Knowledge, Risk Perceptions, and Preventive Behaviors in COVID-19 Pandemic Among Medical Laboratory Students in Wyoming

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ABSTRACT

Following the first reported cases in China, the World Health Organization (WHO) declared the new COVID-19 a pandemic by March 11, 2020. Medical laboratory professionals and students are among the health workers that collect, process, and examine COVID-19 samples for accurate and efficient diagnosis. This present cross-sectional study intends to evaluate the self-reported knowledge, risk perceptions, and preventive behaviors in the COVID-19 pandemic among 44 medical laboratory students in Wyoming. The majority of the respondents were female, had an academic standing of junior or higher, were not employed in a clinical laboratory, and received COVID-19 education from both the WHO and Centers for Disease Control and Prevention. The respondents reported a high level of knowledge, moderate-risk perceptions, and low-preventive–behavioral performance in the COVID-19 pandemic. Pearson's product-moment correlation found a significant difference between the respondents' preventive behaviors and their receipt of COVID-19 education, and the risk perceptions were positively correlated to the respondents' preventive-behavioral–performance. Increased guidance through curricular intervention, mentorship, and continuing professional education is recommended to enhance the medical laboratory students' risk perceptions and preventive behaviors.

ABBREVIATIONS: CDC - Centers for Disease Control and Prevention, HCW - health care worker, MERS - Middle East respiratory syndrome, MLS - medical laboratory science/scientist, MLT - medical laboratory technician, PCR - polymerase chain reaction, SARS - severe acute respiratory syndrome, WHO - World Health Organization, WY - Wyoming.

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INDEX TERMS: COVID-19, medical laboratory science, knowledge, risk perceptions, preventive behaviors.

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INTRODUCTION

Multiple pneumonia cases were reported to the World Health Organization (WHO) Office in China on December 31, 2019. The cases were caused by an unknown pathogen, which was first identified in the city of Wuhan, Hubei.[1] The novel disease spread rapidly not only within China but also in several countries.[2] Through gene sequencing, experts found out that a new coronavirus virus was the etiologic agent of the acute respiratory tract infection.[3,4] Taxonomically, the new virus was named "2019-nCoV" before a revision to "SARS-CoV-2."[5] The WHO designated the new viral disease associated with SARS-CoV-2 as COVID-19 on February 12, 2020.[6] By March 11, 2020, the WHO declared the COVID-19 outbreak a pandemic.[7]

A study to review the clinical characteristics of COVID-19 reported that fever, cough, and difficulty of breathing are the most common clinical manifestations of the disease.[8] As of February 8, 2021, The WHO's Coronavirus Disease Dashboard indicated that 105 805 951 people tested with positive results for the virus and 2 312 278 had died globally.[9] In comparison with the other coronavirus outbreaks in the past, severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), in 2003 and 2012, respectively, COVID-19 killed more people than the combined fatalities of SARS and MERS despite the former's lower mortality rate.[10] Tracing its origin from China, the new disease has spread to many countries around the world.[11]

On January 20, 2020, the Centers for Disease Control and Prevention (CDC) announced the first COVID-19 case in the United States: a 35 year-old man from Washington state with a travel history to Wuhan, China.[12] Recent data show that the United States has 26 852 809 total cases, resulting in 462 037 deaths, with the highest infection rates found in California, Texas, Florida, New York, and Illinois.[13]

Pathologists, medical laboratory scientists (MLSs), medical laboratory technicians (MLTs), laboratory

personnel, and laboratory managers—including PhD-certified laboratory directors—are the pillars of the clinical laboratories, unsung heroes, and part of the front line in combatting COVID-19 through testing that contributes to accurate diagnosis and correct treatment.[14] Aside from laboratory professionals, MLS students in their clinical rotations are also at the forefront of the pandemic; they assist certified MLSs and MLTs in performing essential tasks such as swab collection and processing, real-time polymerase chain reaction (PCR) testing, interpretation of results, and convalescent plasma preparation.[15,16]

