that connect Idaho are not accessible year-round; roads are often closed due to the rugged mountain terrain, hazardous winter conditions and wildfire. It is more appropriate to think of Idaho towns and cities as islands separated by large areas of inhospitable terrain. The service that CAH laboratories provide is critical to improving access to healthcare in these rural, rugged and remote areas.

Two surveys were conducted as part of the data collection process. The initial survey was anonymous and distributed to clinical laboratory science professionals attending a professional conference. The purpose of this study was to gather baseline data regarding common practices through the clinical laboratory science profession. The second survey was mailed to the 27 CAH laboratory managers to gather specific data for this specific population within the clinical laboratory science profession.

The nature of the qualitative research conducted is ethnographic; the surveys focused on the experience of MLS professionals and students during clinical rotations in CAH laboratories.

Data collected was analyzed statistically using the chi-squared test with the null hypothesis that no relationship exists between the two categories being compared; significance was set at p=0.05. It should be noted that due to the small sample size, the usefulness of the statistical information is anecdotal at best.

PARTICIPANTS

Part A – Survey Inquiry

Participants in the first survey were the attendees of the ASCLS-Idaho State Convention who completed the survey anonymously. In total 59 surveys were submitted; however, over a third of the surveys were rejected from analysis (32.29%, n=22) because the forms indicated they were completed by students not employed in a clinical laboratory who attended the conference and were not the target audience of the survey.

Of the 37 submissions used, the majority of participants (48.65%, n=18) were employed at large hospitals (>100 beds), 21.62% (n=8) were from small hospitals (<100 beds), 18.92% (n=7) identified themselves as working at a Critical Access Hospital, 8.11% (n=3) were from an outpatient clinic and 1 participant worked at a reference laboratory. The majority of respondents said that their laboratory was staffed with ≥15 Medical Laboratory Scientists (45.95%, n=17), 16.22% (n=6)

selected 16-25, 29.73% (n=11) selected 26-50, 2 respondents selected 51-75 and 1 respondent selected >100.

The different disciplines of clinical laboratory science were well represented. Participants were allowed to select more than one discipline. Out of 107 total responses, the lowest represented area of clinical laboratory science was molecular (7.48%, n=16). Given the newness of the discipline, it was not a surprising discovery. Additionally, many molecular tests are incorporated in other domains and individuals who perform molecular testing may not identify themselves as working in a molecular department. In the category of other, participants specified that they worked as a generalist, a manager, point-of-care, administration or patient safety.

The second survey was physically mailed to the laboratory managers at the 27 critical access hospitals throughout the State of Idaho. At the time of analysis, 77.78% (n=21) of the 27 CAH laboratory managers had returned their survey.

All participants confirmed their status as a laboratory of a CAH. Half of the respondents (50%, n=10: 1 participant did not respond) said that the closest hospital was 25-50 miles away, 30% (n=6) indicated that the closest hospital was less than 25 miles away, 15% (n=3) selected 50-100 miles and 5% (n=1) selected 100-150 miles away. That majority of CAH laboratories operate within 50 miles from another hospital.

The survey results revealed a variation in the number of beds at each CAH as well. The majority of participants (43%, n=9) were from hospitals with 20-25 beds. Two respondents identified their CAH as having more than 26 beds, which exceeds the CMS threshold of 25. The rest of the respondents were as follows: 6-10 beds

represented 14% (n=3) of the respondents, 11-15 represented 19% (n=4) and 16-20 beds represented 14% (n=3).

The survey respondents were evenly divided when it came to staffing the laboratory 24/7 or taking call: 50% (n=10) routinely scheduled call, 40% (n=8) staffed their lab 24/7, 10% (n=2) took very limited call to fill holidays or when short staffed. One participant declined to provide staffing information.

Part B – Implementation

The second portion of the research project involved the implementation of a professional learning center at a CAH laboratory: St. Luke's Wood River (SLWR). The professional learning center is specifically designed to supplement the educational needs of current students and serve as a repository for training and competency material for current MLS staff. Due to the rural nature of central Idaho, the SLWR hospital routinely provides services to a large network of physicians: the laboratory receives samples from rural areas as far north as Salmon, Idaho (140 miles) and 50 miles to the southwest to the town of Fairfield, ID.

Participants in this thesis project include the laboratory personnel at SLWR hospital in Ketchum, Idaho. SLWR is a 25-bed rural access hospital in the center of the State of Idaho. At the time of this project, the laboratory personnel consist of 11 Medical Laboratory Scientists, 1 Medical Laboratory Technician, and 10 Clinical Laboratory Technicians. The SLWR laboratory is intimately familiar with the MLS program at Idaho State University. In the past 4 years, there have been 6 employees enrolled in the MLS undergraduate program at Idaho State University. During this

thesis project, the laboratory employed 2 prospective students, 1 undergraduate student, 1 recently graduated student (new professional studying for BOC exam) and 1 graduate student.

METHODS AND MATERIALS

Part A – Survey Inquiry

Method

An inquiry of current methods used in clinical laboratories for employee training, employee education, and student clinical rotations was conducted in two surveys. Questions included in the two surveys fit into three categories: hospital information, laboratory personnel demographics, and clinical laboratory education. Both surveys were designed to be anonymous; however, after complications with the initial anonymous survey, the second survey sent to the CAH laboratory managers was edited to be confidential instead.

The first survey was distributed to the attendees of the American Society of Clinical Laboratory Science (ASCLS) Idaho State Convention, held April 20-22, 2017 in Pocatello, Idaho. It was completely anonymous and the participants were provided with a raffle coupon to win an Idaho State University mug. 59 questionnaires were completed and returned. However, 20 of the 59 surveys received were undergraduate students at Idaho State University and not currently employed in a clinical laboratory and 3.4% (n=2) were undergraduate students who were currently employed in a clinical laboratory. These results were rejected and not included in analysis.

The second survey was physically mailed directly to laboratory managers at all 27 critical access hospitals in the State of Idaho with an offer to disseminate the thesis findings to the sites, if desired. A tracking number was associated with each survey to allow for follow-up. A second survey was mailed out to the managers who did not respond before June 16th with the hope of receiving 100% response. At the time of analysis 77.87% (n=21) of the 27 critical access laboratories had submitted their questionnaire. Identifying information of the CAH laboratories will not be published and remain confidential.

Materials

A copy of each survey is included in the appendices.
Appendix A1 – ASCLS-Idaho State Convention Questionnaire
Appendix B1 – Idaho State Critical Access Hospital Laboratory Questionnaire

Part B – Implementation

Methods

Upon analysis of the research results, evaluation of current practices at SLWR laboratory led the implementation of a resource center; intended to be a dedicated repository for unusual cases and reference material. The resource center was established in a common area of the lab and designed to make the information and materials readily accessible.

Materials

Materials implemented in the design of the resource center include: a bulletin board, a computer, slide boxes, a Leica Microscope camera, binders, page protectors,

binder dividers, peripheral blood smears, gram stains, CAP malaria and blood parasite reference slides, previous system "slide of the month" slides, BOC study guide book, and hematology flashcards.

Materials used in the creation of the professional learning center at SLWR were derived from actual patient samples. One exception is a purchase made by SLWR laboratory for competency evaluation of uncommon peripheral blood smear findings: stock malarial & other blood parasite smears.

The resource center is designed to be a collaborative project that involves the coordination and contribution of all laboratory professionals. Interdepartmental training resources are also stored in the resource center as well as any publications or professional conference materials.

Instrumentation/Equipment

All instrumentation and equipment used in the implementation of the learning center at the SLWR Laboratory was provided by or already in service at SLWR.

a. Hematology & Body Fluids: Sysmex XN-2000
b. Coagulation: Siemens CA-1500
c. Chemistry: Ortho Diagnostics 5600
d. Urinalysis: Clinitek Advantus
e. Blood Bank: Immucor reagents & Immucor solid phase technology
f. Other: Hematek Slide Stainer, gram stain dye, microscopes, biosafety cabinet, Leica microscope camera, and centrifuges

IV. RESULTS

Spreadsheets and graphs containing the survey results are appended to this document. ASCLS-Idaho State Convention results can be found in Appendix A2 and the Idaho Critical Access Hospital Laboratory survey can be found in Appendix B2.

Survey 1 – ASCLS-Idaho State Convention

The results of the first survey show that the respondents represent clinical laboratories in multiple settings: outpatient clinics, CAH, small hospitals (<100 beds) and large hospitals (>100 beds). The different disciplines of clinical laboratory science are nearly equally represented (see Figure 3 below). The largest two disciplines represented by the survey participants are Hematology (18.69%, n=20) and Chemistry/Immunology (18.69%, n=20) and the least represented discipline is Molecular (7.48%, n=8). An alternative option was provided for areas not represented; in the other category (10.28%, n=11) the following areas were specified: phlebotomist, manager, administration, POCT, generalist, and patient safety.

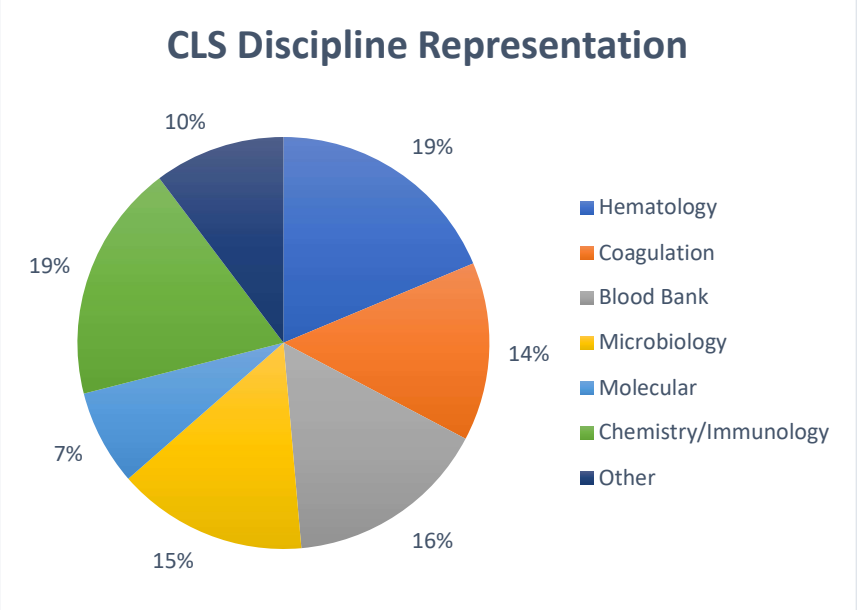


Figure 3: CLS Discipline Representation
The various disciplines of CLS were evenly represented among the survey respondents.

Educational materials available to employees at clinical laboratories varied between respondents. Participants were allowed to select all options that applied to their laboratory. Out of a total of 71 responses, the cumulative averages are as follows: employer provided continuing education credits 35.21% (n=25), competency evaluation 40.85% (n=29), dedicated clinical education department 18.31% (n=13), other 5.63% (n=4). Examples provided in the other category include: lab education fund, CAP competency courses, and proficiency testing. One respondent specified that "not much" educational material is provided in their laboratory.

When asked if laboratory personnel were involved in the design and implementation of educational materials, 70.27% (n=26) responded affirmatively, 24.32% (n=9) said no, and 2 respondents were unsure.

All of the respondents submitted that their lab supported students for clinical rotations, but there was variance in their approach to interacting with students: 54.05% (n=20) said that their lab saves specific training material for students during clinical rotation, 24.32% (n=9) said their lab did not, and 21.62% (n=8) declined to respond. Of the 9 respondents who indicated that their lab did not save specific material to train students, they offered the following as explanations for how students are trained: review lab policies and procedures, use materials/guidelines provided by school, and treating students like newly hired employees. In this situation, students are left waiting to learn via real-patient scenarios, which leads to inconsistency in clinical rotation experience.

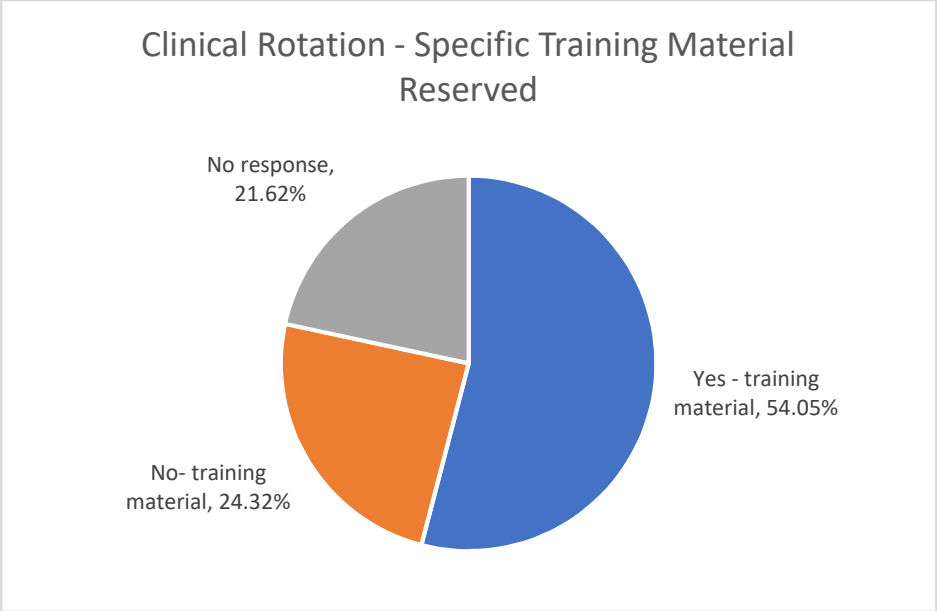


Figure 4: Clinical Rotation – Specific Training Material Reserved
Only half of the respondents indicated that their lab saved specific training material for use with students during their clinical rotation while 21.62% did not respond.

Interestingly, when asked if their lab saves unusual patient results for future training, competency, or reference, 85.71% (n=30) replied yes and 14.59% (n=5) responded no. Those who replied that their lab did not save unusual patient results may already have resources and chose not to add more; this information was not retrievable from the survey. Examples of materials saved included peripheral blood smears, gram stains, blood bank specimens with positive antibodies, crystals, case studies and "unknowns" for student workups. It appears that while sites collect a wide range of material, it is highly variable between sites and is not consistently referenced with students during their clinical rotation.

The concept of saving patient examples was presented in a third format as well. Respondents were asked if their laboratory saved rare patient results and/or case studies for training material and/or competency evaluation. An overwhelming

86.67% (n=26) indicated that they did and 13.33% (n=4) indicated that they did not. When asked if the saved material was referenced routinely, 69.23% (n=18) indicated that the material was saved but not referenced routinely, 30.77% (n=8) indicated that the material was referenced routinely, and 1 respondent was uncertain.

When asked about how their laboratory supports the educational needs of MLS students, 14.71% (n=5) said that they did not sponsor employees who were enrolled in an MLS program, 11.76% (n=4) indicated that they did not know, and 73.5% (n=25) indicated that their laboratory offered student support. Examples of student support included: clinical rotations, work flexibility during school year, tuition reimbursement, and proctoring.

Of the labs surveyed, 67.5% (n=25) indicated that they had an affiliation to Idaho State University (ISU). Connections to ISU are as follows: 39.5% (n=17) indicated that their lab had employees who graduated from ISU, 23.26% (n=10) indicated that their lab had employees who were instructors at ISU, 2 survey responses indicated that their laboratory had employees who volunteers at ISU and 2 responses indicated that their only connection to ISU was through accepting students for clinical rotations. Additionally, 27.91% (n=12) indicated that their laboratory currently employed an MLS student at ISU.

When focusing on the reach of the clinical laboratory beyond the confines of the laboratory, respondents were asked how their laboratory partnered with other clinical departments for training involving laboratory related tasks. Participants were allowed to select all options that applied to their laboratory. The results are as follows: 12% (n=6) indicated that all training of non-laboratory staff was handled by the Clinical

Education Department, 46% (n=23) of respondents indicated that their lab was involved in training non-laboratory staff, 16% (n=8) indicated that laboratory personnel were instructors for classes that pertain to laboratory tests, 22% (n=11) indicated that the laboratory staff were routinely involved in interdepartmental resolutions (and/or provide additional training when needed). One respondent was unsure of how their laboratory interacted with other departments and another respondent indicated that their laboratory provided job aids to non-laboratory staff when needed.

Survey 2 – Idaho Critical Access Hospital Laboratory

The cumulative data suggests that CAH laboratories primarily staff Medical Laboratory Scientists: the average composition of CAH laboratories was found to be 52.13% MLS, 33.44% Phlebotomists, 10.49% MLT, and 3.93% CLT. The survey results reveal extreme differences in the composition of laboratory personnel between individual CAH laboratories. Most noticeably, one laboratory staff was entirely composed of MLS while another laboratory was staffed with 1/3 MLS staff and 2/3 Phlebotomists. One respondent included the comment "MLTs are not a good fit for our lab. I have found that the 2-year degree doesn't provide the critical thinking and troubleshooting skills necessary for a lab our size." The estimates regarding the composition of laboratory personnel are crude at best. Respondents were provided a range when completing their personnel demographics. Figure 5 represents the distribution of laboratory personnel from the 21 CAH laboratory managers that responded to the survey.

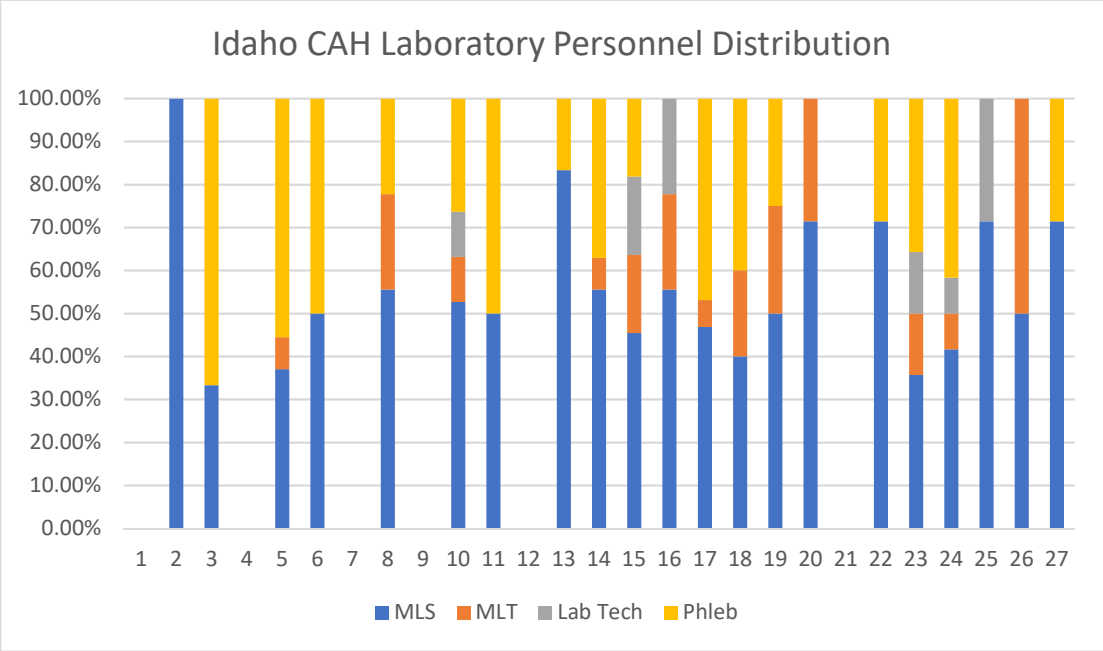


Figure 5: Idaho CAH Laboratory Personnel Distribution
The graph represents the distribution of clinical laboratory personnel at critical access hospitals in the State of Idaho. CAH laboratories mostly consist of Medical Laboratory Scientists (MLS) and Phlebotomists.

