Quality of Life and Its Influence on the Academic Performance of Medical Laboratory Students in Wyoming

JED DOXTATER, CHARLIE CRUZ, JONAS CRUZ

ABSTRACT

The quality of life (QOL) pertains to all the collective perceptions of satisfaction of an individual's life experiences. Among higher educational institutions, utilizing QOL as a predictive measure of the academic performance of their students is relevant. In this study, a sample of 44 medical laboratory students in Wyoming was surveyed to correlate their QOL with their academic performance. Analysis revealed that the majority of the respondents were female, had a senior class standing, and had a mean grade point average of 3.22. The respondents reported the highest and lowest QOL in the environmental and physical domains, respectively. Pearson's Product-Moment Correlation indicated a moderately positive correlation between the social QOL domain and the academic performance of the respondents. Strong positive correlations were reported among the QOL domains, overall perceptions of QOL, and overall perceptions of health. In conclusion, the QOL in the social domain of the respondents has a moderately positive influence on their academic performance. Improvement of academic guidance and consultation as well as student services is recommended for the enhancement of the QOL of medical laboratory students.

ABBREVIATIONS: GPA - grade point average, HEI - higher educational institution, MLS - medical laboratory science, MLT - medical laboratory technician, QOL - quality of life, WHO - World Health Organization, WHOQOL - World Health Organization Quality of Life.

INDEX TERMS: academic performance, medical laboratory students, quality of life, Wyoming.

Clin Lab Sci 2019;32(3):122–130

***Jed Doxtater**, University of Wyoming*

***Charlie Cruz**, University of Wyoming*

***Jonas Cruz**, Shaqra University*

***Address for Correspondence: Charlie Cruz**, University of Wyoming, ccruz6@uwyo.edu*

INTRODUCTION

Globalization and competition are driving forces for higher educational institutions (HEIs) to design strategies to recruit and retain top-caliber students.[1] Managers, administrators, and the teaching staff of HEIs are interested in how to use and improve quality of life (QOL) as a measure to enhance student services.[2] Numerous studies on the QOL have been conducted among undergraduate students,[3,4] including those that investigated the correlation of the QOL with their academic performance.[5,6] The World Health Organization (WHO), in 1996, popularized QOL and defined it as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns."[7] The meaning of QOL underscores the variation in a person's lifestyle that impacts his or her gratification in life.[8,9] Nevertheless, studies reported variations on some facets of this definition and its existing indicators, such as income and life satisfaction.[5]

Recently, there has been a keen interest in exploring the QOL of students in the various areas of higher education,[5,10,11] with medical education being among the most extensively studied.[6,12-14] Medical-related degrees are rigorous, and students encounter stressful circumstances in their education and clinical training, thus fueling interest in understanding their QOL.[15] Challenges in academics and achievements confront both medical and preclinical students.[16] A study reported that preclinical students' academic performance is directly related to their QOL.[6,17] Also, a past study revealed that the quality of academic life has positively and significantly influenced the students' academic performance.[18] One medically oriented program is laboratory medicine, which includes the medical laboratory science (MLS) and medical laboratory technician (MLT) programs. Students in MLS and MLT programs are intensively trained in the performance of laboratory testing on clinical patient samples that paves the way for disease diagnosis and therapy monitoring with the results that the clinical laboratory provides.[19] An earlier study indicated that MLS requires critical thinking in addressing the numerous challenges and understanding the intricate details of the profession.[20] Based on the National Accrediting Agency for Clinical Laboratory Science, the essential functions of a medical laboratory scientist covers academic performance, cognitive and intellectual abilities, communication, ethical standards, observation,

psychomotor skills, and social and behavioral attributes.[21] Consequently, in the context that laboratory medicine is regarded as a stressful program and considering the absence of relevant studies that measure the QOL of MLS and MLT students that correlate it with their academic performance, it is befitting to conduct this study.