Nosocomial (hospital-related) transmission is considered one of the significant mechanisms of the new coronavirus spread.[17,18] The data available indicate that health care workers (HCWs) are valuable professionals in the front lines and are at high risk of contracting the virus.[19-21] In the United States, the most recent CDC statistics reported 397 545 COVID-19 cases among health care personnel and 1374 deaths.[22] As a result, HCWs are strained with uncertainties and challenges as they discharge their functions in addressing the onslaught of the pandemic.[23-26] With their close proximity with COVID-19 patients and clinical samples for laboratory testing, HCWs not only perform their health care duties, but are also required to simultaneously safeguard themselves.[27,28] Knowledge deficit on COVID-19 among medical and health professionals contributes to the potential spike of cases in the health care setting and communities.[27,29] Studies suggest that the extent of knowledge is directly related to a person's belief in disease susceptibility.[30-32]

The novelty of this COVID-19 disease and deficient literature creates an opportunity to investigate the knowledge, risk perceptions, and preventive behaviors exhibited by the HCWs—specifically the MLS and MLT students deployed to clinical laboratories for their clinical rotations during this ongoing global outbreak. Sufficient knowledge of the pathophysiology of the new pathogen, risk factors, and preventive measures that alter the pattern of behaviors of the clinical laboratory students, while performing their critical diagnostic duties, may assist in the eradication of this health threat.

MATERIALS AND METHODS

Study Design

This current investigation is a cross-sectional, descriptive study.

Setting and Sample

Forty-four students, the total population of the university-based Bachelor degree in MLS and college-based Associate degree in MLT programs in the state of Wyoming (WY), were the participants of this study. Both degrees have clinical rotation requirements either on-campus or in multiple clinical affiliation centers in WY. A cohort of medical laboratory students are assigned to clinical laboratories statewide and expected to handle clinical specimens, including nasopharyngeal and oropharyngeal swabs in COVID-19 testing. The participants answered an online questionnaire. The response rate was 100%.

Ethical Consideration

The University of WY's Institutional Review Board permitted this research and issued an exemption approval. Likewise, both the MLS- and MLT-program directors approved the conduct of the study per the proposed protocols. An email describing the purpose of the survey and instructions on how to complete the online questionnaire was sent to the participants. Participants were not provided with any kind of compensation. To ensure anonymity and confidentiality, identifiers—such as names—were not included in the questionnaire. The corresponding author of related research granted permission for the adoption and use of their data-gathering tool.[29]

Instrument

A validated questionnaire[29] was used to measure the knowledge, risk perceptions, and preventive behaviors of the clinical laboratory students in WY during the ongoing COVID-19 global outbreak. The questionnaire has 4 parts that included the demographic details of the participants (part 1), their knowledge (part 2), risk perceptions (part 3), and preventive behaviors (part 4) in the COVID-19 pandemic.

DEMOGRAPHICS OF PARTICIPANTS

The participants' gender, age, education level, employment in a clinical laboratory, receipt of COVID-19 relevant education, and source of COVID-19 education constituted the demographic profile.

KNOWLEDGE IN COVID-19 PANDEMIC

Fifteen items were reflected in the second part of the online questionnaire that elicited specific information about the new coronavirus infection. The 15 true or false statements related to the fundamental scientific nature and the causative agent of COVID-19 (3 statements), its incubation period and symptoms (2), diagnosis (1), mode of transmission (2), community prevention (4), preventive measure per health care professional (1), treatment (1), and referral system for suspected cases (1). One point was assigned for a correct answer, and zero points for a wrong response or if the participant did not know the right answer. The percentage of the correct answers was computed: 75% and above indicates a high-knowledge level, 50%–75% indicates a moderate-knowledge level, and

50% and below indicates a low-knowledge level. The content validity and reliability were tested and yielded acceptable results.[29]

RISK PERCEPTION IN COVID-19 PANDEMIC

The third part of the online tool was composed of 2 items, which evaluated the participants' risk perception on COVID-19. A Likert scale was used, with a score of 1.00 representing "not at all," 4.00 indicating "absolutely yes," and a total score between 2 and 8. Score ranges of 2–3, 4–5, and 6–8 are interpreted as low-risk perception, moderate-risk perception, and high-risk perception, respectively. Content validity and reliability of this scale were established.[29]