Additional information regarding the demographics of the Idaho CAH laboratory workforce was collected, including projected retirement and work experience. While managers are not always able to predict retirement plans of their employees, managers were asked what percentage of their employees they anticipated retiring within the next ten years (see Figure 6 below): according to the Department of Labor and Statistics, 40% of the national clinical laboratory workforce is projected to retire in the next 10 years. Only one manager responded greater than 40% projected retirement of their laboratory personnel in the next decade, indicating that 51-60% of their clinical laboratory science staff would retire. Three managers indicated that 31-40% of their staff would retire in the next 10 years, 4 managers indicated 21-30%, 5 managers indicated 11-20% and 8 managers indicated 0-10%. Over half of the sites

that responded selected a percentage of projected retirement well beneath the national estimate of 40%. The survey results indicate that the CAH laboratories are trending beneath the national retirement trajectory.

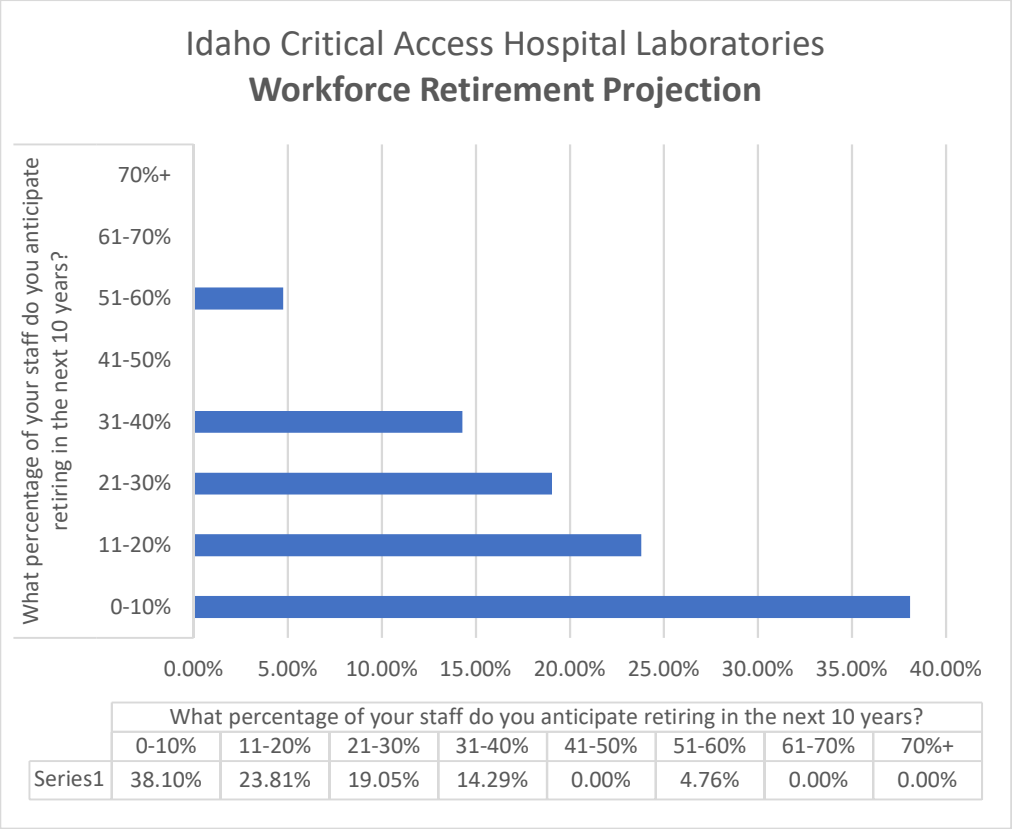


Figure 6: CAH Laboratory Retirement Projection
Nationally, 40% of the CLS workforce is forecasted to retire in the next 10 years. According to the survey results, only one manager predicts a higher rate of retirement. The majority of the respondents indicated a decreased rate of retirement (62.91%).

In addition to the percentage of staff retiring, participants were asked what percentage of their staff had less than 5 years' experience working in clinical laboratory science (see Figure 7). The majority (45%, n=9) of CAH laboratories responded that 0-10% of their staff had less than 5 years' experience. It is noteworthy

that one site responded that 51-60% of their clinical laboratory staff had less than 5 years' experience in clinical laboratory science.

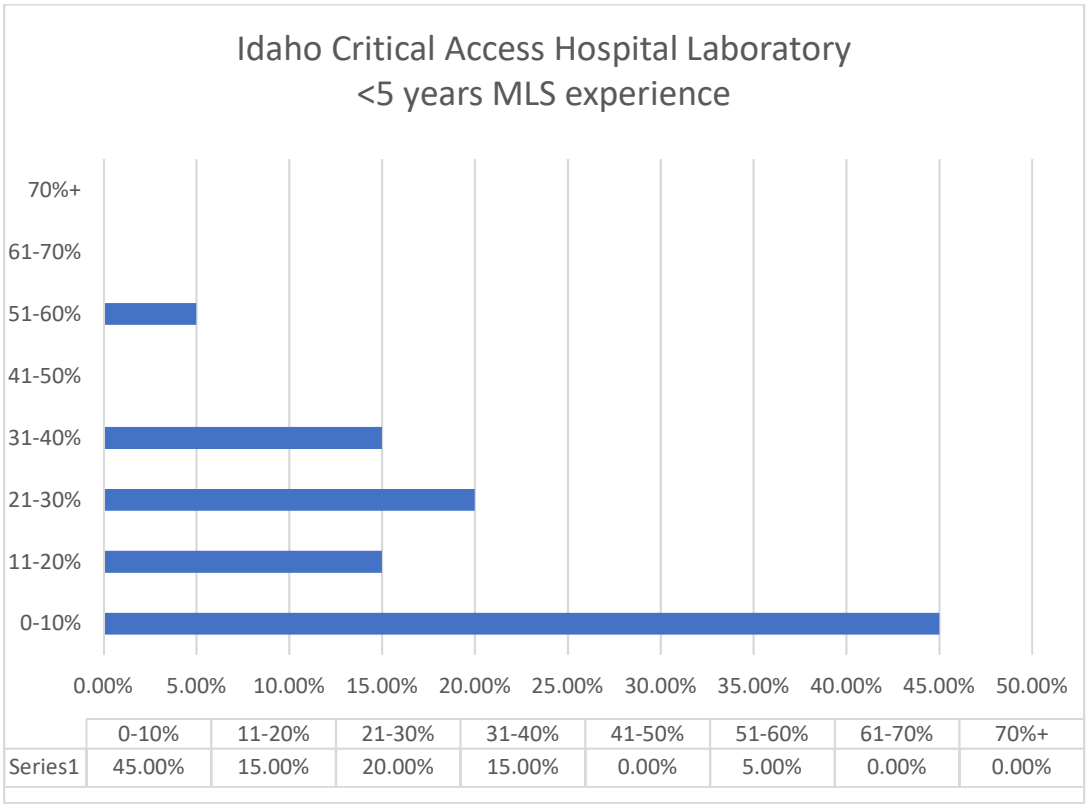


Figure 7: CAH Laboratory Personnel Work Experience

CAH laboratories in Idaho are comprised with a high percentage of MLS staff with less than 5 years' experience, according to the CAH survey respondents. One laboratory manger indicated that 51-60% of their MLS personnel had less 5 years' experience.

Of the 21 responses received, 14 (70%) responded that non-MLS employees had taken online courses toward an MLS degree. Refer to Figure 8 for the distribution of schools attended. 28.57% (n=4) attended Idaho State University, 57.14% (n=8) attended Weber State University, 7.14% (n=1) attended Brigham Young University and 7.14% (n=1) responded "other" – specified as University of Cincinnati.

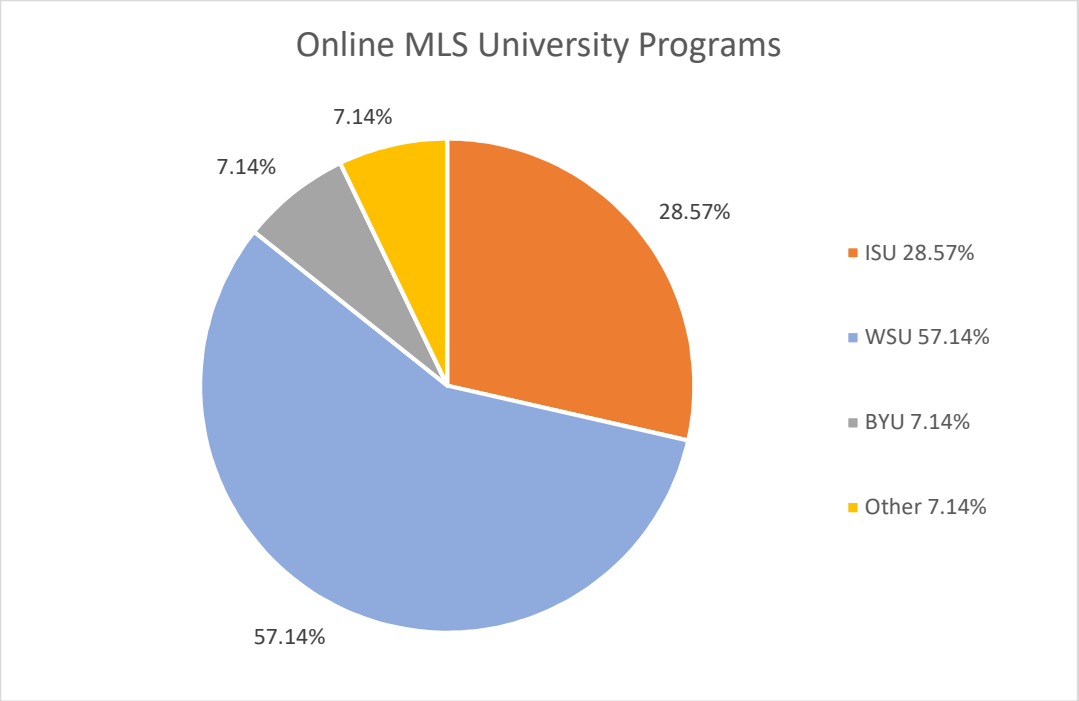


Figure 8: CAH Online Student Program Distribution
Despite having a NAACLS-accredited program in the State of Idaho that is offered online, some students chose to study at alternative universities. Surprisingly, the majority of students employed at CAH laboratories have enrolled in out-of-state programs (71.42%, n=10 of 14 total CAH online students).

Additional data was collected regarding education in CAH laboratories. Participants were asked a variety of questions including: what type of education materials were provided to MLS staff, if laboratory personnel were involved in the design and implementation of educational materials. Regarding students, the survey participants were asked the following: if anyone in the laboratory is connected with the undergraduate or graduate program at ISU, how students are supported, how students are trained during clinical rotation, and what materials the laboratory saves for future reference and/or training.

Participants were allowed to select all options that applied to their laboratory regarding educational materials provided to MLS staff. Cumulative results of the

educational materials collected by CAH laboratories are as follows: 39.47% (n=15) competency evaluations, 31.58% (n=12) employer provide continuing education credits, 5.26% (n=2) dedicated clinical education department, and 23.68% (n=9) other. The other category included the following examples: travel grants to attend conferences, forums, online programs, vendor resources (webinars, online training). Two managers responded that their lab supplied no educational materials, and that their employees were expected to obtain continuing education of their own. 57.89% (n=11) of the laboratories responded that laboratory personnel were involved in the design and implementation of educational materials, 42.11% (n=8) said no. Two managers declined to comment.

Approximately half of the CAH laboratories have a connection to the MLS program at ISU. 52.63% (n=10) responded that their laboratory personnel were connected to ISU. Figure 9 shows the affiliation of CAH employees to ISU. Primarily, CAH laboratories have employees who either graduated from ISU (60%, n=9) or are current students (20%, n=3). One laboratory manager selected that they employed an instructor for ISU and 2 sites selected that they were connected as a preceptor and a clinical rotation site.

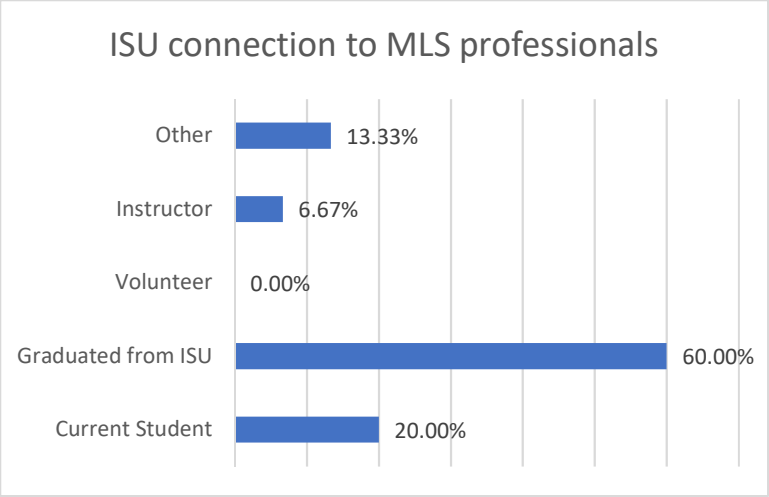


Figure 9: CAH MLS personnel connection to ISU
More than half of the CAH respondents indicated that their laboratory has a connection to the MLS program at ISU.

When CAH laboratory managers were asked in what ways the educational needs of prospective/current MLS students were supported, 4.55% (n=1) responded that they didn't know, 36.36% (n=8) indicated that they do not have sponsored employees enrolled in an MLS program and 59.09% submitted examples of student support. Examples included: modified work schedule, materials/books, internship, clinical rotation, scholarship, and tuition reimbursement (see Figure 10).

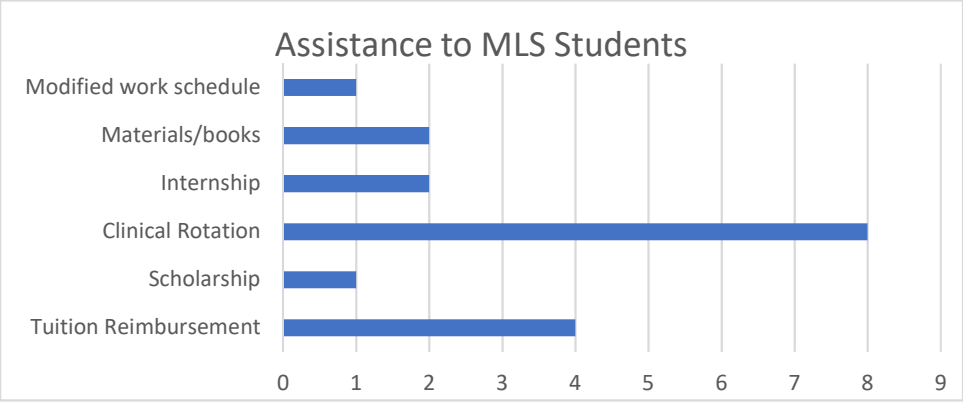


Figure 10: CAH Assistance to MLS students
CAH laboratory managers acknowledged clinical rotations as a form of assistance to MLS students. Only a few managers indicated that their organization supports students in financial, work flexibility and/or educational material support.

Although only 8 managers selected clinical rotations as a way their laboratory supports the educational needs of MLS students, 19 respondents (90.48%) said that they accept students for clinical rotations. Of the respondents that affirmed they take students for clinical rotations, half (n=9) indicated that they saved specific training material for use with students during rotation, and half did not (n=9). One manager declined to specify. The follow materials are the cumulative averages of examples provided for material saved for use with students: peripheral smears (76.92%), gram stains (7.69%), proficiency samples (23.08%), digital pictures (7.69%), urine crystals (7.69%) and microbiology specimens (7.69%). While only half of the respondents indicated that they saved material for work with students during their clinical rotation, 61.90% (n=13) of respondents indicated that they saved unusual patient results for future training and competency, and 61.90% (n=13) indicated that they save rare patient results and/or case studies but all admitted that these materials were rarely referenced.

In regards to the CAH laboratories involvement with other clinical departments, cumulative results are as follows: 9.30% (n=4) responded that all training of non-laboratory staff was handled by their Clinical Education Department, 39.53% (n=17) indicated that laboratory personnel were involved in training clinical staff, 18.60% (n=8) noted that laboratory personnel were class instructors when classes pertained to laboratory tests, and 25.58% selected that laboratory personnel were routinely involved in interdepartmental resolutions and/or provided additional training when needed to help non-laboratory staff avoid pre-analytical errors. Furthermore, 3 sites selected the category “other” and specified the following additional examples:

laboratory provides orientation for all clinical new hires, lab hosts tour/orientations/Power Point presentations for new nursing staff, and lab provided competency evaluations to all medical staff performing laboratory testing.

V. DISCUSSION

DISCUSSION OF RESEARCH FINDINGS

As mentioned previously, the ASCLS-Idaho State Convention survey was designed to be completed and submitted anonymously with the intent of encouraging participation. While the survey results indicate that the different disciplines of clinical laboratory science were equally represented, there is no way to determine bias due to geographical exclusion. While CAH laboratories were the target of this project, the majority of the participants of this survey were from large hospitals (49%, n=18); a mere 19% (n=3) of the surveys submitted were from professional working in CAH laboratories. This also does not reflect the distribution of clinical laboratories in the State of Idaho and suggests that CAH hospitals are not participating in ASCLS professional meetings at the state level although the majority of hospitals in the state are CAH. Nevertheless, the information collected can be used to determine practices and operations across all clinical laboratories regardless of size and/or settings. In this way, the information can provide a baseline from which to compare and contrast the practices and operations of CAH laboratories.

The results of the ASCLS-Idaho State Convention survey suggest that competency evaluation and employer provided continuing education credits are the main source of educational material available to clinical laboratory science professionals in State of Idaho; the cumulative data suggests that the two categories comprise 76% of all educational material provided. On a positive note, it appears that laboratory professionals are highly engaged in their profession; 70% indicated that they were involved in the design and implementation of educational materials, 74%

indicated that their laboratory supported students, and 86% indicated that their laboratory saved reference material. Unfortunately, while material is saved 69% of the participants acknowledged that the material is not referenced routinely.

Similar to the first survey, the majority of educational materials in the CAH survey were identified as employer-provided continuing education and competency evaluation, comprising 71% of the submissions. The first survey results show that 12% of training is handled by a dedicated clinical education department in contrast to 9% at CAH laboratories.

Additionally, 24% of the CAH respondents provided other examples of educational materials suggesting that they actively find alternative resources. Only 5.6% of the ASCLS survey respondents provided alternative examples. The chi-squared analysis (refer to Table 1) was found to have a p-value of 0.005591 which is a statistically significant difference.

	Educational Materials "Other"	No Educational Materials "Other"
ASCLS Survey	5	95
CAH Survey	24	76
The chi-square statistic is 7.6776. The p-value is 0.005591. *This result is significant at $p < 0.05$.*		

Table 1: Chi square analysis for the practice of providing additional educational materials or alternative resources for MLS personnel

While the ASCLS survey indicates that laboratory professionals throughout Idaho are active in the self-education of their profession, the CAH survey results are not as favorable. Only 53% of sites indicated that laboratory personnel were involved in the

design and implementation of educational materials, 50% indicated that they reserved specific training material for students and 65% submitted that they saved unusual patient results. All of the CAH sites indicated that the reference material saved was not utilized routinely. The two surveys showed a statistically significant difference in regards to saving unusual patient results (p=0.005224) and rare patient results (p=0.040198); see Table 2 & 3.

	Saves unusual results	Does not save
ASCLS Survey	30	5
CAH Survey	13	8
The chi-square statistic is 7.8002. The p-value is 0.005224. This result is significant at p < 0.05.		

Table 2 – Chi square analysis for the practice of saving unusual patient results for future reference/training.

	Save rare patient results	Does not save
ASCLS Survey	26	4
CAH Survey	13	8
The chi-square statistic is 4.2095. The p-value is .040198. This result is significant at p < 0.05.		

Table 3 – Chi square analysis for the practice of saving rare patient results for future reference/training.

Another area where the two surveys differed was in the laboratory's involvement with training other clinical staff when training pertained to laboratory related tasks. Cumulatively, 40% of the CAH responses indicated that laboratory personnel were involved in training clinical staff, in contrast to 46% of the ASCLS responses. However, these differences were not found to be statistically significant.