The medical laboratory students' academic performance is measured as their cumulative grade point average (GPA) in their final semester. In a comparative study conducted, the final GPA scores predicted the academic preparedness of both distance and on-campus clinical laboratory science students.[22] One study among medical students reported that academic performance is positively related to professional competence.[23] Thus, good academic performance may influence the professional conduct of both the medical and clinical laboratory professionals in dealing with their patients and colleagues.

Studies on the QOL of medical laboratory students are deficient in the United States and around the world. More so, investigations to correlate academic performance and QOL of MLS and MLT students are absent. This present study is aimed at measuring the QOL of the medical laboratory students in Wyoming and correlating the 4 domains, namely physical, psychological, environmental, and social relations, with their academic performance.

MATERIALS AND METHODS

Study Design

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

Setting and Sample

This study was conducted at a university and college in Wyoming, exclusively offering the associate in MLT and bachelor of science in MLS. The curricula of both programs entail clinical rotations in clinical laboratory affiliates as well as in-house advanced clinical practicums at teaching laboratories. Questionnaires were distributed to 44 medical laboratory students, the total student population in the MLS and MLT programs, who were recruited to participate in this study, giving a response rate of 100%.

Ethical Consideration

The Institutional Review Board of the University of Wyoming issued review exemption and approved the conduct of this study. Moreover, the program directors of the MLT and MLS programs reviewed and approved the study protocol, and the protocols in conducting research at both institutions were observed up to the completion of the study. Questionnaires with an attached cover letter explaining the details of the survey were distributed to respondents, and they were reassured that they could decline to participate in this study without any detrimental consequences. Respondents gave verbal permissions before receiving the questionnaires. Confidentiality of the identity of the participants and the results was strictly enforced. The entire data collection process did not entail any compensation. Permission was sought to use the English version of the World Health Organization Quality of Life (WHOQOL)-BREF.

Instrument

This study used a 3-page questionnaire as the data gathering tool. The first section of the questionnaire included the GPA scores, gender, and year level of the respondents. The second section consisted of the survey for measuring the QOL (Appendix A). The QOL of the medical laboratory students was assessed with the WHOQOL-BREF.[24,25] The WHOQOL-BREF is the short version of the WHOQOL-100 scale.[24,25] Widely accepted and translated into multiple languages, this instrument contains a set of conveniently simple QOL measures regarding the 4 domains, namely physical health, psychological health, social relations, and environment. These 4 domains consisted of 24 separate parameters with the physical health, psychological health, social relations, and environment domains containing 7, 6, 3, and 8 parameters, respectively. Based on the scoring system of 0–100, responses of the respondents were recorded. Higher scores represent a better QOL in each dimension. The scale has been utilized in measuring QOL, and its validity and reliability have been previously established.[24,25]

Data Collection

Data collection was conducted between January and March 2019. The questionnaires were given to the respondents during their on-campus laboratory sessions. Before the respondents began answering the survey questions, the researchers described the purpose of the study and gave instructions on how to answer the questionnaire survey. The respondents were given 20–25 minutes to complete the survey questions and were directed to place completed questionnaires into envelopes and seal them to reassure anonymity. The respondents put the sealed enveloped on the front table of the lab room.

Statistical Analysis

Data analyses were completed with SPSS v. 22.0 (IBM Corp., Armonk, New York, USA). Frequency counts and percentages were utilized for the GPA scores, gender, and year level demographics of the respondents. The QOL of the medical laboratory students was computed with means and standard deviations. To determine the correlation of the QOL of the medical laboratory students to their academic performance, Pearson's Product-Moment Correlation was employed. The level of significance was set at 0.05.

RESULTS

Table 1 shows a summary of the respondents' demographic characteristics. As reflected, most of the respondents were female (93.2%). Most of the respondents were in the senior year of the program (56.8%), whereas 9.1%, 20.5%, and 13.6% were enrolled in the freshman, sophomore, and junior year, respectively. The mean GPA of the students was 3.22 ($SD = 0.64$, range = 0.87–4.00).