PREVENTIVE BEHAVIORS IN COVID-19 PANDEMIC

Nine items comprised the final section of the online-data–collection tool, which assesses preventive practices against COVID-19. Five statements depicted the reduction in the daily use of public spaces, 1 dealt with coughing etiquette, 2 for proper handwashing and disinfection of surfaces, and 1 for a conversation with immediate family members and friends regarding prevention. For each item, participants responded "Yes" to signify agreement and "No" for disagreement. One point was awarded for "Yes" answers (appropriate behaviors) and zero for "No" responses (inappropriate behaviors). The percentage of the "Yes" responses was calculated. A 75% score and higher was indicative of high-preventive–behavioral performance and less than 75% was indicative of low-preventive–behavioral performance. Validation and testing of the reliability of this scale were performed, and the results were adequate.[29]

Data Collection

The University of WY Qualtrics survey tool was employed to create an online questionnaire (https://uwyo.sjc1.qualtrics.com/jfe/form/SV_eA6QiJ0a0vxDDCJ). Aware of the risk of face-to-face data collection, an email with the questionnaire's link was sent to the participants. The email indicated the intent of the study as well as the instructions for completing the survey. The collection of data was made between August and October of 2020.

Statistical Analysis

Data analyses were performed using SPSS v. 22.0 (IBM Corp, Armonk, NY). Mean, SD, frequency count, and percentage were used for the variables (demographics, knowledge, risk perception, and preventive behaviors). A T test, analysis-of–variance with Tukey-honest significant–difference test, and Pearson *r* correlation were employed to establish the associations or differences among knowledge, risk perception, and demographics. In examining the influence of knowledge and risk perception on the preventive role, standard multiple regression analyses were applied.

RESULTS

Demographics of Respondents

A total of 44 MLT and MLS students responded to the questionnaire, yielding a response rate of 100%. The mean age was 27.70 years. Among the respondents, 12 (27.3%) were male, 32 (72.7%) were female, 15 (34.1%) of the students were in their freshman or sophomore year, and 29 (65.9%) were in their junior year or higher. The majority (54.5%) of the participants were not employed in the clinical laboratory at any capacity but had received education on COVID-19 (61.4%). The individuals that answered "Yes" to receiving COVID-19 education were asked the origin of the information. Almost half (47.7%) stated both the WHO and CDC as the education source, and 15.9% reported other resources. The respondents' other resources included college and university guidance, higher education courses, and work-related training.

Table 1. Demographic variables of the respondents

Variable	Mean (SD)	Range
Age	27.70 (6.29)	19–45
Gender	n	%
Male	12	27.3
Female	32	72.7
Academic level		
Freshman	1	2.3
Sophomore	14	31.8
Junior	9	20.5
Senior	20	45.5
Current employment		
No	24	54.5
Yes	20	45.5
Receipt of COVID-19 education		
No	17	38.6
Yes	27	61.4
If yes, sources of education		
WHO and/or CDC	3	6.8
Federal and/or state guidance	2	4.5
Both	21	47.7
Others	7	15.9

N = 44.

Students' Knowledge in the COVID-19 Pandemic

Table 2 depicts the analyses of student's knowledge of COVID-19. Based on the correct response, the mean correct answer was 83.3%. The majority of students (80%) had high knowledge, and 20% had a low level of related knowledge of the topic. The 2 highest-scoring items of students' knowledge in the COVID-19 pandemic pertained to the transmission of the virus. A majority (97.7%) of the respondents correctly associated COVID-19 transmission to respiratory droplets produced from speaking, coughing, and sneezing. In contrast, 100.0% of the respondents inferred that transmission occurs through close contact with an infected individual. The 3 lowest scoring items were in relation to, "All the people in society should wear masks," "Only during intubation, suction, bronchoscopy, and cardiopulmonary resuscitation do you have to wear an N95 mask," and "The disease can be treated by the usual antiviral drugs." These incorrect responses scored 31.8%, 38.6% and 47.7%, respectively.

COVID-19 Risk Perceptions

As can be gleaned in Table 3, 2 items depicting the respondents' risk perceptions of COVID-19 were assessed: "I may be infected with COVID-19 more easily than others" and "I am afraid to be infected with COVID-19." Respectively, the mean scores were 2.20 and 1.95, indicating a low-risk perception. With a range of 2.00–8.00, the overall score of 4.16 represents a moderate-risk perception among clinical laboratory students.

Preventive Behaviors in COVID-19 Pandemic

Table 4 exhibits the self-reported preventive behaviors in the COVID-19 pandemic. The total percent of correct responses (72.7%) indicates low-preventive behavior among the respondents. The highest score (93.2%) related to the avoidance of coughing around people as much as possible. In comparison, the lowest score (59.1%) pertained to the statement, "I canceled or postponed meetings with friends, eating out, or attending sporting events."