The CAH survey suggests that Idaho CAH laboratories anticipate a lower retirement rate than the national estimate of 40% in the next 10 years; 80.96% of the sites responded that they anticipate less than 30% of their staff to retire in the next ten years. This finding however, is subject to the assumption that managers are aware of their employee's retirement plans. It is worth mentioning that one manager submitted that they anticipate 51-60% of their staff to retire in the next ten years ,which is above the national retirement trajectory. While retirement rate is not the only indication of increased workforce demands, the US Department of Labor and Statistics included the anticipated increase in job demand based on the aging population. This research did not analyze the population-aging rate for the State of Idaho.

The number of professionals with less than 5 years' experience employed at CAH laboratories is low: 12 sites (65%) indicated that less than 20% of their staff was comprised of new professionals. Only one site responded that their lab was comprised of 51-60% new professionals. These findings reflect the challenges of working in smaller hospitals located in remote areas: the competency of the laboratorian is paramount. Critical thinking skills, ability to multi-task, competency in all disciplines of clinical laboratory science and confidence are required to meet the unique demands of a CAH laboratory.

The results of these surveys confirm that laboratories have access to an abundance of reference materials, yet have not implemented an efficient and effective means to utilize the information. Additionally, the surveys suggest that the professional laboratories could do more to support the educational needs of current MLS students. It should be noted that while comparisons were made between CAH laboratories and

the general findings of the ASCLS survey, each clinical laboratory setting is unique and serves a separate population. Every laboratory faces different challenges in staff composition, staff retention, educational resources, and training/competency practices.

IMPLICATIONS

Truly, this project merely scratches the surface of potential inquiries into the operations of CAH laboratories in Idaho. Learning from the limitations of this survey and the information gained, future research can be improved and better focused. The data collected can be used in combination with additional data regarding the demographics, operations, education and training of laboratory personnel in CAHs or combined with a survey of non-critical access hospital laboratories for a comprehensive analysis of all hospital laboratories in Idaho.

Another possibility is the implementation of an intrastate CAH laboratory professional collaboration. On a small scale, simply sharing the results of this study can help individual CAH laboratories assess their own practices and operations. On a larger scale, as a result of this survey an educational resource such as a quarterly case study, or other educational material could be shared between CAH laboratories. This collaboration could be very helpful to smaller and/or low volume laboratories that may lack to resources to develop a robust educational center from their own patient volume. Finally, this study could vastly improve the quality and consistency of student's experience during clinical rotations at smaller facilities.

LIMITATIONS

Results based on surveys are inherently flawed as the accuracy is subject to the compliance, comprehension and consistency of each participant. Additionally, the ASCLS survey conducted as part of this thesis project was designed to be submitted anonymously and no follow-up was possible for clarification. The second survey submitted to the CAH laboratory managers was designed to be collected and reported confidentially so that individual laboratories would not be identifiable; the confidentiality limits the potential for future research to expand directly from data collected.

The first survey conducted at the ASCLS-Idaho State Convention was distributed to all participants of the convention; as a result, large portions of the surveys were rejected due to student participation. The intended audience of the survey was active MLS professionals. Additionally, the surveys were collected but not reviewed at the time of submission; as a result, not all surveys were filled out in their entirety. In retrospect, it would have been helpful to have oversight in the distribution and collection of the surveys to provide oversight and ensure the accuracy of the information provided. In addition, the sample size (n=39) is very small and contains an inherent bias as the majority of professionals in attendance at the ASCLS-Idaho Convention were from the Southeastern Region of Idaho as the convention was held in Idaho Falls.

The second survey distributed to the laboratory managers at all 27 critical access hospital laboratories in Idaho had a few discrepancies. First, a few surveys were not completed in their entirety. One survey skipped an entire page; a possible

explanation was that the surveys were printed on both sides of the paper and the backside was missed. Another survey declined to answer specific questions; it is probable that the laboratory manager actively chose to omit these answers. Second, the data did not always align within the surveys. At least two surveys submitted a percentage of staff expected to retire that did not align with the total number of laboratory employees or other contradictory answers.

Lastly, it was difficult to delineate specific details as the survey responses are set with ranges. It would have been more useful to have specific information requested. For example, one survey listed that they had a total of 2-4 employees, but anticipated that 0-10% of their staff would retire in the next 10 years. This leads me to conclude that either no staff will retire, the manager is unaware of any retirement plans or that the correct percentage was not selected. All scenarios are possible.

V. CONCLUSION

Clinical laboratory science professionals will face a workforce shortage crisis within the next decade. Approximately 40% of the workforce is expected to retire in the next 10 years, and 70% of NAACLS-accredited clinical laboratory programs in the United States have closed since the 1970s. The use of automation, point-of-care testing, hiring support staff with less education or fewer credentials, and outsourcing laboratory tests is not enough to address the workforce shortage and does not replace the crucial role of a Medical Laboratory Scientist.

Professional Medical Laboratory Scientists have an obligation to ensure the competency of newly hired staff and a duty to support and supplement the education of current students. To date, hospital educational departments are primarily focused on the nursing side of healthcare; the body of knowledge that a clinical laboratorian is expected to remain competent in is not within the scope of a traditional clinical education department. A learning center established within clinical laboratories would enrich the careers of current professionals and assist in the training of students and new professionals as well. It is time for the clinical laboratory profession to take ownership of their own department within the hospital setting, take responsibility for the reputation and continuity of their profession and supplement the educational needs of current professionals and students.

The survey results reveal that clinical laboratories are sitting on a trove of resources and materials that, if curated appropriately, could be of great benefit not only to the individual laboratory but also to the hospital itself, and to the profession as whole. The material collected in a professional clinical science learning center could be used for

inter- and intra-departmental trainings. The ability to document site-based clinical errors and case-studies could bring intrinsic value to the instruction of staff. The resources of a learning center would not only be helpful for training of Medical Laboratory Science students but also provide a resource for the organization as well.

It has never been more imperative that new professionals receive the highest level of education and robust training; they will be expected to master skills, be fiercely independent, more competent and take on more responsibility sooner than the professionals that came before. This is especially true as the laboratory has become increasingly complex and laboratory tests are used to make the majority of healthcare decisions; providers rely on laboratory results to make diagnostic, treatment, and healthcare management decisions.

Individual clinical laboratories face unique challenges, and provide service to different patient populations; however, all have the capacity to empower their clinical staff to take a more active professional role. Indeed, each clinical laboratory has an obligation to ensure the competency of their staff and the accuracy of the reported results. In conclusion, the power and the potential for the future of the profession are in the hand of the current professionals.

DISCLOSURE

I am closely affiliated with both Idaho State University and St. Luke's Wood River; I am a recent graduate of the ISU undergraduate program (2015), current ISU MLS graduate student and the St. Luke's Healthcare System at the Wood River Hospital currently employs me. I have received no funding or endorsement from either location as a result of this research project.

REFERENCES

ASCLS. (2015). 2015 Legislative Symposium. Workforce Study. Alexandria, VA.

ASCLS. (2016). 2016 Legislative Symposium. Workforce Study. Alexandria, VA.

Bose MJ, Jarreau PC, Lawrence LW, & Snyder P. (2004). Using cooperative learning in clinical laboratory science education. *Clinical Laboratory Science*, *17*(1), 12–18 7p. Retrieved from http://libpublic3.library.isu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=106759920&site=eds-live

Castillo D. (2012). The effectiveness of digital microscopy as a teaching tool in medical laboratory science curriculum. *Clinical Laboratory Science*, *25*, 4–11 8p. Retrieved from http://libpublic3.library.isu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=108078593&site=eds-live

Conway-Klaassen, J. M., Wiesner, S. M., et. al. (2012). Using online instruction and virtual laboratories to teach hemostasis in a medical laboratory science program. *Clinical Laboratory Science*, *25*(4), 224–229 6p. Retrieved from http://libpublic3.library.isu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=108078600&site=eds-live

Conway-Klaassen JM, Brennecke PJ, Wiesner SM, & Spannaus-Martin DJ. (2012b). Development of online conferencing and web-based in-service modules for preceptor training. *Clinical Laboratory Science*,*25*, 4–33 30p. Retrieved from http://libpublic3.library.isu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=108078594&site=eds-live

Hammerling, J. A. (2012). Best Practices in Undergraduate Clinical Laboratory Science Online Education and Effective Use of Educational Technology Tools. *Laboratory Medicine*, *43*(6), 313–319 7p. http://doi.org/10.1309/LMVB300RE3AIELJXE

Hunt, D. A., Milani, M. F., & Wilson, S. (2015). Dedicated education units: An innovative model for clinical education. *American Nurse Today*,*10*(5), 45–49 5p.

Jones, C., & Dornberger, J. (2006). Creating an Informational CD for Distance Clinical Laboratory Science Students. *Journal of Library Administration*, *45*(1/2), 229–243. http://doi.org/10.1300/J111v45n01_13

Kaiser Foundation. (2016). Idaho Total Hospitals. Kaiser Foundation. Retrieved from http://www.kff.org/other/state-indicator/total-hospitals/

Kasper LM, & Schultze AE. (2006). A model for educational enrichment and employment recruitment for clinical laboratory science students. *Clinical Laboratory Science*, *19*(3), 169–173 5p. Retrieved from http://libpublic3.library.isu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=106350386&site=eds-live

Landin, C. W. (2013). Evidenced Based Practice: Classroom to Clinical Laboratory...Focus: redefining patient safety in the clinical laboratory. *Clinical Laboratory Science*, *26*(4), 212–215 4p. Retrieved from http://libpublic3.library.isu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=107936595&site=eds-live

Laudicina, R., Fenn, J., Freeman, V., McCoy, C., et. al. (2011). Focus: building research through MLS curricula. Research in clinical laboratory science: professionals'

involvement. *Clinical Laboratory Science*, *24*(4), 235–242 8p. Retrieved from http://libpublic3.library.isu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=108210092&site=eds-live

Leibach EK. (2007). The doctorate in clinical laboratory science: a view of the strategy for continuity, growth, and realization of potential. *Clinical Laboratory Science*, *20*(3), 132–135 4p. Retrieved from http://libpublic3.library.isu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=106158395&site=eds-live

Leibach EK. (2008a). The doctorate in clinical laboratory science: a view of clinical practice development. *Clinical Laboratory Science*, *21*(4), 196–198 3p. Retrieved from http://libpublic3.library.isu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=105597769&site=eds-live

Leibach EK. (2008b). The doctorate in clinical laboratory science: an executive summary. *Clinical Laboratory Science*, *21*(3), 134–137 4p. Retrieved fromhttp://libpublic3.library.isu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=105801680&site=eds-live

McCauley, G., Meixner, J. A., Harwell, G., & Onsomu, E. O. (2011). Preparation for Clinical Laboratory Practice: A Practitioners' Point of View to Enhance Students' Experiences and Workforce Needs. *Journal of Best Practices in Health Professions Diversity: Education, Research & Policy*, *4*(2), 669–680 12p. Retrieved

fromhttp://libpublic3.library.isu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=104394079&site=eds-live

Russell B, Turnbull D, & Leibach EK. (2007). Evaluating distance learning in clinical laboratory science. *Clinical Laboratory Science*, *20*(2), 106–111 6p. Retrieved from http://libpublic3.library.isu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ccm&AN=106141461&site=eds-live

US Department of Labor and Statistics. Medical Laboratory Technologists. Accessed 5 Jul 2017. http://www.bls.gov/ooh/healthcare/medical-and-clinical-laboratory-technologists-and-technicians.htm

Ward-Cook, K., Chapman, SA, et. al. (2005). The Clinical Laboratory Workforce: the changing picture of supply, demand, education and practice. HRSA. US Dept. of L&D. Retrieved from http://bhpr.hrsa.gov/healthworkforce/reports/clinicallab.pdf

APPENDIX A1: ASCLS – Idaho State Convention Survey

THESIS: ESTABLISHING PROFESSIONAL LEARNING CENTERS WITHIN RURAL-ACCESS CLINICAL LABORATORIES

1. **In what setting do you currently work?**
   - ☐ Not applicable
   - ☐ Outpatient clinic setting
   - ☐ Critical access hospital
   - ☐ Small hospital (under 100 beds)
   - ☐ Large hospital (over 100 beds)
   - ☐ Other, explain: _____

2. **How many Medical Laboratory Scientists are employed at your laboratory?**
   - ☐ 1-15
   - ☐ 16-25
   - ☐ 26-50
   - ☐ 51-75
   - ☐ 76-100
   - ☐ 100+

3. **In which disciplines of clinical laboratory science do you currently work?**
   - ☐ Hematology
   - ☐ Coagulation
   - ☐ Blood Bank
   - ☐ Microbiology
   - ☐ Molecular
   - ☐ Chemistry/Immunology
   - ☐ Other: _____

4. **What educational materials are provided to MLS staff in your laboratory?**
   - ☐ Employer provided CE credits
   - ☐ Competency evaluations
   - ☐ Dedicated Clinical Education Department
   - ☐ Other: _____
     _____
     _____

5. **Are laboratory personnel involved in the design and implementation of educational materials at your laboratory?**
   - ☐ Yes
   - ☐ No

6. **Is anyone in your laboratory connected with the undergraduate or graduate program at Idaho State University (volunteer, currently enrolled, instructor, etc) ?**
   - ☐ Yes
     - ☐ Current Student
     - ☐ Graduated from ISU
     - ☐ Volunteer
     - ☐
     - ☐ Instructor
     - ☐ Other:_____
   - ☐ No

APPENDIX A1: ASCLS – Idaho State Convention Survey

7. **In what ways does your laboratory support the educational needs of prospective/current MLS students?**
   - ☐ We don't have employees who are enrolled in a MLS program
   - ☐ I don't know
   - ☐ Explain:_____
     _____
     _____
     _____

8. **Does your laboratory support clinical rotations for MLS students?**
   - ☐ Yes
     If yes, does your laboratory have specific training material for use with students during their clinical rotation?
     - ☐ Yes ☐ No
   - ☐ No: please explain how students are trained during their clinical rotation:_____
     _____
     _____
     _____
     _____

9. **Does your laboratory save unusual patient results for future training, competency or reference (interdepartmental training, case studies, presentations, peripheral blood smear archive etc)?**
   - ☐ Yes, example:
   - ☐ No

10. **For hospital laboratories: how does your laboratory partner with other clinical departments for training of clinical staff in regards to laboratory related tasks? Select all that apply**
    - ☐ All training of non-laboratory staff is handled by the Clinical Education Department
    - ☐ Laboratory personnel are involved in training clinical staff (*ie annual competency evaluations for POCT, monitoring/training nursing staff for POCT testing compliance with QA*)
    - ☐ Laboratory personnel are class instructors for when classes pertain to laboratory tests (ie phlebotomy, POCT, heelstick, ABG, etc)
    - ☐ Laboratory staff are routinely involved in interdepartmental resolutions and/or provide additional training when needed to help non-laboratory staff avoid preanalytical errors
    - ☐ Other: _____
      _____
      _____
      _____
      _____

11. **Does your laboratory save rare patient results and/or case studies for training material and/or competency evaluation?**
    - ☐ Yes
      If yes, are these materials available for routine reference or are they inaccessible?
      - ☐ Yes, these materials are available but not referenced routinely
      - ☐ Yes, these materials are available and referenced frequently
    - ☐ No

Q1
Work Setting

	n/a	OP	CA	Small Hospital >100 beds	Large Hospital >100 beds	Other	*Explaination*	
1			1					
2					1			
3				1				
4					1			
5		1						
6		1						
7			1					
8			1					
9						1	*RF Lab*	
10		1						
11					1			
12				1				
14					1			
15					1			
16					1			
17					1			
19				1				
20					1			
21					1			
22				1				
23					1			
24			1					
25					1			
27			1					
28				1				
29					1			
30				1				
32			1					
33					1			
36					1			
37				1				
41					1			
46					1			
47					1			
49				1				
52					1			
53			1					
Total	**0**	**3**	**7**	**8**	**18**	**1**		**37**
	n/a	OP	CAH	Small Hospital >100 b	Large Hospital >100 b	Other	*Explaination*	
%	0.00%	8.11%	18.92%	21.62%	48.65%	2.70%		

Q2
# of MLS

	n/a	1 to 15	16 to 25	26 to 50	51 to 75	76 to 100	100+	
1		1						
2					1			
3		1						
4							1	
5		1						
6		1						
7		1						
8		1						
9				1				
10		1						
11				1				
12			1					
14			1					
15				1				
16			1					
17			1					
19		1						
20				1				
21				1				
22		1						
23			1					
24				1				
25				1				
27		1						
28		1						
29				1				
30		1						
32		1						
33				1				
36					1			
37		1						
41			1					
46				1				
47				1				
49		1						
52		1						
53		1						
Total	**0**	**17**	**6**	**11**	**2**	**0**	**1**	**37**
	n/a	1 to 15	16 to 25	26 to 50	51 to 75	76 to 100	100+	
%	0.00%	45.95%	16.22%	29.73%	5.41%	0.00%	2.70%	

Q3
Discipline of Study

	Hematology	Coagulation	Blood Bank	Microbiology	Molecular	Chemistry/Immunology	Other	*Explaination*	
1	1	1	1	1	1	1			
2			1						
3							1	Manager	
4	1			1		1	1	Phlebotomist	
5	1			1		1			
6	1			1		1	1	POCT	
7							1	Manager	
8	1	1	1	1	1	1			
9	1	1				1			
10	1			1		1			
11	1		1						
12	1	1	1			1			
14	1	1	1	1		1			
15			1						
16							1	Patient Safety	
17							1		
19	1	1	1	1		1			
20			1						
21			1						
22						1			
23	1	1	1	1	1	1		Generalist	
24	1	1	1	1	1	1		Generalist	
25							1	Manager	
27	1	1				1			
28							1	Administration	
29							1	POCT	
30				1					
32	1	1	1	1	1	1			
33								Student	
36							1	POCT	
37	1	1	1	1	1	1	1	Generalist	
41	1	1	1	1		1		Generalist	
46								Student	
47		1				1			
49	1	1	1	1	1	1			
52	1								
53	1	1	1	1	1	1			
Total	**20**	**15**	**17**	**16**	**8**	**20**	**11**		**107**
	Hematology	Coagulation	Blood Bank	Microbiology	Molecular	Chemistry/Immunolo	Other	*Explaination*	
%	18.69%	14.02%	15.89%	14.95%	7.48%	18.69%	10.28%		

Q4
Educational Materials

	EP CE Credits	Competency Eval	Dedicated CE Dept	Other	
1	1	1			
2	1				
3	1	1	1		
4			1		
5	1				
6	1	1			
7				1	Not Much
8		1			
9	1	1	1	1	Lab Education fund to h
10		1		1	Clinical education from
11	1	1	1		
12	1				
14		1	1		
15	1	1		1	CAP competency course
16		1	1		
17	1	1	1		
19		1			
20	1	1	1		
21	1	1			
22	1	1	1		
23	1	1			
24	1	1	1		
25	1	1			
27		1			
28		1			
29	1	1	1		
30		1			
32		1			
33	1				Student
36	1		1		
37	1	1			
41	1	1	1		
46	1	1			
47	1	1			
49		1			
52	1				
53	1	1			
Total	**25**	**29**	**13**	**4**	**71**
	EP CE Credits	Competency Eval	Dedicated CE Dept	Other	
%	35.21%	40.85%	18.31%	5.63%	

Q5 *Educational Materials*

	Yes	No	Other	Explanation	
1		1			
2	1				
3	1				
4	1				
5	1				
6	1				
7	1				
8	1				
9	1				
10	1				
11		1			
12		1			
14			1	*Unsure*	
15	1				
16	1				
17	1				
19	1				
20		1			
21	1				
22	1				
23	1				
24	1				
25	1				
27	1				
28	1				
29	1				
30	1				
32	1				
33		1			
36		1			
37		1			
41			1	*Unsure*	
46	1				
47		1			
49		1			
52	1				
53	1				
Total	**26**	**9**	**2**		37
	Yes	No	Other	Explanation	
%	70.27%	24.32%	5.41%		