The average overall QOL perception was 4.11 ($SD = 0.81$, range = 2.00–5.00), whereas the average overall health perception was 3.75 ($SD = 0.84$, range = 2.00–5.00). The respondents reported the highest QOL in the environmental domain ($M = 72.87$, $SD = 15.32$), which was followed by social relationship domain ($M = 68.94$, $SD = 26.25$) and psychological domain ($M = 64.49$, $SD = 11.31$). The poorest QOL domain was perceived by the respondents in physical domain ($M = 53.08$, $SD = 11.36$; see Table 2).

Table 3 shows the results of the correlation tests between the students' GPA and QOL. As indicated, the social relationship domain had a moderate positive correlation with the students' GPA ($r = 0.31$, $p = .039$). Strong positive correlations were observed among the domains of the QOL, overall perceptions of QOL, and overall perceptions of health.

Table 1. Demographic characteristics of the respondents

Variable	*n*	%
Gender		
Male	3	6.8
Female	41	93.2
	Academic level	
Freshman	4	9.1
Sophomore	9	20.5
Junior	6	13.6
Senior	25	56.8
	Mean (SD)	Range
GPA	3.22 (0.64)	0.87–4.00

DISCUSSION

The study investigated the QOL of medical laboratory students in Wyoming using the standard WHOQOL-BREF tool. The tool measures the environmental, social relations, psychological health, and physical health domains of the respondents. Access to health care services, financial resources, home environment, information and skills, leisure and recreation, opportunities for new information, physical safety and security, and transport were assessed in the environmental domain. The social relation's domain includes measurement of the participants' personal relationships, sexual satisfaction, and social support. Psychological health encompasses the body image, learning, thinking and concentration, meaningfulness of life, negative and positive feelings, personal beliefs, self-esteem, and spirituality of the participants. Lastly, physical health covers the respondents' daily living activities, dependence on medication, energy and fatigue, mobility, pain and discomfort, rest and sleep, and work capacity.

Environmental Domain

Results of this study indicated that the respondents reported the highest QOL in the environmental domain. One requirement for admission to the MLT or MLS program is proof of health insurance, reaffirming that these students have access to health care services. Along with financial resources, most of the medical laboratory students were employed to support their college education aside from the availability of multiple scholarship opportunities from benefactors and government aids. This finding is in contrast with a study that determined financial difficulty is common among medical students around the world.[26] The high QOL of the respondents is inconsistent with studies conducted in other countries, where the environmental domain was ranked second, third, or even last.[6,13,14]

Social Relations Domain

Interestingly, of all the 4 domains of QOL, only social relations have a moderately positive correlation to the academic performance of the medical laboratory students.

Table 2. Quality of life of the respondents

			Range	
Quality of Life	**Mean**	**SD**	**Lower Limit**	**Upper Limit**
Overall perception of quality of life	4.11	0.81	2.00	5.00
Overall perception of health	3.75	0.84	2.00	5.00
Physical domain	53.08	11.36	28.57	75.00
Psychological domain	64.49	11.31	37.50	83.33
Social relationship domain	68.94	26.25	16.67	100.00
Environmental domain	72.87	15.32	34.38	96.88

Table 3. Correlations between the respondents' grade point average and quality of life

	Grade Point Average		Overall Perception of Quality of Life		Overall Perception of Health		Physical Domain		Psychological Domain		Social Relationship Domain	
	r	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*
Overall perception of quality of life	0.03	.841										
Overall perception of health	0.12	.425	0.69	<.001***								
Physical domain	0.18	.237	0.64	<.001***	0.48	.001**						
Psychological domain	-0.01	.954	0.71	<.001***	0.60	<.001***	0.69	<.001***				
Social relationship domain	0.31	.039*	0.60	<.001***	0.63	<.001***	0.64	<.001***	0.61	<.001***		
Environmental domain	0.12	.454	0.67	<.001***	0.55	<.001***	0.62	<.001***	0.74	<.001***	0.64	<.001***

*Significant at .05 level; **Significant at .01 level; ***Significant at .001.