Table 2. Descriptive analyses of the clinical laboratory students' knowledge in COVID-19 pandemic

Item (True/False)	Correct Response, n (%)	Incorrect Response, n (%)
1. COVID-19 is a respiratory tract infection caused by a new species of the coronavirus family.	42 (95.5%)	2 (4.5%)
2. The first case of COVID-19 was diagnosed in Wuhan, China.	44 (100.0%)	0 (0.0%)
3. The origin of COVID-19 is not clear, but it seems that it has been transmitted to humans by seafood, snakes, or bats.	37 (84.1%)	7 (15.9%)
4. Its common symptoms are fever, cough, and shortness of breath, but nausea and diarrhea were reported rarely.	40 (95.5%)	4 (9.1%)
5. Its incubation period is up to 14 days with a mean of 5 days.	42 (95.5%)	2 (4.5%)
6. It can be diagnosed by a PCR test on samples collected from nasopharyngeal and oropharyngeal discharge or sputum and bronchial washing.	40 (95.5%)	4 (9.1%)
7. It is transmitted through respiratory droplets produced from speaking, coughing and sneezing.	43 (97.7%)	1 (2.3%)
8. It is transmitted through close contact with an infected case (especially in family, crowded places, and health centers).	44 (100.0%)	0 (0.0%)
9. The disease can be prevented through hand washing and personal hygiene.	40 (95.5%)	4 (9.1%)
10. A medical mask is useful to prevent the spread of respiratory droplets when coughing.	42 (95.5%)	2 (4.5%)
11. The disease can be prevented by eliminating close contact such as shaking hands and kissing, not attending meetings, and frequent hand disinfection.	43 (97.7%)	1 (2.3%)
12. All the people in society should wear masks.	14 (31.8%)	30 (68.2%)
13. Only during intubation, suction, bronchoscopy, and cardiopulmonary resuscitation do you have to wear an N95 mask.	17 (38.6%)	27 (61.4%)
14. The disease can be treated by the usual antiviral drugs.	21 (47.7%)	23 (52.3%)
15. If symptoms appear within 14 days from direct contact with a suspected case, the person should call and seek advice from a nearby public health center.	41 (93.2%)	3 (6.8%)
	Mean (SD)	Range
Total score	12.50 (1.19)	9.00–15.00
Percentage	83.3% (7.94)	60.0%–100.0%

N = 44.

Table 3. Descriptive analyses on the COVID-19 risk perceptions among the clinical laboratory students

Item	Mean	SD	Range	
			Lower Limit	Upper Limit
1. I may be infected with COVID-19 more easily than others.	2.20	1.00	1.00	4.00
2. I am afraid to be infected with COVID-19.	1.95	0.91	1.00	4.00
Overall	4.16	1.66	2.00	8.00

N = 44.

Table 4. Descriptive analyses of the clinical laboratory students' preventive behaviors in COVID-19 pandemic

Item (Yes/No)	Yes Response	
	n	%
1. I canceled or postponed meetings with friends, eating out, or attending sporting events.	26	59.1
2. I reduced the use of public transportation (ie, taxi, uber, bus, plane).	30	68.2
3. I went shopping less frequently.	31	70.5
4. I reduced the use of closed spaces such as the library, theater, and cinema.	33	75.0
5. I avoided coughing around people as much as possible.	41	93.2
6. I avoided places where a large number of people are gathered.	34	77.3
7. I increased the frequency of cleaning and disinfecting items that can be easily touched with the hands (ie, door handles and surfaces).	30	68.2
8. I washed my hands more often than usual.	29	65.9
9. I discussed with my family and friends about COVID-19 preventions.	34	77.3
Total	72.7	

N = 44.

Associations Between Variables

Presented in Table 5 are the results of the tests for association among variables. Participant demographics correlated to COVID-19 knowledge, risk perceptions, and the preventive behavior variables were evaluated. A positive relationship is indicated between the receipt of COVID-19 education and preventive behavior ($P < 0.05$).

Correlations Among Knowledge, Risk Perceptions, and Preventive Behaviors

A positive correlation between risk perceptions and preventive behaviors is also evident when evaluating the correlations among knowledge, risk perception, and preventive behaviors ($P < 0.05$), as indicated in Table 6.