Q6 *ISU connection*

	No	Yes	Current Student	ISU Graduate	Volunteer	Instructor	Other	Explanation	
1		1	1	1					
2	1								
3		1		1					
4		1			1	1			
5		1							
6		1	1	1		1			
7		1					1	*Lab students from college internship*	
8	1								
9		1		1					
10	1								
11	1								
12	1								
14		1		1		1			
15		1	1	1					
16	1								
17		1		1		1			
19	1								
20	1								
21		1	1	1		1			
22	1								
23		1	1						
24		1		1		1			
25		1	1			1			
27	1								
28		1					1	*Student clinical site*	
29		1	1	1	1	1			
30		1		1					
32		1	1						
33		1	1	1					
36		1		1		1			
37	1								
41		1	1	1		1			
46		1	1					*Student*	
47	1								
49		1		1					
52		1		1					
53		1	1	1					
Total	**12**	**25**	**12**	**17**	**2**	**10**	**2**		43
	No	Yes	Current Student	ISU Graduate	Volunteer	Instructor	Other	Explanation	
%	32.43%	67.57%	27.91%	39.53%	4.65%	23.26%	4.65%		

Q7 *Student Support*

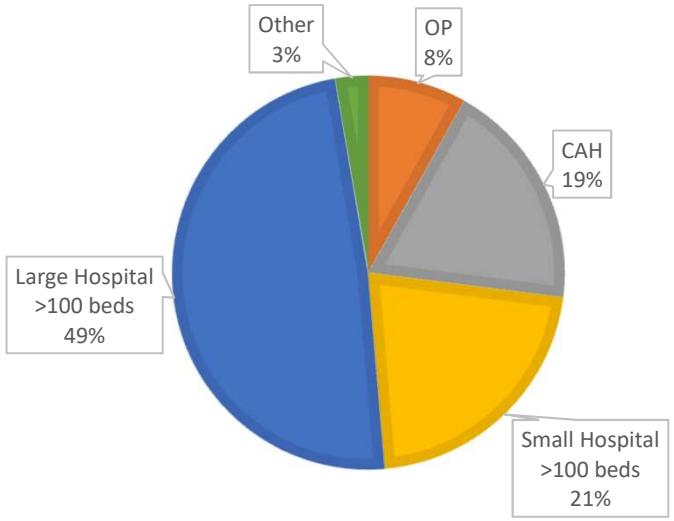
	No Students	I don't know	Student Support	Explain
1			1	*Clinical rotations*
2			1	*Provide qualified educator*
3			1	*We offer clinical rotation experience for students*
4		1		
5			1	*Allow students access to machine*
6			1	*Rotation of students, keep slides, instrument training*
7			1	*2 online students*
8	1			
9			1	*Offer rotations, prospective students can shadow MLS*
10			1	*Clinical site - willing to hire students*
11			1	*Rotation of students*
12			1	*Clinical rotations*
14	1			
15			1	*6 month clinical rotation*
16				
17			1	*Clinical rotations*
19	1			
20		1		
21			1	*Work with school schedule, encourage employees to enroll in the progr*
22			1	*MLS student training*
23				
24			1	*Tuition reimbursement, work with school schedule, clinical rotation*
25			1	*Clinical rotation*
27	1			
28			1	*Clinical rotation for ISU and Weber State*
29			1	*Employees are enrolled in the program*
30			1	*Clinical rotations*
32				
33			1	*Tuition reimbursement*
36	1			
37		1		
41		1		
46			1	*Tuition reimbursement*
47			1	*Work with student schedule, clinical rotation*
49			1	*Internships*
52			1	*Clinical rotation*
53			1	*Clinical rotation*
Total	**5**	**4**	**25**	34
	No Students	I don't know	Student Support	Explain
%	14.71%	11.76%	73.53%	

Q8a *Clinical rotation*

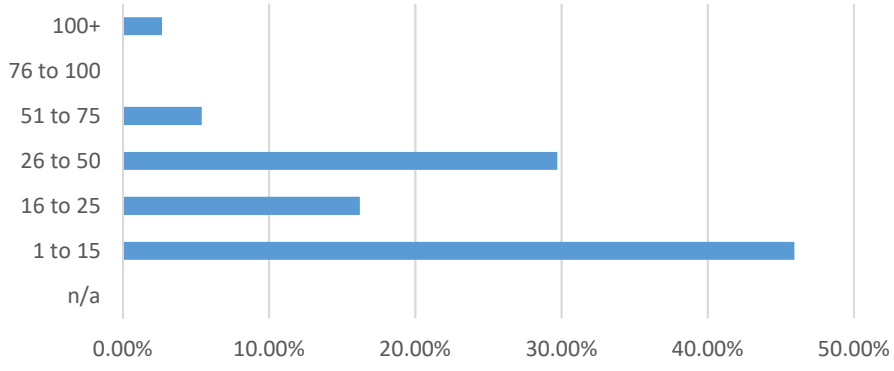
	Yes	No
1	1	
2	1	
3	1	
4	1	
5	1	
6	1	
7	1	
8	1	
9	1	
10	1	
11	1	
12	1	
14	1	
15	1	
16	1	
17	1	
19	1	
20	1	
21	1	
22	1	
23		
24	1	
25	1	
27	1	
28	1	
29	1	
30	1	
32	1	
33	1	
36	1	
37	1	
41	1	
46	1	
47	1	
49	1	
52	1	
53	1	
Total	**36**	**0**
	Yes - Clinical Rotation	No
%	100.00%	0.00%

	Q8b Specific training material				Q9 *Unusual Patient Results*				Q10 *Interdeparmental*							Q11a *Rare patient results*				Q11b	
	Yes	No	No response			No	Yes	*Example*		handled by CE Dept	Lab involved	Lab are instructors	Lab involved in interdepartr	Other			Yes	No		Referenced	Not referenced
		1		Policy review, use ISU provided checklist	**1**	1			**1**	1	1	1				**1**		1			
		1			**2**		1	*blood smear*	**2**		1	1	1			**2**		1		1	1
	1				**3**		1	*abnormal slides (blood smear/gram)*	**3**		1		1			**3**	1				1
	1				**4**		1		**4**		1	1				**4**	1			1	
	1				**5**		1	*blood smear*	**5**		1	1	1			**5**	1			1	
	1			hematology slides & printouts	**6**		1	*hem slides & print out*	**6**		1	1	1			**6**	1			1	
	1				**7**		1	*slides*	**7**		1		1			**7**	1				1
		1			**8**	1			**8**		1					**8**		1			
		1		Use ISU provided checklist	**9**	1			**9**							**9**	1				1
		1		Policy review	**10**	1			**10**						non-hospital lab	**10**		1			
	1				**11**		1	*slides*	**11**	1	1					**11**	1				1
			1		**12**		1	*slides & ab for BB*	**12**							**12**	1				1
			1		**14**	1			**14**							**14**					
	1				**15**		1		**15**		1					**15**	1			1	
	1				**16**		1	*smears*	**16**		1					**16**	1				1
	1				**17**		1	*smears/gram*	**17**	1	1					**17**	1				1
	1				**19**		1		**19**	1	1		1			**19**	1				1
	1				**20**		1		**20**				1			**20**	1				1
	1				**21**		1	*paraistes, stock organisms etc*	**21**					1	unsure	**21**					
			1		**22**		1		**22**		1					**22**	1				
			1		**23**				**23**							**23**					
	1				**24**		1	*smears, complex BB*	**24**							**24**	1			1	
	1				**25**		1	*bone marrow, slides*	**25**		1					**25**	1				1
		1		Treat students like new employees	**27**		1	*proficiency test samples*	**27**			1				**27**					
	1				**28**		1		**28**		1		1			**28**	1			1	
	1				**29**		1	*"unknowns" for student testing*	**29**	1						**29**	1				1
	1				**30**		1		**30**		1					**30**	1				1
		1			**32**		1	*slides*	**32**				1			**32**	1				1
		1			**33**		1	*smear archive*	**33**	1		1				**33**					
	1				**36**		1		**36**		1					**36**	1				1
		1		Go through checklist	**37**		1	*slides, crystals*	**37**							**37**	1				1
			1	1	**41**		1	*leukemias, rare sickle*	**41**		1		1			**41**					
			1		**46**				**46**							**46**					
			1		**47**		1	*smears*	**47**		1					**47**	1				1
			1		**49**		1	*smears*	**49**		1					**49**	1				1
	1				**52**		1	*abnormal smears*	**52**		1					**52**	1			1	
	1				**53**		1	*smears, case studies*	**53**		1	1	1	1	lab provides job aids	**53**	1			uncertain	
36	**20**	**9**	**8**	37	**Total**	**5**	**30**		35 **Total**	**6**	**23**	**8**	**11**	**2**	50	**Total**	**26**	**4**	30	**8**	**18** 26
	Yes - training materia	No- training material	No response			No	Yes	*Example*		handled by CE Dept	Lab involved	Lab are instructors	Lab involved in interc	Other			Yes	No		Referenced	Not referenced Uncertain
	54.05%	24.32%	21.62%		**%**	14.29%	85.71%		**%**	12.00%	46.00%	16.00%	22.00%	4.00%		**%**	86.67%	13.33%		30.77%	69.23% 3.85%
										12	46	16	22	4							

Q1. IN WHAT SETTING DO YOU CURRENTLY WORK?

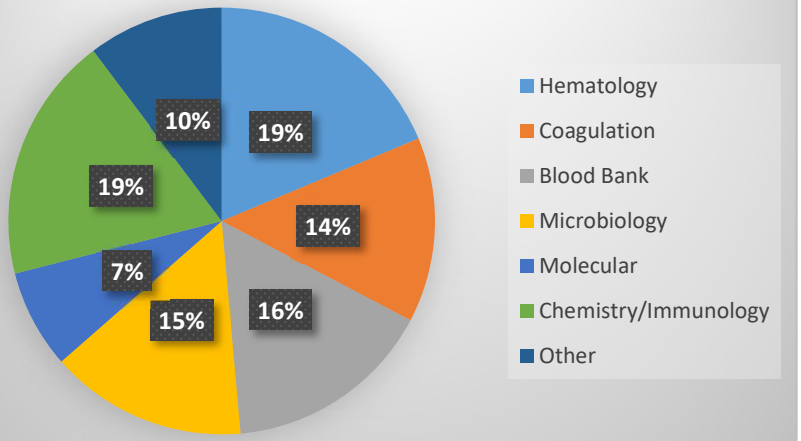


Q2. How many MLS are emloyed at your laboratory?

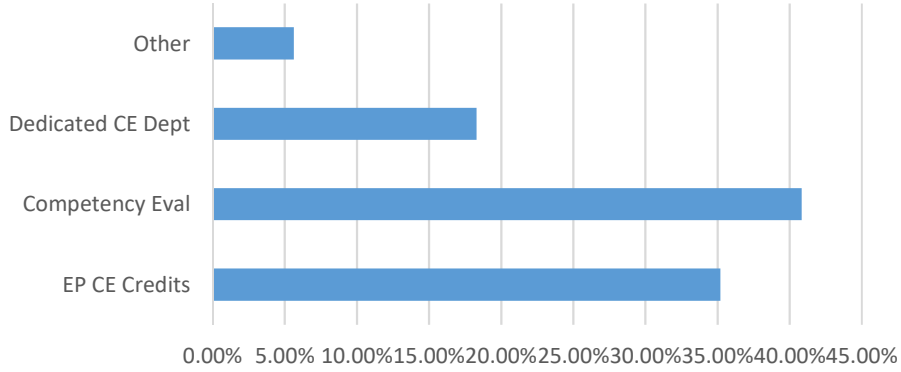


	n/a	1 to 15	16 to 25	26 to 50	51 to 75	76 to 100	100+
Series1	0.00%	45.95%	16.22%	29.73%	5.41%	0.00%	2.70%

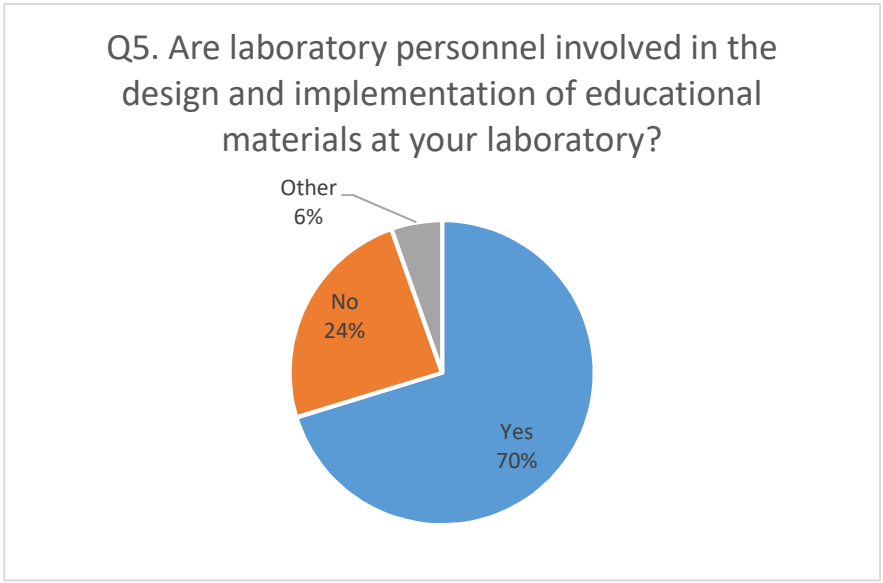
Q3. CLS Discipline Representation

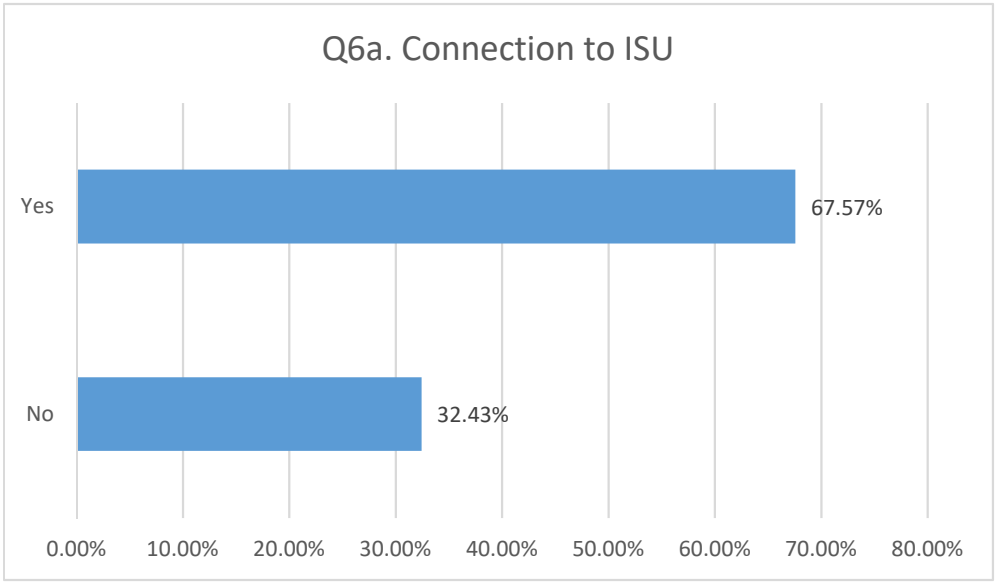


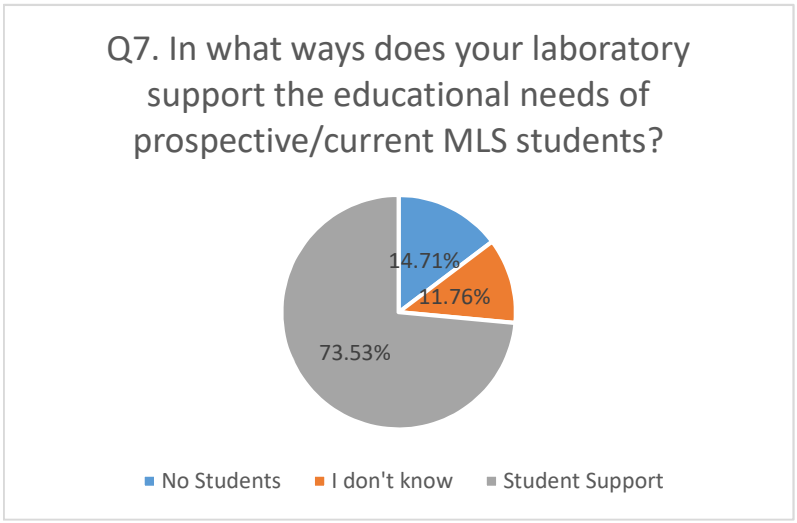
Q4. Availability of Education Materials

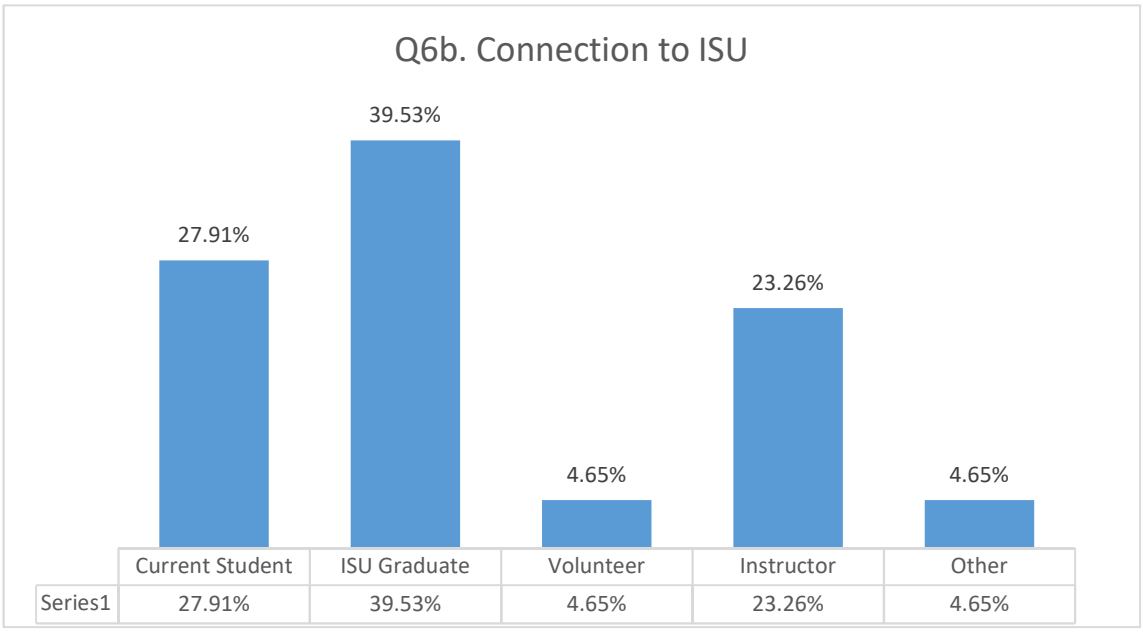


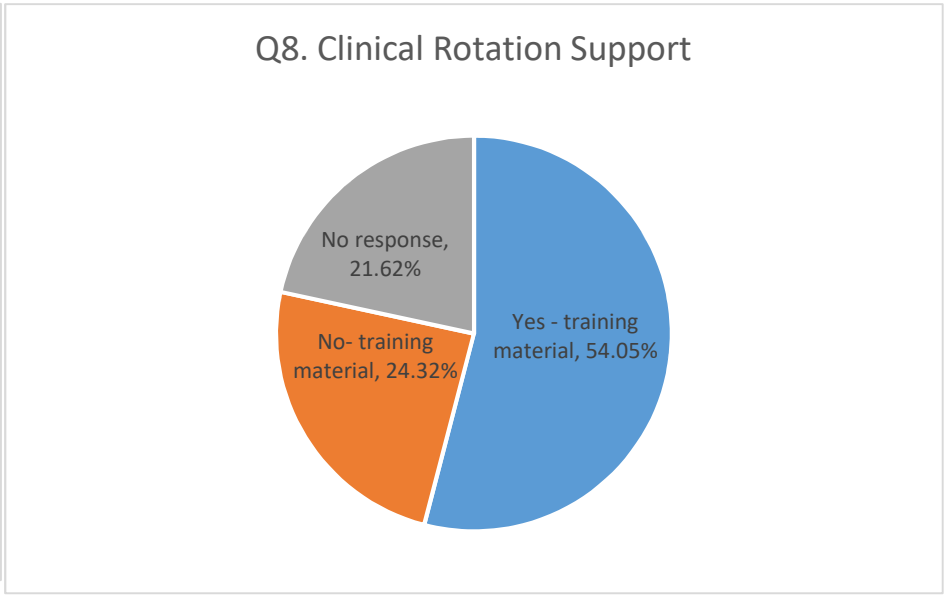
	EP CE Credits	Competency Eval	Dedicated CE Dept	Other
Series1	35.21%	40.85%	18.31%	5.63%