This implies that these students regard personal relationships, sexual satisfaction, and social support as impactful to their academic success. Among undergraduates, social support provides vital security in the university.[27] Social support is perceived to be readily available social resources shared by individuals or organizations that are willing to help.[28] In this present study, the medical laboratory students tended to gain friends and develop a study group in complying with their assignments and projects. One qualitative research indicated the reliance of college students on their friends and classmates in forming study groups and sharing of assignments.[29] Another study identified peer support as an effective strategy in coping with school-related problems among college students. The family provides emotional support but not a crucial instrumental support.[30] Conversely, qualitative evidence strongly suggests that family support is one of the most influencing factors in achieving high academic success in medical students.[29]

Multiple studies previously conducted reported that support provided by family and peers is related to college academic performance.[31,32] However, college students perceived that peer support is more influential to their academic success.[30] In another study involving preclinical medical students, their QOL in the social domain is directly associated with their GPA, which is essential in preparing them for future roles as physicians as well as in adhering to the principle of a good doctor-patient relationship.[6] This finding suggests that the positive relationship of the QOL in the social domain among the medical laboratory students and their academic performance is vital for their clinical laboratory practice after completion of the programs.

Psychological Health Domain

In regard to the psychological domain, the findings of this study are dissimilar with studies that investigated the association of psychological health factors, such as anxiety, depression, and emotional intelligence, to the academic performance of students.[33,34] Additionally, a previous study negated the finding of this study and reported that a 5-point increase in the psychological health of students resulted in 1-point improvement in their GPAs.[6] The authors deduced that there are limited studies that examine the items in the psychological domain of the QOL tool by the WHO; thus, more investigations could be conducted.

Physical Health Domain

Notably, the physical health was evaluated the poorest QOL domain. The majority of the medical laboratory students in this study were balancing their education with significant work and family obligations, resulting in increased daily workload and deprivation of adequate sleep. In turn, these circumstances would further contribute to fatigue and loss of energy. MLS and MLT programs entail heavy academic workload, which affects the physical health of the students. A study among preclinical students reported that physical health was evaluated as their poorest domain.[6]

The result of this current investigation is parallel to a study in health science graduate students, which revealed that a significant effect of physical health to their GPAs does not exist.[35] Instead, commitment and hard work were identified as influential factors of academic performance.[36] However, a past study concluded that well-performing students academically scored better in the physical domain compared with the average counterparts.[37] In a US university based on a survey in Baccalaureate students, those with higher GPAs were more involved in physical activities than those with lower GPAs.[38]

In the present study, the QOL of the medical laboratory students in the environmental, psychological health, and physical health domains is noncorrelated to their academic performance. The medical laboratory students perceived that these 3 domains do not influence their academic achievement in the college or university. This result is not consistent with research conducted at a larger

university in the United States, where an improvement in the environment through physical activities, such as leisure and recreation, resulted in better academic achievement of the students.[38] Moreover, another study did not support the result of this research in that it affirmed the positive relationship between the environment and the preclinical students' GPAs.[6]

Despite the results of this research indicating no association between the environmental, physical, and psychological domains of QOL and the academic performance of the medical laboratory students in Wyoming, the respondents exhibited excellent satisfaction in all areas surveyed.

Limitations of the Study

This study was conducted at only 1 site utilizing students from a university-based MLS program and a college-based MLT program. This limited the sample size as well as the generalizability of the study. Correlations between first-, second-, third-, and fourth-year students with the QOL were not performed, and so student maturity and other covariants were not considered making data analysis cautious.

CONCLUSION

The QOL in the social domain has a moderately positive influence on the academic performance of the medical laboratory students in Wyoming. Colleges, universities, and hospitals offering MLS and MLT programs may provide social support in the form of academic guidance, consultation, and improving services to increase academic success for their students.