DISCUSSION

The WHO declared the new COVID-19 as a pandemic on March 11, 2020, a few months after it was first discovered in Wuhan, China.[1,7] The emergence of COVID-19 and its high transmissibility have created extreme anxiety and fear among the population and communities.[33] Health and medical professionals are not exempt from the high levels of fear and anxiety induced by the pandemic's impact.[29] Allied health professionals who are essential in the laboratory diagnosis of diseases include pathologists, MLSs, MLTs, medical laboratory students, and laboratory managers—including PhD-certified laboratory directors. It has been identified that they are susceptible to contracting infections, and they are at a higher risk of COVID-19 because of increased exposure.[14-16,29] The assessment of knowledge, preventive behaviors, and risk perceptions of medical laboratory students can contribute baseline information on curricular enhancement, especially in clinical practicum policies.

An internet search yielded that this present cross-sectional study marks the first time that the knowledge, risk perception, and preventive behaviors in the COVID-19 pandemic have been investigated among medical laboratory students after the discovery of the novel coronavirus. This study is intended to measure the extent of knowledge, risk perception, and preventive-behavioral performance of the MLS and MLT students. Correlation among these 3 variables was performed, as well as the determination of the significant difference in the participants' COVID-19 knowledge, risk perception, and preventive behavior based on their demographics.

Table 5. Results of the tests for associations among variables

Variables	COVID-19 Knowledge			Risk Perceptions			Preventive Behaviors		
	Mean (SD)	Statistical Test	*P*	Mean (SD)	Statistical Test	*P*	Mean (SD)	Statistical Test	*P*
Age		$r = 0.24$	0.111		$r = -0.01$	0.955		$r = -0.02$	0.896
Gender									
Male	85.00 (7.04)	$U = 168.00$	0.510	4.42 (1.88)	$U = 179.00$	0.727	66.67 (38.78)	$U = 187.50$	0.903
Female	82.71 (8.27)			4.06 (1.58)			75.00 (23.44)		
Level of education									
Freshman/Sophomore	83.56 (6.60)	$U = 210.50$	0.857	3.87 (1.64)	$U = 187.50$	0.448	65.19 (24.80)	$U = 144.50$	0.064
Junior/Senior	83.22 (8.66)			4.31 (1.67)			76.63 (29.45)		
Current employment									
No	81.67 (7.68)	$U = 176.50$	0.119	4.04 (1.76)	$U = 212.00$	0.501	66.67 (29.12)	$U = 168.50$	0.084
Yes	85.33 (7.98)			4.30 (1.56)			80.00 (25.00)		
Receipt of COVID-19 education									
No	83.53 (6.72)	$U = 220.50$	0.821	3.88 (1.83)	$U = 185.00$	0.274	59.48 (30.42)	$U = 128.50$	0.013*
Yes	83.21 (8.75)			4.33 (1.45)			81.07 (23.63)		

* = significant at 0.05 level; N = 44.

Table 6. Correlations among knowledge, risk perceptions, and preventive behaviors

Variables	COVID-19 Knowledge		Risk Perceptions	
	r	*P*	*r*	*P*
Risk perceptions	−0.20	0.206		
Preventive behaviors	−0.18	0.250	0.30	0.048*

* = significant at 0.05 level; N = 44.

This current study revealed that the clinical laboratory students have high knowledge of the COVID-19 pandemic with an average of 83.3%. The participants obtained an overall score of 4.16 in risk perception, which was interpreted as a moderate-risk perception. Interestingly, with a mean of 72.7%, the participants obtained a low-preventive–behavioral performance in response to the COVID-19 pandemic.

The high level of COVID-19 knowledge among the clinical laboratory students (83.3%) is comparable to the good knowledge of health care students in Turkey (90.3%),[34] undergraduate life sciences students in Italy,[35] and medical students in Iran (86.96%).[29] A study in front-line physicians in Pakistan indicated a moderate to a high level of knowledge in the COVID-19 outbreak.[36] Notably, the clinical laboratory students surveyed scored the highest in 2 items related to the transmission of COVID-19: "It is transmitted through respiratory droplets produced from speaking, coughing and sneezing" (97.7%) and "It is transmitted through close contact with an infected case (especially in family, crowded places, and health centers)" (100%). University students in South Korea, China, and Japan manifested a good extent of knowledge about COVID-19's transmission routes.[37] Furthermore, the clinical laboratory students had low knowledge of 3 items relating to the proper use of masks and treatment. Scores of 31.8%, 38.6%, and 47.7% with "All the people in society should wear masks," "Only during intubation, suction, bronchoscopy, and cardiopulmonary resuscitation do you have to wear an N95 mask," and "The disease can be treated by the usual antiviral drugs," were documented, respectively. Similarly, low knowledge on wearing masks by everyone in