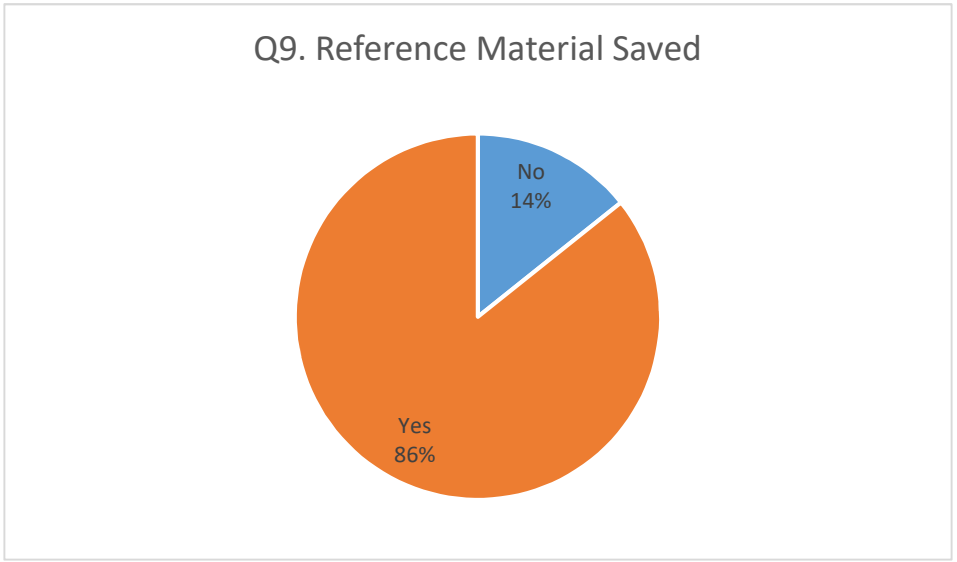

Q5. Are laboratory personnel involved in the design and implementation of educational materials at your laboratory?
Other 6%
No 24%
Yes 70%

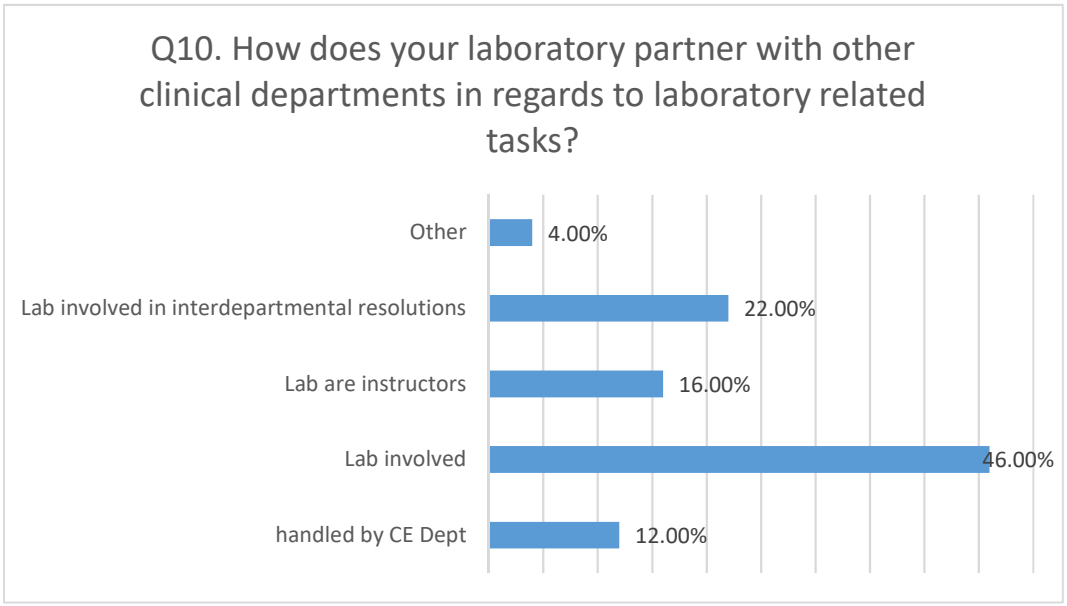

Q6a. Connection to ISU
Yes
67.57%
No
32.43%
0.00%
10.00%
20.00%
30.00%
40.00%
50.00%
60.00%
70.00%
80.00%

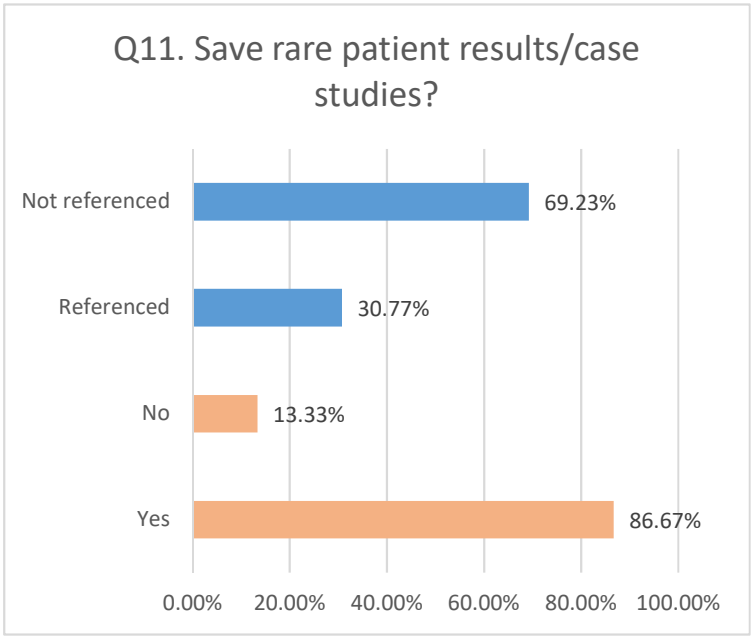

Q7. In what ways does your laboratory support the educational needs of prospective/current MLS students?
14.71%
11.76%
73.53%
No Students
I don't know
Student Support


Q6b. Connection to ISU
27.91%
39.53%
4.65%
23.26%
4.65%
Current Student
ISU Graduate
Volunteer
Instructor
Other
Series1
27.91%
39.53%
4.65%
23.26%
4.65%


Q8. Clinical Rotation Support
No response, 21.62%
Yes - training material, 54.05%
No- training material, 24.32%


Q9. Reference Material Saved
No 14%
Yes 86%


Q10. How does your laboratory partner with other clinical departments in regards to laboratory related tasks?
Other
4.00%
Lab involved in interdepartmental resolutions
22.00%
Lab are instructors
16.00%
Lab involved
46.00%
handled by CE Dept
12.00%


Q11. Save rare patient results/case studies?
Not referenced
69.23%
Referenced
30.77%
No
13.33%
Yes
86.67%
0.00%
20.00%
40.00%
60.00%
80.00%
100.00%

Rejected Questionnaires - competed by non-CLS professionals

	Q1 Work Setting									Q2 # of MLS									Q3 Discipline of Study									Q4 Educational Materials					
	n/a	OP	CA	SmH	lgH	Other	Explaination			n/a	1 to 15	16 to 25	26 to 50	51 to 75	76 to 100	100+			Hematology	Coagulation	Blood Bank	Microbiology	Molecular	Chemistry/Immunology	Other	Explaination			EP CE Credits	Competency Eval	Dedicated CE Dept	Other		
13					1				13				1					13								Student		13		1				
18					1				18			1						18								Student		18	1	1	1			
26	1						Student		26	1								26								Student		26						Student
31	1						Student		31	1								31								Student		31						Student
34	1						Student		34	1								34								Student		34						Student
35	1						Student		35	1								35								Student		35						Student
38	1						Student		38	1								38								Student		38						Student
39	1						Student		39	1								39								Student		39						Student
40	1						Student		40		1							40								Student		40						Student
42	1						Student		42		1							42								Student		42						Student
43						1	Bengal lab		43		1							43								Student		43						Student
44		1					Student		44		1							44								Student		44		1				
45	1						Student		45	1								45								Student		45						Student
48	1			1			Student		48		1							48								Student		48						Student
50	1						Student		50		1							50								Student		50						Student
51	1						Student		51		1							51								Student		51						Student?
54	1						Student		54		1							54	1	1	1	1		1				54	1	1				
55	1						Student		55		1							55								Student		55						Student
56	1						Student		56	1								56								Student		56						Student
57	1						Student		57	1								57								Student		57						Student
58	1						Student		58	1								58								Student		58						Student
59	1						Student		59	1								59								Student		59						Student

n=22

Rejected Questionnaires - competed by non-CLS professionals

	Q5 *Educational Materials*					Q6 *ISU connection*										Q7 *Student Support*					Q8a *Clinical rotation*		
	Yes	No	Other	*Explanation*		No	Yes	Current Student	ISU Graduate	Volunteer	Instructor	Other	*Explanation*			No Students	I don't know		*Explain*		Yes	No
13		1				13		1	1							13		1			13	1	
18	1					18		1			1					18		1			18	1	
26				*Student*		26								*Student*		26					26		
31				*Student*		31								*Student*		31					31		
34				*Student*		34								*Student*		34					34		
35				*Student*		35								*Student*		35		1			35		
38				*Student*		38								*Student*		38					38		
39				*Student*		39		1	1							39		1			39		
40	1					40		1	1	1		1				40		1			40	1	
42				*Student*		42		1	1							42		1			42	1	
43	1					43		1	1	1		1				43		1			43	1	
44	1					44		1	1	1		1				44		1			44	1	
45				*Student*		45								*Student*		45					45	1	
48				*Student*		48		1	1							48		1			48	1	
50		1				50	1									50		1			50		1
51	1					51								*Student*		51		1			51		1
54	1					54		1	1							54					54	1	
55	1			*Student*		55		1	1					*Student*		55					55	1	
56				*Student*		56								*Student*		56					56		
57	1			*Student*		57								*Student*		57		1			57		
58				*Student*		58								*Student*		58					58		
59				*Student*		59								*Student*		59					59		

Rejected Questionnaires - competed by non-CLS professionals

	Q8b Specific training material				Q9 *Clinical rotation*					Q10 *Interdeparmental*							Q11a *Interdeparmental*				Q11b	
	Yes	No				No	Yes	*Example*			handled by CE Dept	Lab involved	Lab are instructors	Lab involved in interdeparti	Other			Yes	No		Referenced	Not referenced
		1			13	1				13		1					13		1			
	1				18		1			18					1	unsure	18					
					26					26							26					
					31					31							31					
					34					34							34					
					35					35		1	1				35					
					38					38							38					
					39					39							39	1				
	1				40		1			40					1	unsure	40	1			1	
	1				42	1				42				1			42					
		1			43	1				43							43		1			
	1				44	1				44			1				44		1			
					45					45							45					
	1				48		1			48	1						48	1				1
					50	1				50							50		1			
					51	1				51					1		51		1			
	1				54	1				54							54	1				1
	1				55					55							55	1				1
					56					56							56					
					57					57							57					
					58					58							58					
					59					59							59					

APPENDIX B1: CAH Laboratory Manager Survey

THESIS: ESTABLISHING PROFESSIONAL LEARNING CENTERS WITHIN RURAL-ACCESS CLINICAL LABORATORIES

PART A: Hospital Information

1. Is your hospital currently designated as critical access?
   - ☐ Yes
   - ☐ No

2. How far is the closest hospital to your hospital?
   - ☐ Less than 25 miles
   - ☐ 25-50 miles
   - ☐ 50-100 miles
   - ☐ 100-150 miles
   - ☐ 150+ miles

3. What is the size of your hospital?
   - ☐ 0-5 beds
   - ☐ 6-10 beds
   - ☐ 11-15 beds
   - ☐ 16-20 beds
   - ☐ 20-25 beds
   - ☐ 26+ beds

4. Is your laboratory staffed 24/7 or do you take call?
   - ☐ Laboratory is staffed 24/7
   - ☐ Take call from _____ to _____
   - ☐ Other: _____
     _____

PART B: Laboratory Personnel Demographics

1. How many people are employed by your laboratory in the following categories:

Medical Laboratory Scientist (*4 year degree & ASCP certification*)	Medical Laboratory Technicians (*2 year degree, only*)	Laboratory Technician (*some college*)	Phlebotomists (*high school diploma*)
☐ 0-2	☐ 0-2	☐ 0-2	☐ 0-2
☐ 3-5	☐ 3-5	☐ 3-5	☐ 3-5
☐ 6-10	☐ 6-10	☐ 6-10	☐ 6-10
☐ 11-15	☐ 11-15	☐ 11-15	☐ 11-15
☐ 15+	☐ 15+	☐ 15+	☐ 15+

Other: (please describe):_____
_____
_____
_____

2. What percentage of your staff do you anticipate retiring in the next 10 years?
   - ☐ 0-10%
   - ☐ 11-20%
   - ☐ 21-30%
   - ☐ 31-40%
   - ☐ 41-50%
   - ☐ 51-60%
   - ☐ 61-70%
   - ☐ 70%+

APPENDIX B1: CAH Laboratory Manager Survey

3. What percentage of your MLS/MLT staff has less than 5 years' experience working in clinical laboratory science?

- ☐ 0-10%
- ☐ 11-20%
- ☐ 21-30%
- ☐ 31-40%
- ☐ 41-50%
- ☐ 51-60%
- ☐ 61-70%
- ☐ 70%+

4. Have any of your non-MLS employees taken online courses toward an MLS degree?

- ☐ Yes, we currently have online students
- ☐ Yes, we have had online students in the past
- ☐ No

If yes: in what university program were they enrolled?

- ☐ Idaho State University
- ☐ Oregon State University
- ☐ Weber State University
- ☐ BYU
- ☐ Other: _____

PART C: Clinical Laboratory Education

1. **What educational materials are provided to MLS staff in your laboratory?**
   - ☐ Employer provided CE credits
   - ☐ Competency evaluations
   - ☐ Dedicated Clinical Education Department
   - ☐ Other: _____
     _____
     _____

2. **Are laboratory personnel involved in the design and implementation of educational materials at your laboratory?**
   - ☐ Yes
   - ☐ No

3. **Is anyone in your laboratory connected with the undergraduate or graduate program at Idaho State University (volunteer, currently enrolled, instructor, etc) ?**
   - ☐ Yes
     - ☐ Current Student
     - ☐ Graduated from ISU
     - ☐ Volunteer
     - ☐ Instructor
     - ☐ Other:_____
   - ☐ No

4. **In what ways does your laboratory support the educational needs of prospective/current MLS students?**
   - ☐ We don't have employees who are enrolled in a MLS program
   - ☐ I don't know
   - ☐ Explain: _____

5. **Does your laboratory support clinical rotations for MLS students?**
   - ☐ Yes
   - ☐ No

   If yes, does your laboratory reserve specific training material for use with students during their clinical rotation?
   - ☐ Yes
   - ☐ No. *Please explain how students are trained during clinical rotation at your site:*_____

6. **Does your laboratory save unusual patient results for future training, competency or reference (interdepartmental training, case studies, presentations, peripheral blood smear archive etc)?**
   - ☐ Yes, example:
   - ☐ No

7. **How does your laboratory partner with other clinical departments for training of clinical staff in regards to laboratory related tasks? Select all that apply**
   - ☐ All training of non-laboratory staff is handled by the Clinical Education Department
   - ☐ Laboratory personnel are involved in training clinical staff (*ie annual competency evaluations for POCT, monitoring/training nursing staff for POCT testing compliance with QA*)
   - ☐ Laboratory personnel are class instructors for when classes pertain to laboratory tests (ie phlebotomy, POCT, heelstick, ABG, etc)
   - ☐ Laboratory staff are routinely involved in interdepartmental resolutions and/or provide additional training when needed to help non-laboratory staff avoid preanalytical errors
   - ☐ Other: _____

8. **Does your laboratory save rare patient results and/or case studies for training material and/or competency evaluation?**
   - ☐ Yes

   If yes, are these materials available for routine reference or are they inaccessible?
   - ☐ Yes, these materials are available but not referenced routinely
   - ☐ Yes, these materials are available and referenced frequently

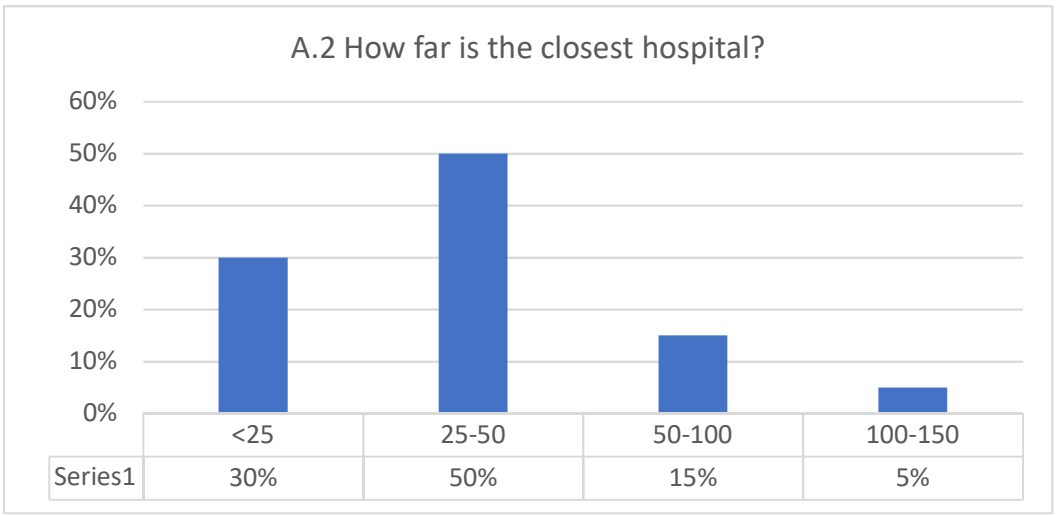
   - ☐ No

	Is your hospital currently desginated as critical access?	
	Yes	*No*
1		
2	1	
3	1	
4		
5	1	
6	1	
7		
8	1	
9		
10	1	
11	1	
12		
13	1	
14	1	
15	1	
16	1	
17	1	
18	1	
19	1	
20	1	
21		
22	1	
23	1	
24	1	
25	1	
26	1	
27	1	
	21	0
	21 Total	

	How far is the closest hospital to your hospital?				
	<25	*25-50*	*50-100*	*100-150*	*150+*
		1			
		1			
	1				
		1			
	1				
				1	
		1			
		1			
			1		
			1		
			1		
		1			
		1			
		1			
	1				
		1			
	1				
	1				
		1			
	1				
	6	10	3	1	0
					20 Total