MLS and MLT programs may also consider implementing curricular enhancement and improved student services to sustain environmental and psychological domains and augment the physical health needs of the medical laboratory students. It is further suggested that program administrators introduce interventions that may reduce the stress and anxiety levels of the students. More importantly, the teaching team can provide accessible and flexible academic support and consultation to students throughout their education at the college or university. Replication of this novel study to measure the QOL of medical laboratory students in the United States nationwide will provide MLS and MLT programs an overall grasp on the influence of QOL on academic success.

Appendix A WHOQOL-BREF

[Questionnaire]

The following questions ask how you feel about your quality of life, health, or other areas of your life. Please choose the answer that appears most appropriate. If you are unsure about which response to give to a question, the first response you think of is often the best one.

Please keep in mind your standards, hopes, pleasures, and concerns. We ask that you think about your life in the last four weeks.

1. How would you rate your quality of life?
   Very poor: 1
   Poor: 2
   Neither poor nor good: 3
   Good: 4
   Very good: 5

2. How satisfied are you with your health?
   Very dissatisfied: 1
   Dissatisfied: 2
   Neither satisfied nor dissatisfied: 3
   Satisfied: 4
   Very satisfied: 5

The following questions ask about how much you have experienced certain things in the last four weeks.

3. To what extent do you feel that physical pain prevents you from doing what you need to do?
   Not at all: 5
   A little: 4
   A moderate amount: 3
   Very much: 2
   An extreme amount: 1

4. How much do you need any medical treatment to function in your daily life?
   Not at all: 5
   A little: 4
   A moderate amount: 3
   Very much: 2
   An extreme amount: 1

5. How much do you enjoy life?
   Not at all: 5
   A little: 4
   A moderate amount: 3
   Very much: 2
   An extreme amount: 1

6. To what extent do you feel your life to be meaningful?
   Not at all: 5
   A little: 4
   A moderate amount: 3
   Very much: 2
   An extreme amount: 1

7. How well are you able to concentrate?
   Not at all: 1
   A little: 2
   A moderate amount: 3
   Very much: 4
   Extremely: 5

8. How safe do you feel in your daily life?
   Not at all: 1
   A little: 2
   A moderate amount: 3
   Very much: 4
   Extremely: 5

9. How healthy is your physical environment?
   Not at all: 1
   A little: 2
   A moderate amount: 3
   Very much: 4
   Extremely: 5

The following questions ask about how completely you experience or were able to do certain things in the last four weeks.

10. Do you have enough energy for everyday life?
    Not at all: 1
    A little: 2
    Moderately: 3
    Mostly: 4
    Completely: 5

11. Are you able to accept your bodily appearance?
    Not at all: 1
    A little: 2
    Moderately: 3
    Mostly: 4
    Completely: 5

12. Have you enough money to meet your needs?
    Not at all: 1
    A little: 2
    Moderately: 3
    Mostly: 4
    Completely: 5

13. How available to you is the information that you need in your day-to-day life?
    Not at all: 1
    A little: 2
    Moderately: 3
    Mostly: 4
    Completely: 5

14. To what extent do you have the opportunity for leisure activities?
    Not at all: 1
    A little: 2
    Moderately: 3
    Mostly: 4
    Completely: 5

15. How well are you able to get around?
    Very poor: 1
    Poor: 2
    Neither poor nor good: 3
    Good: 4
    Very good: 5

16. How satisfied are you with your sleep?
    Very dissatisfied: 1
    Dissatisfied: 2
    Neither satisfied nor dissatisfied: 3
    Satisfied: 4
    Very satisfied: 5

17. How satisfied are you with your ability to perform your daily living activities?
    Very dissatisfied: 1
    Dissatisfied: 2
    Neither satisfied nor dissatisfied: 3
    Satisfied: 4
    Very satisfied: 5

18. How satisfied are you with your capacity for work?
    Very dissatisfied: 1
    Dissatisfied: 2
    Neither satisfied nor dissatisfied: 3
    Satisfied: 4
    Very satisfied: 5

19. How satisfied are you with yourself?
    Very dissatisfied: 1
    Dissatisfied: 2
    Neither satisfied nor dissatisfied: 3
    Satisfied: 4
    Very satisfied: 5