the community and the treatment of COVID-19 with antiviral drugs were inferred by one study.[34] Another research obtained comparable findings regarding the use of N95 masks.[29] The use of face masks has been regarded as a forefront in prevention and containment of disease transmission.[38] Face masks are a component of the personal protective equipment necessary for clinical laboratory students and professionals by providing a barrier when they are processing and examining specimens in the clinical laboratory. The insufficient knowledge on face masks is the basis for underscoring self-protection practices in the MLS curriculum, especially in the conduct of laboratory classes and clinical rotations. Moreover, the reported behavior of the medical laboratory students in adherence to the use of face masks may have been because of the absence of a mask mandate in WY during the data collection. The order for a statewide mandate for wearing a mask from the Office of the Governor of WY was implemented on December 9, 2020 and was lifted on March 16, 2021.[39,40]

Along with the COVID-19 risk perceptions among the clinical laboratory students in WY, the overall moderate-risk perception was similar to studies involving medical and health care students.[29,34] In contrast, studies with medical students in Saudi Arabia and college students in China reported a high-risk perception of COVID-19.[41,42] The MLS program can take this moderate-risk perception of the students on COVID-19 and other highly infectious diseases as guidance in course improvements such as in microbiology, virology, and epidemiology.

Another interesting finding of this present study is the low-preventive–behavioral performance of the clinical laboratory students against COVID-19. These results did not concur with studies indicating high-preventive–behavioral performance in medical, health care, and nursing students.[29,34,43,44] Medical laboratory educators need to consider these alarming results and adopt preventive practices and laboratory safety measures. Health safety and prevention protocols should be ingrained among students by including these concepts in all professional courses.

In correlating the participants' demographics in this study, the receipt of COVID-19 education was the only variable that has shown a positive relationship to preventive behaviors. It implies that clinical laboratory science students who obtained information about COVID-19 from various sources such as the WHO, CDC, or federal and local guidance exhibit higher-preventive–behavioral performance. Accessible and informative guidance from these agencies serves as valuable tools for avoiding contraction of an infectious disease.

The correlations among knowledge, risk perceptions, and preventive behaviors were also measured. Interestingly, there was a positive correlation between the clinical laboratory students' risk perceptions and their preventive behaviors. This indicates that the higher their self-reported risk perceptions, the more they become compliant to COVID-19 preventive measures. This finding is consistent with the global study on COVID-19 risk perceptions among 10 countries in America, Asia, and Europe, where it was concluded that risk perceptions have a significant correlation with the preventive-health behaviors adopted by respondents.[45] However, a study among Iranian medical students reported a negative correlation between risk perceptions and preventive behaviors.[29]

Limitations of the Study

The study involved only the entire population of the medical laboratory students in the state of WY. The online administration of the data-gathering tool may have influenced the responses of the participants. Nonetheless, this investigation's findings can serve as valuable input to curricular improvements in the field of MLS.

CONCLUSION

The medical laboratory students in WY exhibited a high level of self-reported knowledge, moderate-risk perceptions, and low-preventive–behavioral performance in the COVID-19 pandemic. Students who received COVID-19 education from different sources reported higher preventive behaviors. Consequently, the risk perceptions are positively correlated to their preventive behaviors. Risk perceptions and preventive behaviors could be rectified and improved through curricular intervention and fortified guidance in their MLS education and clinical training, along with professional courses with laboratory components. Examples of special topics include laboratory safety practices and review of the biosafety protocols in handling viral specimens and epidemiology—both with emphasis pandemics. The provision of mentorship and continuing professional education that addresses COVID-19 knowledge and preventive behaviors in coordination with professional societies—such as the American Society for Clinical Laboratory Science—and local, state, and federal government health institutions may result in increased risk perception and preventive behaviors among laboratory personnel, HCWs, and community members.

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