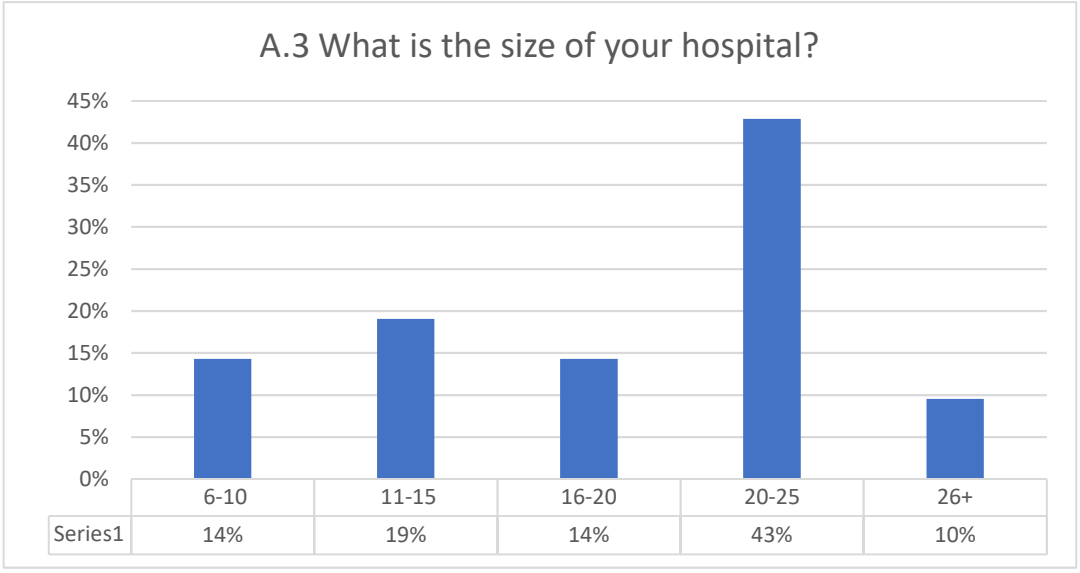
Is your hospital currently desginated as critical access?	
Yes	*No*
100%	0%

How far is the closest hospital to your hospital (miles)?				
<25	*25-50*	*50-100*	*100-150*	*150+*
30%	50%	15%	5%	0%



	What is the size of your hospital?						
	0-5	*6-10*	*11-15*	*16-20*	*21-25*	*26+*	
1							
2					1		25
3					1		25
4							
5						1	26
6					1		25
7							25
8				1			20
9							
10			1				15
11		1					
12							
13			1				15
14						1	26
15			1				15
16			1				15
17					1		25
18					1		25
19				1			20
20		1					10
21							
22					1		25
23					1		25
24					1		25
25					1		25
26		1					10
27				1			20
	0	3	4	3	9	2	
						21	**Total**

What is the size of your hospital?					
0-5	*6-10*	*11-15*	*16-20*	*20-25*	*26+*
0%	14%	19%	14%	43%	10%

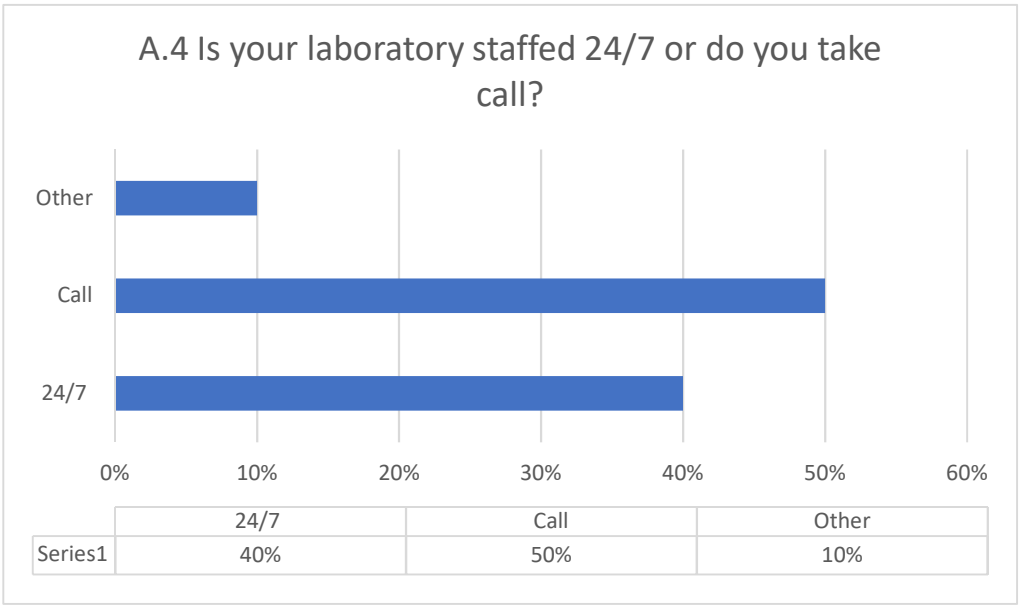


Is your laboratory staffed 24/7 or do you take call

	24/7	*Call*	*Other*	*Description*
1				
2	1			
3		1		2400 to 0600
4				
5	1			
6		1		2100 to 0600
7				
8		1		2200 to 0600 (weekdays) staffed 8 hours, then call (weekends)
9				
10	1			
11		1		1730-0730, different on weekend
12				
13	1			
14	1			
15			1	Only about 6hrs of call/week. All other hours are staffed.
16		1		1800 to 0700
17	1			
18	1			
19			1	Call is used on holidays and when short staffed
20		1		5pm to 7am
21				
22		1		1800 to 0600
23		1		2400 to 0500
24	1			
25		1		1730 to 0630
26		1		1800 to 0600 & on weekends
27				
	8	10	2	
			20	**Total**

Is your laboratory staffed 24/7 or do you take call

24/7	*Call*	*Other*	*Description*
40%	50%	10%	



How many people are employed by your laboratory in the following categories:

	MLS					MLT				
	0-2	3-5	6-10	11-15	15+	0-2	3-5	6-10	11-15	15+
1										
2				1						
3		1								
4										
5			1			1				
6		1								
7										
8		1				1				
9										
10			1			1				
11	1									
12										
13			1							
14				1		1				
15		1				1				
16		1				1				
17				1		1				
18			1				1			
19			1				1			
20		1				1				
21										
22		1								
23		1				1				
24			1			1				
25		1								
26	1					1				
27		1								
Total	2	10	6	3	0	11	2	0	0	0

How many people are employed by your laboratory in the following categories:

Lab Tech						Phlebotomist						Other
0-2	3-5	6-10	11-15	15+		0-2	3-5	6-10	11-15	15+		
								1				1
						1						
									1			
							1					
						1						
1							1					
						1						
						1						
								1				
						1						
1												
1									1			
								1				
							1					
												1
						1						
1							1					
1								1				
1												
						1						Other
6	0	0	0	0		7	4	4	2	0		2

Overall estimate per category

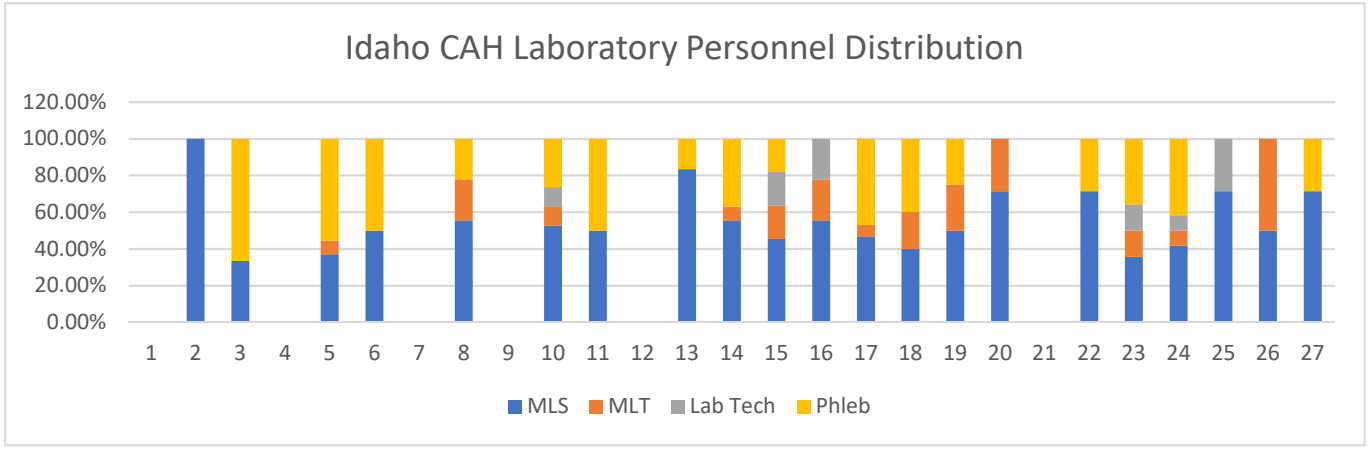
	MLS	MLT	Lab Tech	Phleb	Total
1					
2	15	0	0	0	15
3	5	0	0	10	15
4					
5	10	2	0	15	27
6	5	0	0	5	10
7					
8	5	2	0	2	9
9					
10	10	2	2	5	19
11	2	0	0	2	4
12					
13	10	0	0	2	12
14	15	2	0	10	27
15	5	2	2	2	11
16	5	2	2	0	9
17	15	2	0	15	32
18	10	5	0	10	25
19	10	5	0	5	20
20	5	2	0	0	7
21					
22	5	0	0	2	7
23	5	2	2	5	14
24	10	2	2	10	24
25	5		2	0	7
26	2	2	0	0	4
27	5	0	0	2	7
Total	*159*	*32*	*12*	*102*	*305*
Average #	*9.35*	*1.88*	*0.71*	*6.00*	*17.94*
Average %	52.13%	10.49%	3.93%	33.44%	100.00%

Percentage of each employee category

	MLS	MLT	Lab Tech	Phleb
1	0.00%	0.00%	0.00%	0.00%
2	100.00%	0.00%	0.00%	0.00%
3	33.33%	0.00%	0.00%	66.67%
4	0.00%	0.00%	0.00%	0.00%
5	37.04%	7.41%	0.00%	55.56%
6	50.00%	0.00%	0.00%	50.00%
7	0.00%	0.00%	0.00%	0.00%
8	55.56%	22.22%	0.00%	22.22%
9	0.00%	0.00%	0.00%	0.00%
10	52.63%	10.53%	10.53%	26.32%
11	50.00%	0.00%	0.00%	50.00%
12	0.00%	0.00%	0.00%	0.00%
13	83.33%	0.00%	0.00%	16.67%
14	55.56%	7.41%	0.00%	37.04%
15	45.45%	18.18%	18.18%	18.18%
16	55.56%	22.22%	22.22%	0.00%
17	46.88%	6.25%	0.00%	46.88%
18	40.00%	20.00%	0.00%	40.00%
19	50.00%	25.00%	0.00%	25.00%
20	71.43%	28.57%	0.00%	0.00%
21	0.00%	0.00%	0.00%	0.00%
22	71.43%	0.00%	0.00%	28.57%
23	35.71%	14.29%	14.29%	35.71%
24	41.67%	8.33%	8.33%	41.67%
25	71.43%	0.00%	28.57%	0.00%
26	50.00%	50.00%	0.00%	0.00%
27	0.714285714	0	0	0.285714286

Average Percentage

MLS	MLT	Lab Tech	Phleb
52.13%	*10.49%*	*3.93%*	*33.44%*



What percentage of your staff do you anticipate retiring in the next 10 years?

	0-10%	11-20%	21-30%	31-40%	41-50%	51-60%	61-70%	70%+
1								
2				1				
3				1				
4								
5				1				
6	1							
7								
8	1							
9								
10	1							
11	1							
12								
13	1							
14			1					
15		1						
16	1							
17		1						
18		1						
19			1					
20		1						
21								
22						1		
23		1						
24			1					
25	1							
26	1							
27			1					
Total	8	5	4	3	0	1	0	0

21

What percentage of your staff do you anticipate retiring in the next 10 years?

	0-10%	11-20%	21-30%	31-40%	41-50%	51-60%	61-70%	70%+
Percent	38.10%	23.81%	19.05%	14.29%	0.00%	4.76%	0.00%	0.00%
	0.380952381	0.238095238	0.19047619	0.142857143	0	0.047619048	0	0

What percentage of your MLsS/MLT staff has less than 5 years' experience in clinical laboratory science?

	0-10%	*11-20%*	*21-30%*	*31-40%*	*41-50%*	*51-60%*	*61-70%*	*70%+*
1								
2		1						
3	1							
4								
5								
6	1							
7								
8	1							
9								
10				1				
11	1							
12								
13			1					
14			1					
15				1				
16			1					
17	1							
18		1						
19						1		
20		1						
21								
22			1					
23	1							
24	1							
25	1							
26				1				
27	1							
Total	9	3	4	3	0	1	0	0

20

What percentage of your MLsS/MLT staff has less than 5 years' experience in clinical laboratory science?

	0-10%	*11-20%*	*21-30%*	*31-40%*	*41-50%*	*51-60%*	*61-70%*	*70%+*
Percent	45.00%	15.00%	20.00%	15.00%	0.00%	5.00%	0.00%	0.00%
	0.45	0.15	0.2	0.15	0	0.05	0	0

Have any of your non-MLS employees taken online courses toward an MLS degree

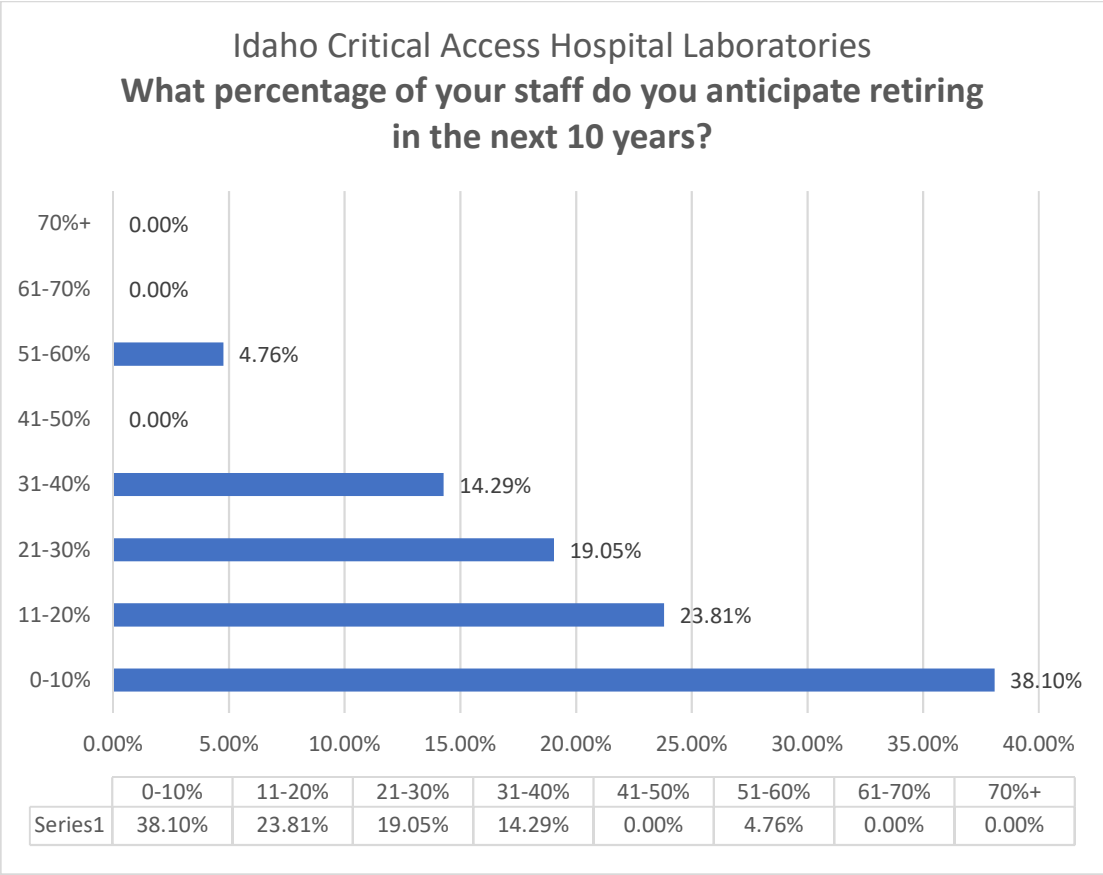
	Yes	No	ISU	OSU	WSU	BYU	Other	
1								
2	1				1			
3		1						
4								
5								
6	1							
7								
8	1				1			
9								
10	1				1			
11		1						
12								
13		1						
14	1		1					
15		1						
16	1		1			1		
17	1				1			
18	1						1	University of Cin
19	1				1			
20		1						
21								
22	1		1					
23	1				1			
24	1				1			
25	1		1					
26	1				1			
27		1						
Total	14	6	4	0	8	1	1	34
							14	

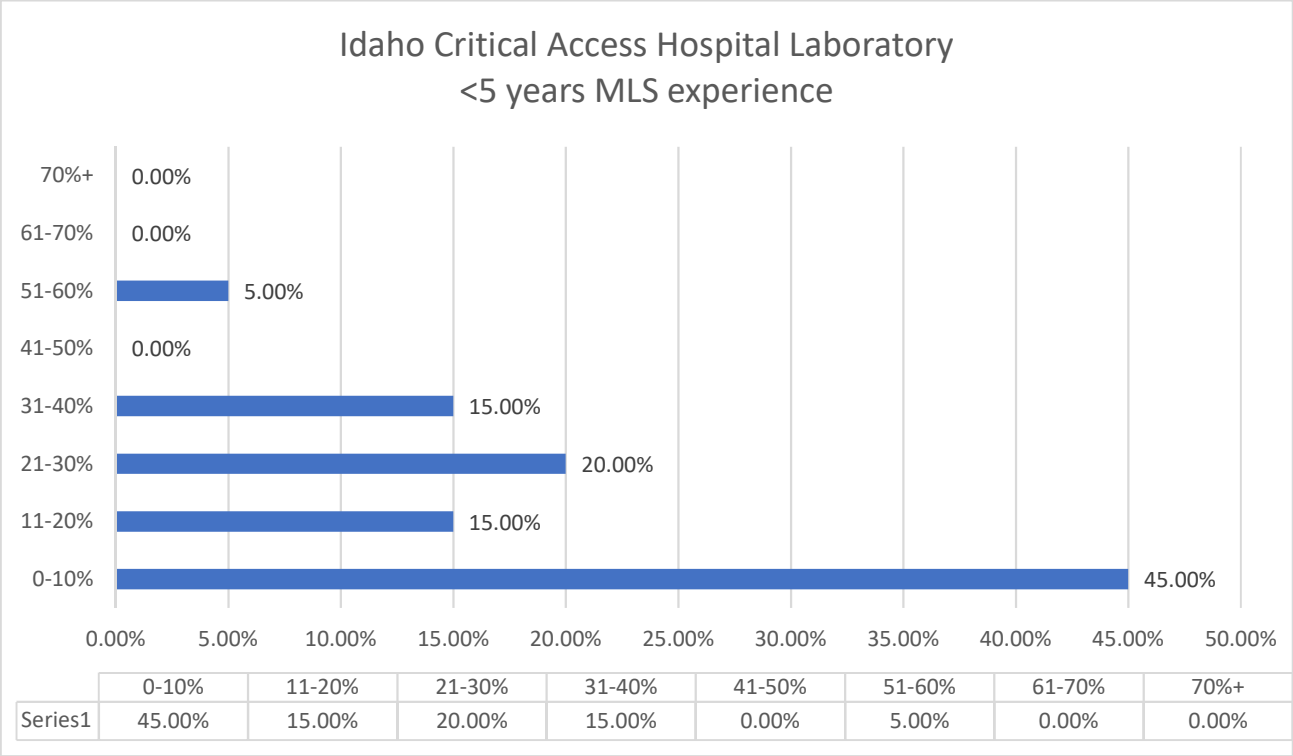
Have any of your non-MLS employees take What online university program were they enrolled in?