20. How satisfied are you with your personal relationships?
    Very dissatisfied: 1
    Dissatisfied: 2
    Neither satisfied nor dissatisfied: 3
    Satisfied: 4
    Very satisfied: 5

21. How satisfied are you with your sex life?
    Very dissatisfied: 1
    Dissatisfied: 2
    Neither satisfied nor dissatisfied: 3
    Satisfied: 4
    Very satisfied: 5

22. How satisfied are you with the support you get from your friends?
    Very dissatisfied: 1
    Dissatisfied: 2
    Neither satisfied nor dissatisfied: 3
    Satisfied: 4
    Very satisfied: 5

23. How satisfied are you with the conditions of your living place?
    Very dissatisfied: 1
    Dissatisfied: 2
    Neither satisfied nor dissatisfied: 3
    Satisfied: 4
    Very satisfied: 5

24. How satisfied are you with your access to health services?
    Very dissatisfied: 1
    Dissatisfied: 2
    Neither satisfied nor dissatisfied: 3
    Satisfied: 4
    Very satisfied: 5

25. How satisfied are you with your transport?
    Very dissatisfied: 1
    Dissatisfied: 2
    Neither satisfied nor dissatisfied: 3
    Satisfied: 4
    Very satisfied: 5

The following question refers to how often you have felt or experienced certain things in the last four weeks.

26. How often do you have negative feelings such as blue mood, despair, anxiety, depression?
    Never: 5
    Seldom: 4
    Quite often: 3
    Very often: 2
    Always: 1

REFERENCES

1. Douglas J, Douglas A. Evaluating teaching quality. *Qual High Educ*. 2006;12(1):3–13. doi: 10.1080/13538320600685024
2. Posadzki P, Musonda P, Debska G, Polczyk R. Psychosocial conditions of quality of life among undergraduate students: a cross sectional survey. *Appl Res Qual Life*. 2009;4(3):239–258. doi: 10.1007/s11482-009-9064-z
3. Andre A, Pierre GC, McAndrew M. Quality of life among dental students: a survey study. *J Dent Educ*. 2017;81(10):1164–1170. doi: 10.21815/JDE.017.074
4. Arslan S, Akkas OA. Quality of college life (QCL) of students in Turkey: students' life satisfaction and identification. *Soc Indic Res*. 2014;115(2):869–884. doi: 10.1007/s11205-013-0235-9
5. Langame AdP, Neto JAC, Melo LNB, Castelano ML, Cunha M, Ferreira RE. Quality of life of university students and their