	Yes	No	ISU	OSU	WSU	BYU	Other
Percent	70.00%	30.00%	28.57%	0.00%	57.14%	7.14%	7.14%
	0.7	0.3	0.285714286	0	0.571428571	0.071428571	0.071428571

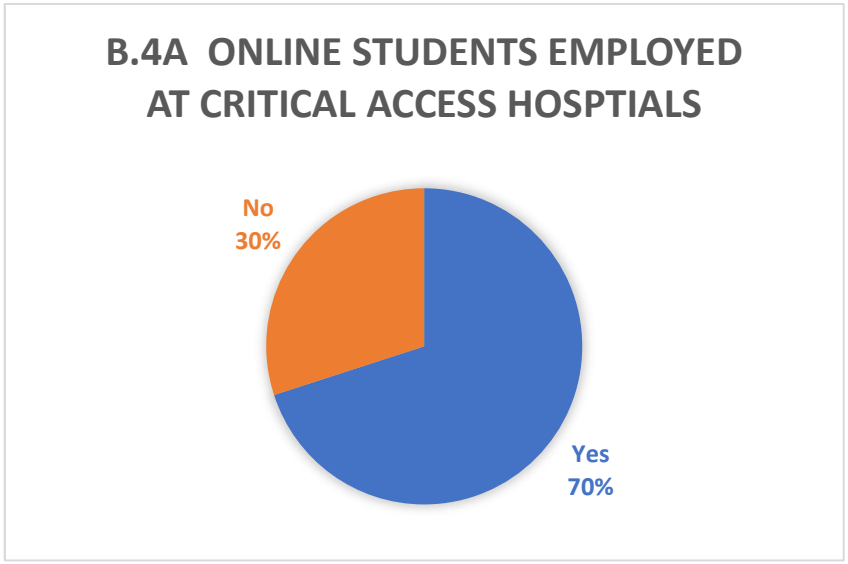
What online university program were they enrolled in?

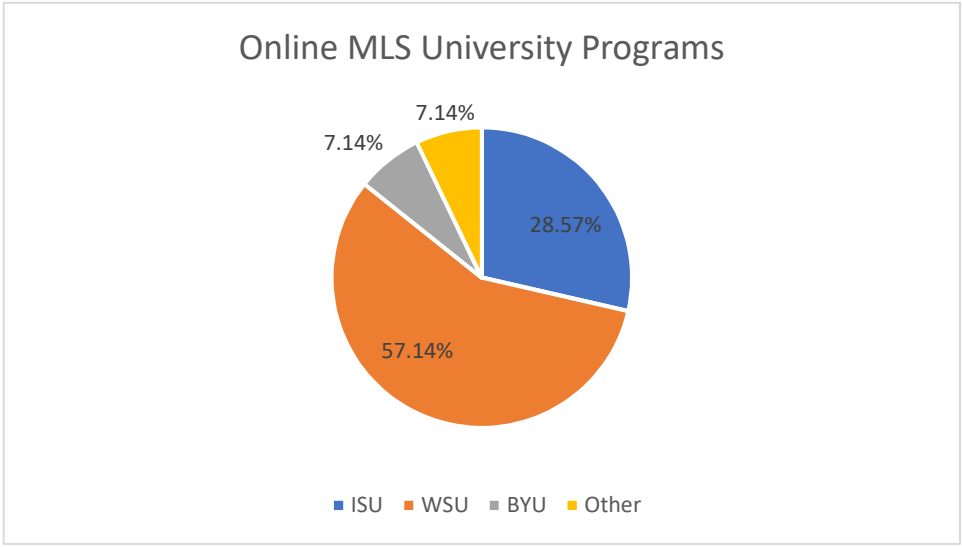
ISU	WSU	BYU	Other
28.57%	57.14%	7.14%	7.14%


Idaho Critical Access Hospital Laboratories
What percentage of your staff do you anticipate retiring in the next 10 years?
70%+
61-70%
51-60%
41-50%
31-40%
21-30%
11-20%
0-10%
0.00%
0.00%
4.76%
0.00%
14.29%
19.05%
23.81%
38.10%
0.00%
5.00%
10.00%
15.00%
20.00%
25.00%
30.00%
35.00%
40.00%
0-10% 11-20% 21-30% 31-40% 41-50% 51-60% 61-70% 70%+
Series1 38.10% 23.81% 19.05% 14.29% 0.00% 4.76% 0.00% 0.00%



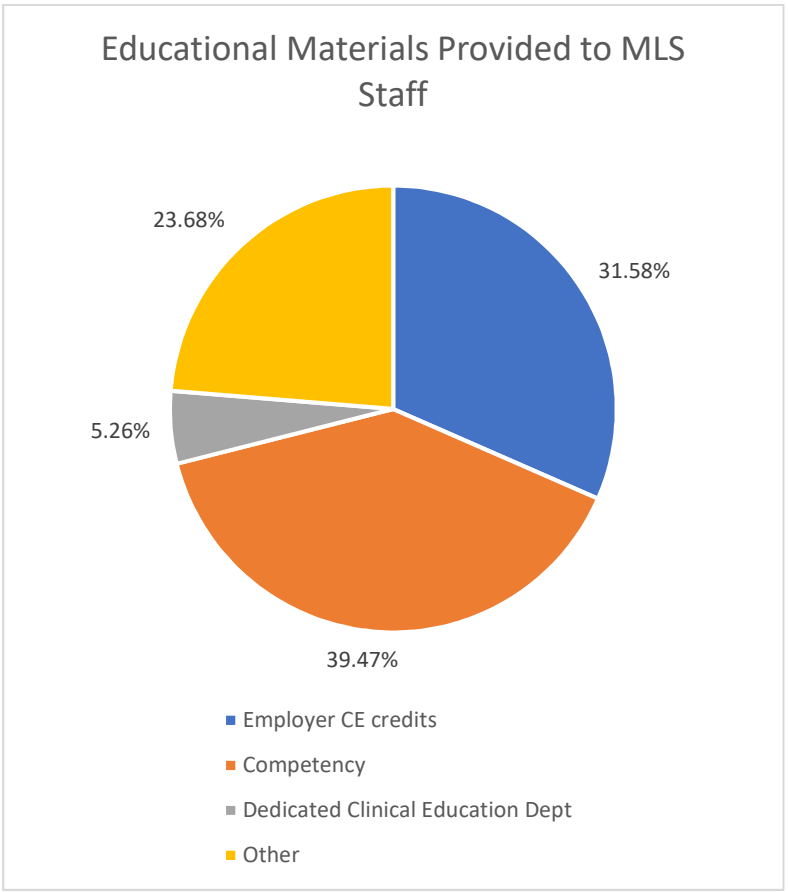
	0-10%	11-20%	21-30%	31-40%	41-50%	51-60%	61-70%	70%+
Series1	45.00%	15.00%	20.00%	15.00%	0.00%	5.00%	0.00%	0.00%


B.4A ONLINE STUDENTS EMPLOYED AT CRITICAL ACCESS HOSPTIALS
No 30%
Yes 70%


Online MLS University Programs
7.14%
7.14%
28.57%
57.14%
ISU
WSU
BYU
Other

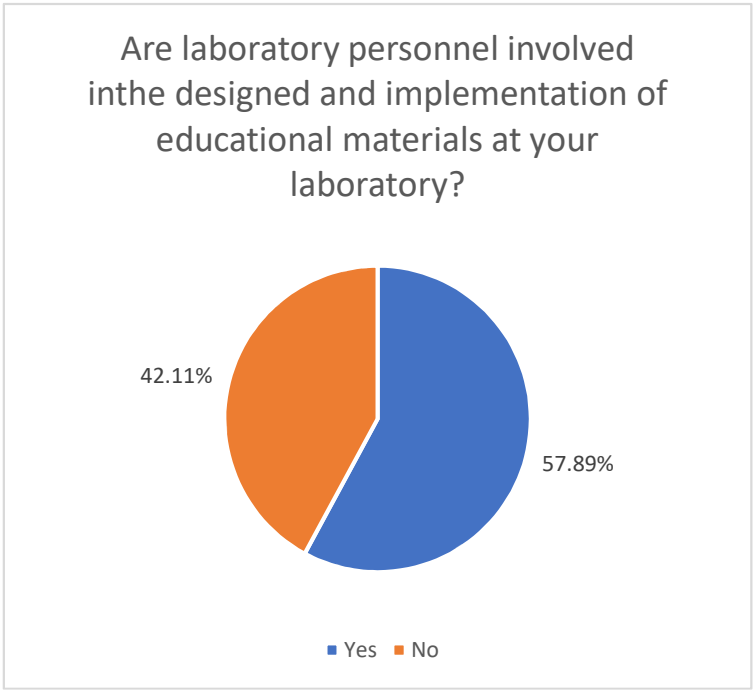
	C.1 What educational materials are provided to MLS staff in your laboratory?				
	Employer CE c	*Competency*	*Dedicated Clir*	*Other*	
1					
2		1		1	Vendor webinars. University of Washington online courses
3	1				
4					
5					
6	1			1	Online CE / U of Cinn
7					
8	1	1			
9					
10	1	1	1	1	Online vendors (CAP, MTS etc)
11				1	Supply their own, usually via Anderson
12					
13	1	1		1	Yearly State Conventions, if in Boise
14	1	1			
15				1	None other than proficiency/free courses
16	1	1			
17					
18	1	1	1		
19	1	1		1	Medtraining.org and Relias
20		1		1	Budget allows attendance to State ASCLS Convention
21					
22	1	1		1	Online programs, forums, State CLSA meetings
23	1	1			
24		1			
25		1			
26		1			
27	1	1			
	12	15	2	9	
				38	**Total**

C.1 What educational materials are provided to MLS staff in your laboratory?			
Employer CE c	*Competency*	*Dedicated Clir*	*Other*
31.58%	39.47%	5.26%	23.68%



	C.2 Are laboratory personnel involved in the design and implementation of educational materials at your laboratory?	
	Yes	*No*
1		
2		1
3	1	
4		
5		
6	1	
7		
8	1	
9		
10		1
11	1	
12		
13	1	
14	1	
15		1
16		1
17		1
18		1
19	1	
20	1	
21		
22	1	
23	1	
24		1
25	1	
26		1
27		
	11	8
	19 Total	

C.2 Are laboratory personnel involved in the design and implementation of educational materials at your laboratory?	
Yes	*No*
57.89%	42.11%

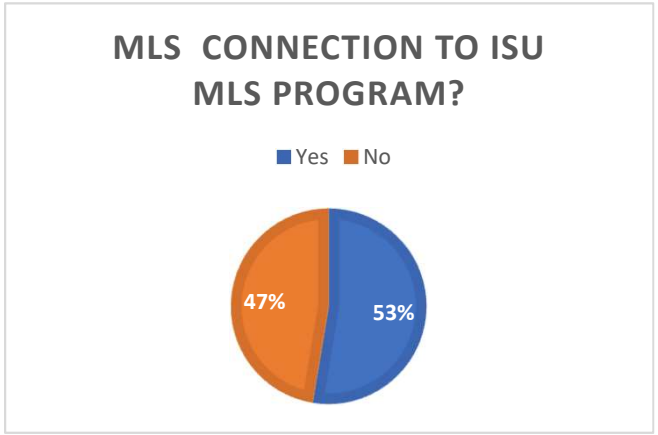


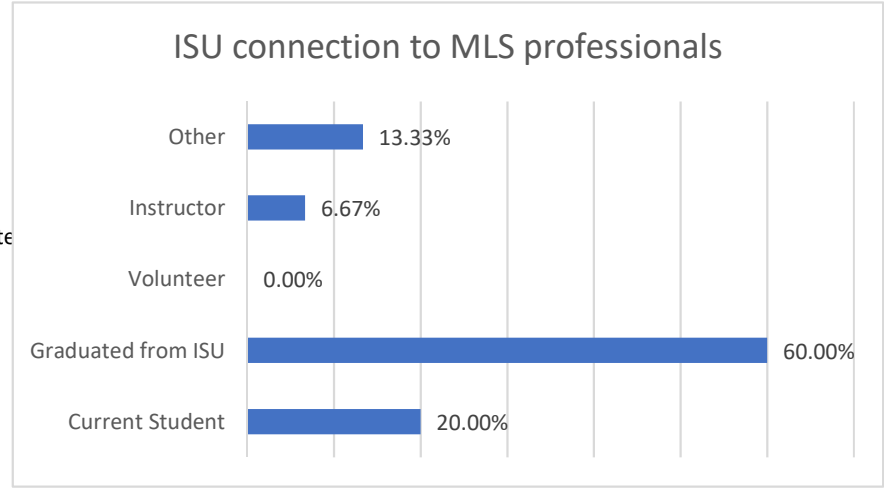
C.3 Is anyone in your laboratory connected with the undergraduate or graduate program at Idaho State University?

	Yes	No	Current Stu	Graduated	Volunteer	Instructor	Other	
1								
2		1						
3		1						
4								
5								
6		1						
7								
8		1						
9								
10	1		1					
11		1						
12								
13	1		1	1				
14	1		1	1				
15		1						
16	1			1				
17	1			1				
18	1			1				
19	1			1				
20							1	Preceptor
21								
22	1			1				
23		1					1	Clinical rotation site
24	1			1		1		
25	1			1				
26		1						
27		1						
	10	9	3	9	0	1	2	
	19						**15**	**Total**

C.3 Is anyone in your laboratory connected with the undergraduate or graduate program at Idaho State University?

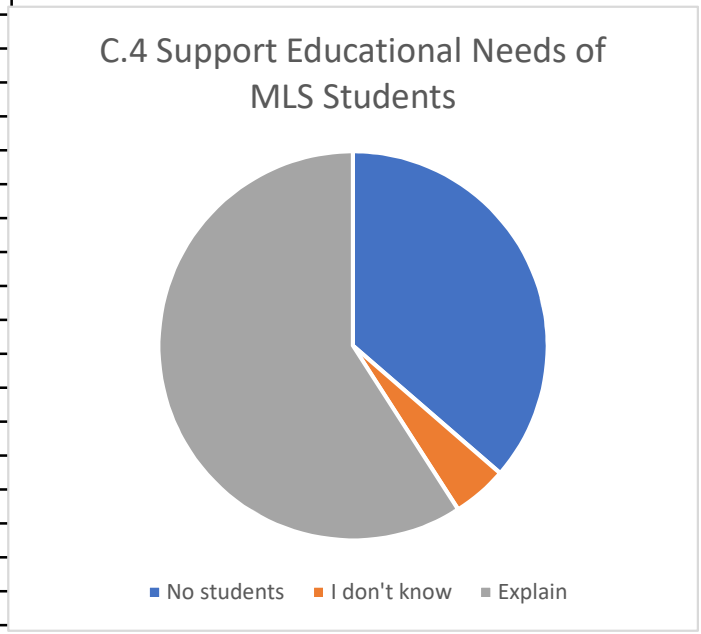
Yes	No	Current Stu	Graduated f	Volunteer	Instructor	Other
52.63%	47.37%	20.00%	60.00%	0.00%	6.67%	13.33%





	C.4 In what ways does your laboratory support the educational needs of prospective/current MLS students?			
	No students	*I don't know*	*Explain*	
1				
2			1	*We take one ISU student per year for clinical site.*
3	1			
4				
5			1	*Tuition/educaiton benefits*
6			1	*Tutor/direct to websites & literature*
7				
8	1		1	*Our lab has supportd one MLS student in the past few years from ISU and*
9				
10	1			
11	1			
12				
13			1	*MTS comptency & Continuing ED. Bench experience.*
14			1	*Time off and clinical rotation*
15	1			
16			1	*Participate in the onsite clinical program and take students for clinical*
17			1	*In-house intern/student coordinator. Bench mentoring.*
18			1	*Clinical rotations*
19			1	*Tuition assistance, modified work schedules, assist in setting up clinical*
20	1			
21				
22			1	*We will have a student 2018 enrolled and will be employeed in June. We*
23			1	*Hospital funded tuition reimbursement program*
24	1			
25			1	*Provide scholarships, clinical rotations and provide books (reference*
26		1		
27	1			
	8	1	13	
			22	**Total**

C.4 In what ways does your laboratory support the educational needs of prospective/current MLS students?		
No students	*I don't know*	*Explain*
36.36%	4.55%	59.09%

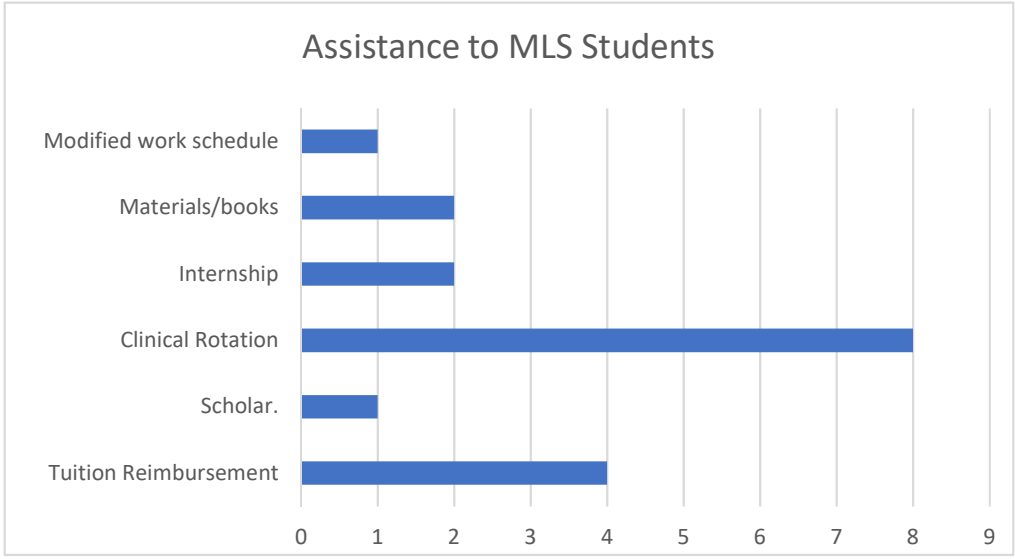


C.4 In what ways does your laboratory support the educational needs of prospective/current MLS students?

Explanations provided

Reimbursem	Scholar.	Rotation	Internship	Books	Work flex.
		1			
1					
		1			
1					
		1		1	
		1			
		1	1		
		1			
1		1			1
		1			
1					
	1		1	1	

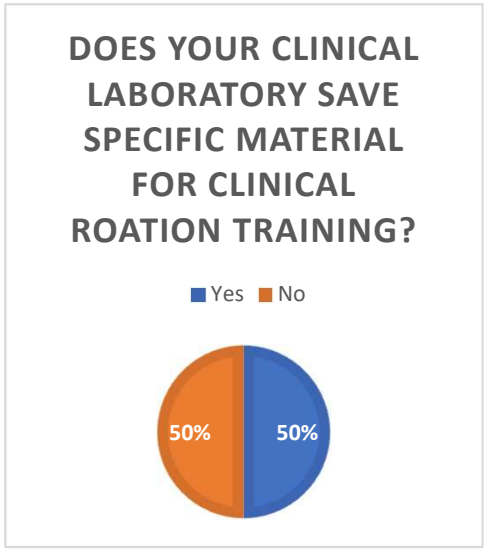
Reimbursem	Scholar.	Rotation	Internship	oks	work
4	1	8	2	2	1



c

	C.5a Does your laboratory support clinical rotations for MLS students		C.5b If yes, does your laboratory reserve specific training material for use with students during their clinical rotation?		
	Yes	*No*	*Yes*	*No*	
1					
2	1			1	*Our students are training by performing actual patient work. They work side*
3	1			1	*Students spend a week to observe a CAH, rural facility and watch our*
4					
5	1			1	*Follow same process as with new employees with more details when*
6	1		1		
7					
8	1		1		
9					
10	1		1		
11		1			
12					
13	1		1		
14	1		1		*Slides for peripheral smears and case studies*
15		1			
16	1		1		
17	1				
18	1		1		
19	1			1	*Use ISU or Weber check off sheets*
20	1			1	*Manufacturer's manual and package insert*
21					
22	1			1	*We walk them through what we do like a shaow first few days then we have*
23	1		1		*Real-life hands-on experience as well as some unknown in micro and*
24	1			1	*ISU provided materials; Intermountain Healthcare resources (procedure*
25	1			1	*students are taught how to use instrumentation under direct supervision.*
26	1		1		
27	1			1	Use ISU criteria as a guideline
	19	2	9	9	
		21		**18**	**Total**

C.5a Does your laboratory support clinical rotations for MLS students		C.5b If yes, does your laboratory reserve specific training material for use with students during their clinical rotation?	
Yes	*No*	*Yes*	*No*
90.48%	9.52%	50.00%	50.00%

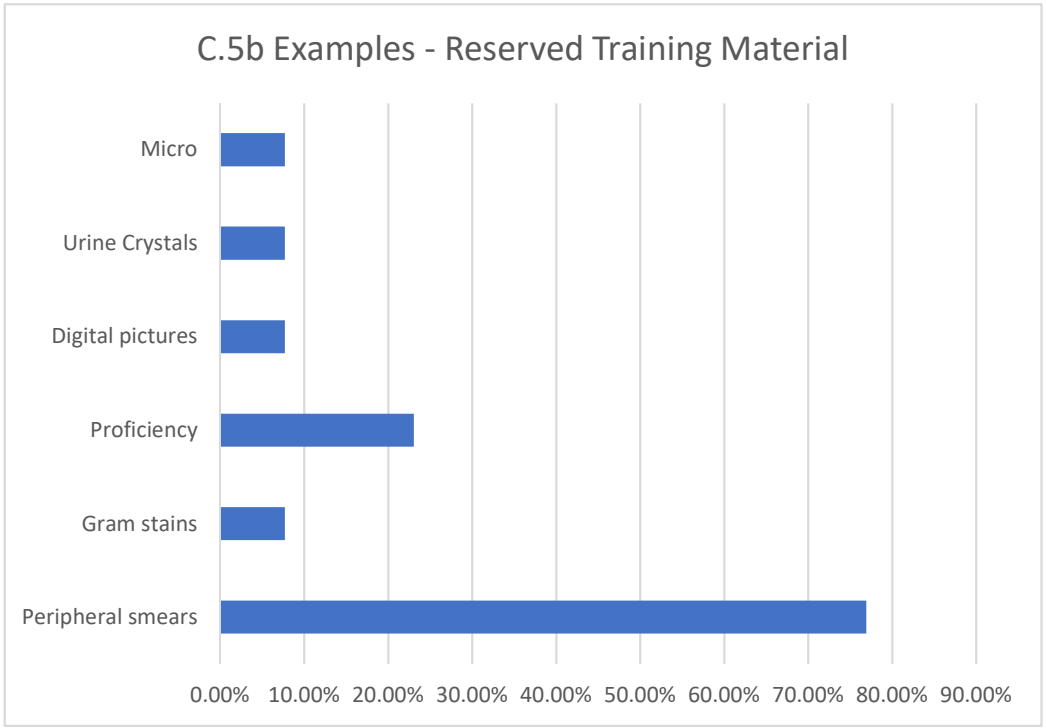


EXAMPLES PROVIDED

Does your laboratory save ususual patient results for future training, competency or reference?

smears	Gram stains	Proficiency	pictures	Crystals	Micro
1		1			
1					
1					
1		1	1		
					1
1					
		1			
1					
1	1			1	
1					
1					
1					
10	1	3	1	1	1

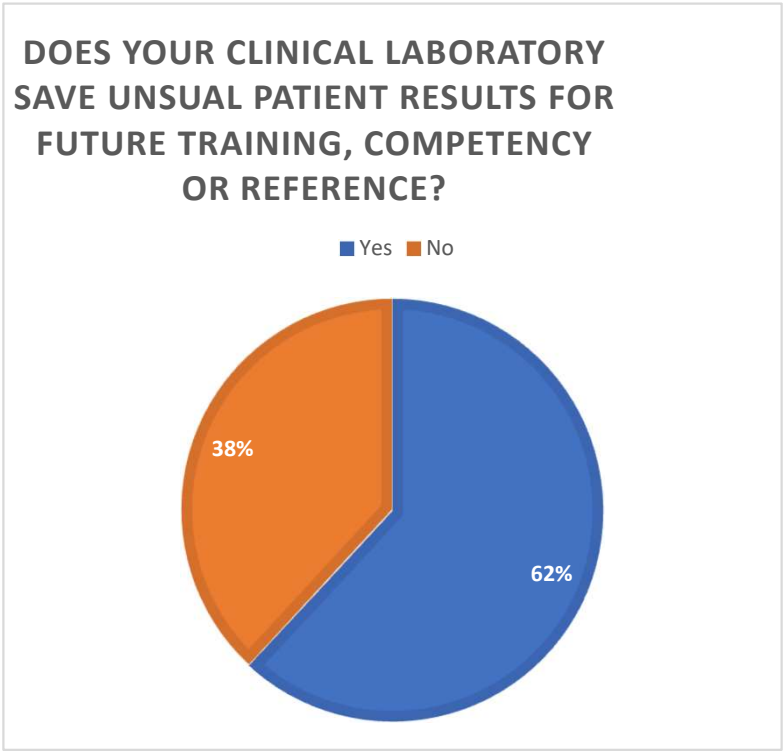
smears	Gram stains	Proficiency	pictures	Crystals	Micro
76.92%	7.69%	23.08%	7.69%	7.69%	7.69%



C.6 Does your laboratory save unusual patient results for future training, competency or reference?

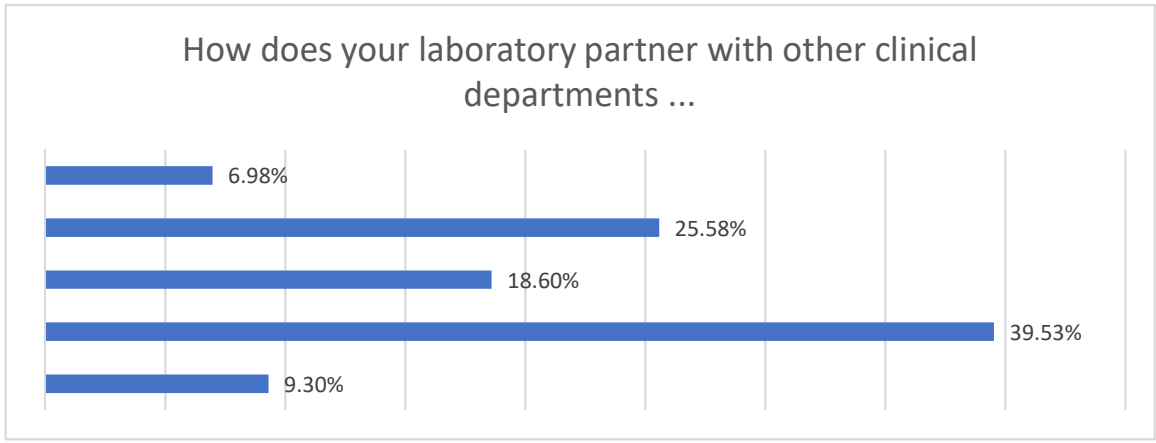
	Yes	*No*	*Example*
1			
2	1		bank antibody IDs.
3		1	
4			
5	1		Peripheral smears
6	1		Unusual slides for competency, unusual cases discussed at lab meeting
7			
8	1		hematology smears with abnormal cells/blasts
9			
10		1	
11		1	
12			
13	1		Heme slides, old CAP surveys, digital pictures from microscope
14	1		
15		1	
16	1		smears)
17		1	
18	1		
19		1	other techs.
20	1		Save proficiency testing from past
21			
22	1		Some peripheral blood smears
23	1		Slides (gram & wright). Urine crystals.
24	1		Peripheral blood smears
25	1		Adnormal blood smears
26		1	
27		1	
	13	8	

Yes	*No*	
61.90%	38.10%	**21 Total**

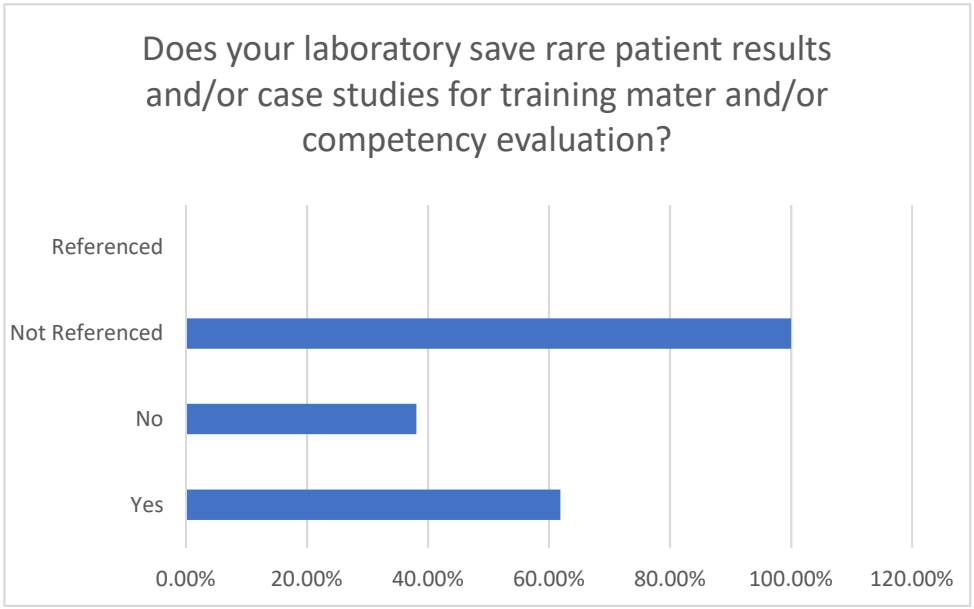


C.7 How does your laboratory partner with other clinical departments for training of clinical staff in regards to laboratory related tasks?

	All training of	*Laboratory pe*	*Laboratory pe*	*Laboratory st*	*Other*	
1						
2		1	1		1	Lab orientation for all clinical new hires.
3		1	1	1		
4						
5		1	1	1		
6		1		1		
7						
8		1			1	Lab hosts lab tours/orientations & Power point
9						
10		1	1	1		
11				1		
12						
13					1	Lab based orientations with new nursing staff. PPM
14		1	1	1		
15	1					
16		1				
17		1				
18	1	1	1	1		
19		1				
20		1	1	1		
21						
22	1	1		1		
23		1	1			
24	1	1				
25		1		1		
26		1				
27				1		
	4	17	8	11	3	**43**
	9.30%	39.53%	18.60%	25.58%	6.98%	



	C.8 Does your laboratory save rare patient results and/or case studies for training material and/or competency evaluation?				
	Yes	*These materia*	*These materia*	*No*	
1					
2				1	
3				1	
4					
5	1	1			
6	1	1			Referenced as needed
7					
8				1	
9					
10	1	1			
11				1	
12					
13	1	1			
14	1	1			
15				1	
16	1	1			
17	1	1			
18	1	1			
19				1	MTS offers competency modules
20	1	1			
21					
22	1	1			
23	1	1			
24				1	
25	1	1			
26				1	
27	1	1			
	13	13	0	8	**21 Total**
	Yes	*No*	*Not Referenc*	*Referenced*	
	61.90%	38.10%	100.00%	0.00%	



APPENDIX C

ASCLS Legislative Days Issue Brief 2015

Shortages of Clinical Laboratory Personnel Must Be Addressed

Position:

In light of the current employment outlook for clinical laboratory personnel, and other allied health professionals, as documented by the U.S. Department of Labor's Bureau of Labor Statistics (BLS), we urge Congress to request that the Government Accountability Organization (GAO) report to Congress on the following:

- The supply and demand projections over the next ten years for clinical laboratory personnel and other allied health professionals,
- The federal investment needed to address such shortages, and
- The methods needed to address pervasive shortages in chronically underserved urban and rural communities.

Rationale:

Clinical laboratory personnel and other allied health professionals are critical to our nation's health care. They provide a wide-range of diagnostic, technical, therapeutic and direct patient care and support services. These professionals are critical to physicians and nurses with whom they work and to the patients they serve. In total, clinical laboratory personnel and other allied health professions account for an estimated 60 percent of the entire health care workforce.

The demand for the services of clinical laboratory personnel and other allied health professions is growing. This is due to the aging population and the expanded access to health care services provided by health care reform. Long-term and pervasive shortages of qualified professionals to fill many clinical laboratory and allied health positions are expected. According to the BLS, many of the allied health professions are among the fastest growing occupations. For instance, the BLS projects job growth between 2014 and 2024 to increase by 34 percent for physical therapists, 29 percent for audiologists, 27 percent for occupational therapists, 21 percent for speech-language pathologists, and 16 percent for clinical laboratory personnel. In comparison, overall employment is expected to grow by about 7 percent over the same time period.

Limited or no federal investment is being provided to address the workforce shortage in allied health. The Allied Health Special Projects and Grants program, which historically has provided resources to health professions training programs to address these shortages has received no funding from Congress for nearly a decade and has not been supported in the Obama Administration's recent budget submissions.

In its September 2015 report to the Veterans Health Administration (VHA), the VA's Office of the Inspector General identifies nine health professions in critical need, one of which is clinical laboratory personnel. In FY2014 the VHA was only able to make considerable gains in eight of the nine professions in critical shortage with the exception of laboratory personnel. The VA gained 385 laboratory personnel but lost 360 for a net gain of only 25 or 6.5 percent. Part of the cause for the significant losses is the shortage of laboratory personnel and thus the difficulty of the VHA retaining qualified personnel. http://www.va.gov/oig/pubs/VAOIG-15-03063-511.pdf

APPENDIX C

In addition, industry data is showing that shortages are growing steadily as retirements in the laboratory community begin to pick up pace. The personnel are not being replaced at a fast enough rate and thus shortages are projected to grow rapidly.

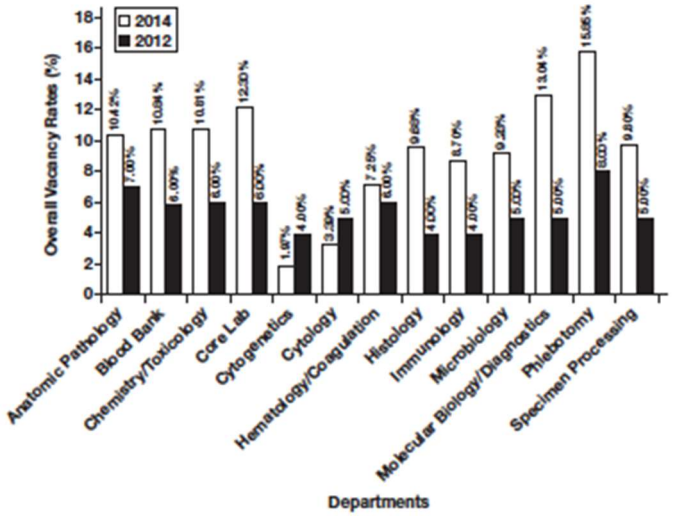


Figure 10 Overall vacancy rates (2012 vs 2014).

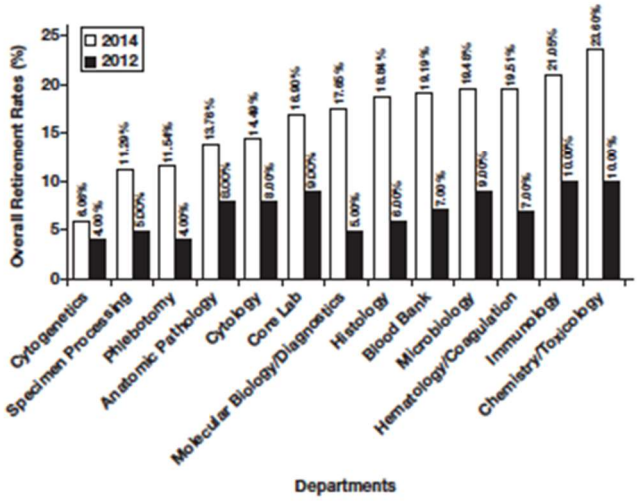
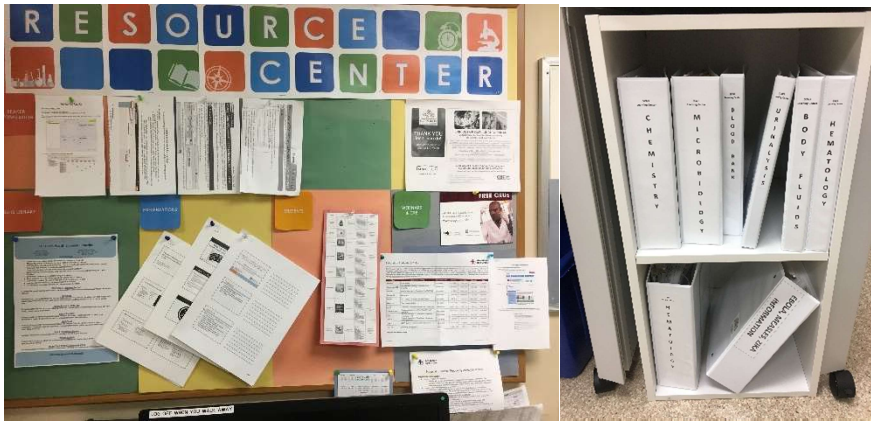


Figure 11 Overall retirement rates (2012 vs 2014).

For further information on this issue, please contact Patrick Cooney at 202-347-0034 x101 or via email at Patrick@federalgrp.com.

APPENDIX D

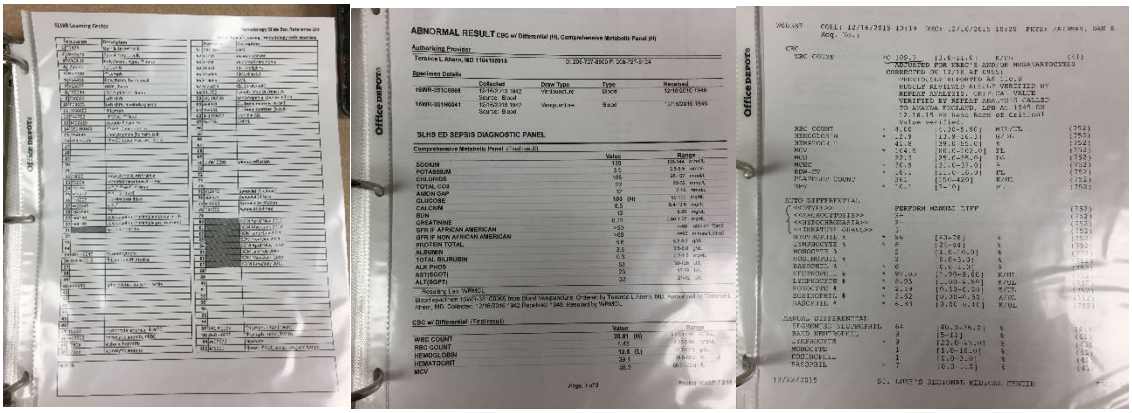
SLWR Resource Center



Resource Center Bulletin Board (right) and subject based binders (right).

A bulletin board serves as an interactive collaboration between professionals to disseminate useful information, tips/reminders, upcoming webinars/conferences, and other useful information. The binders are used as respository for training materials and case studies based on CLS discipline. Each binder has a table of contents for quick reference. The hematology materials are provided as an example below.

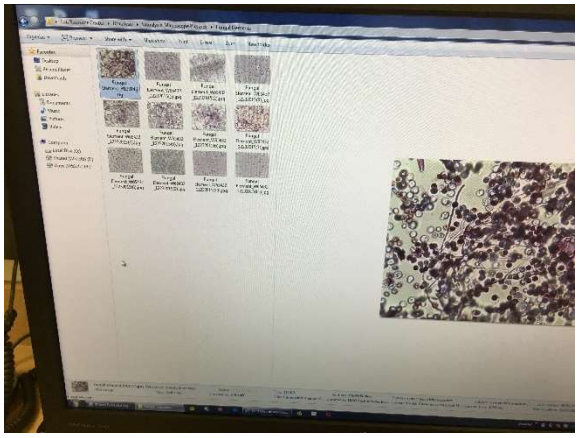
Hematology & microbiology reference slide boxes correlated to the binders.



Hematology Reference Binder: table of contents corresponds to slide box position (left) and two examples of patient print outs (center, right)

APPENDIX D

For materials that are not easily preserved (urinalysis, wet prep, body fluids etc). Images are captured using a Leica Microscope camera and saved to subject specific sub-folders within the Resource Center folder. An example of an image captured from a urine specimen is pictured below.



Urinalysis: fungal elements observed in urine.

The learning center is an on-going collaboration among the MLS professionals at SLWR with supervision of the binders given to the lead technician over each subject area. The scope of the resource center extends beyond simply saving patient results; it also includes building a trove of reference materials that can be used not only to educate laboratory staff, but also to begin to build interdepartmental training materials, case studies, and webinar/conference summaries.