academic performance. *Revista Brasileira Em Promocao Da Saude*. 2016;29(3):313–325.
6. Shareef MA, AlAmodi AA, Al-Khateeb AA, et al. The interplay between academic performance and quality of life among preclinical students. *BMC Med Educ*. 2015;15(1):193. doi: 10.1186/s12909-015-0476-1
7. What quality of life? The WHOQOL Group. World Health Organization quality of life assessment. *World Health Forum*. 1996;17(4):354–356.
8. Campbell A. *The Sense of Well-being in America: Recent Patterns and Trends*. 1st ed. *Psychol Med*. McGraw-Hill; 1981:436–437.
9. Campbell ACP, Rogers WL. *The Quality of American Life: Perceptions, Evaluations, and Satisfactions*. Russell Sage Foundation;1976.
10. Cruz JP, Felicilda-Reynaldo RF, Lam SC, et al. Quality of life of nursing students from nine countries: a cross-sectional study. *Nurse Educ Today*. 2018;66:135–142. doi: 10.1016/j.nedt.2018.04.016
11. Aboshaiqah AE, Cruz JP. Quality of life and its predictors among nursing students in Saudi Arabia. *J Holist Nurs*. 2019;37(2):200–208. doi: 10.1177/0898010118784147
12. Tempski P, Bellodi PL, Paro HBMS, Enns SC, Martins MA, Schraiber LB. What do medical students think about their quality of life? A qualitative study. *BMC Med Educ*. 2012;12(1):106. doi: 10.1186/1472-6920-12-106
13. Henning MA, Krägeloh CU, Hawken SJ, Zhao Y, Doherty I. The quality of life of medical students studying in New Zealand: a comparison with nonmedical students and a general population reference group. *Teach Learn Med*. 2012;24(4):334–340. doi: 10.1080/10401334.2012.715261
14. Henning MA, Hawken SJ, Krägeloh CU, Zhao Y, Doherty I. Asian medical students: quality of life and motivation to learn. *Asia Pac Educ Rev*. 2011;12(3):437–445.
15. Backovic DV, Maksimovic M, Davidovic D, Ilic-Zivojinovic JI, Stevanovic D. Stress and mental health among medical students. *Srp Arh Celok Lek*. 2013;141(11-12):780–784. doi: 10.2298/SARH1312780B
16. Pikó B. Interrelationships among stress, coping and psychological well-being among preclinical medical students. *Orv Hetil*. 2014;155(33):1312–1318. doi: 10.1556/OH.2014.29953
17. Zhang Y, Qu B, Lun S, Wang D, Guo Y, Liu J. Quality of life of medical students in China: a study using the WHOQOL-BREF. *PLoS One*. 2012;7(11):e49714. doi: 10.1371/journal.pone.0049714
18. Pedro E, Leitao J, Alves H. Does the quality of academic life matter for students' performance, loyalty and university recommendation? *Appl Res Qual Life*. 2016;11(1):293–316. doi: 10.1007/s11482-014-9367-6
19. National Accrediting Agency for Clinical Laboratory Sciences. NAACLS Standards for Accredited and Approved Programs. 2014:1–84. Available at http://www.naacls.org/docs/standards2012.pdf. Accessed October 8, 2018.
20. Solberg B. Critical thinking as a predictor of certification exam performance in medical laboratory science. *Clin Lab Sci*. 2015;28(2):76–82. doi: 10.29074/ascls.28.2.76
21. Delost ME, Nadder TS. The utility of essential function in clinical laboratory science programs. *Clin Lab Sci*. 2011;24(4):Suppl 4–21. doi: 10.29074/ascls.24.4_Supplement.21
22. Russell B, Turnbull D, Leibach EK, et al. Evaluating distance learning in clinical laboratory science. *Clin Lab Sci*. 2007;20(2):106–111.
23. Tartas M, Walkiewicz M, Majkowicz M, Budzinski W. Psychological factors determining success in a medical career: a 10-year longitudinal study. *Med Teach*. 2011;33(3):e163–e172. doi: 10.3109/0142159X.2011.544795
24. Gholami A, Jahromi LM, Zarei E, Dehghan A. Application of WHOQOL-BREF in measuring quality of life in health-care staff. *Int J Prev Med*. 2013;4(7):809.
25. THE WHOQOL GROUP. Development of the World Health Organization WHOQOL-BREF quality of life assessment. *Psychol Med*. 1998;28(3):551–558. doi: 10.1017/S0033291798006667
26. Colquitt WL, Killian CD. Students who consider medicine but decide against it. *Acad Med*. 1991;66(5):273–298. doi: 10.1097/00001888-199105000-00010
27. Tao S, Dong Q, Pratt MW, Hunsberger B, Pancer SM. Social support. *J Adolesc Res*. 2000;15(1):123–144. doi: 10.1177/0743558400151007
28. Cronkite RC, Moos RH. Life context, coping processes, and depression. In: Beckman EE, Leber WR, eds. *Handbook of Depression*. 2nd ed. Guilford Press; 1995.
29. Richardson R, Skinner E. Helping first-generation minority students achieve degrees. *New Dir Community Colleges*. 1992;80(80):29–43. doi: 10.1002/cc.36819928005
30. Dennis JM, Phinney JS, Chuateco LI. The role of motivation, parental support, and peer support in the academic success of ethnic minority first-generation college students. *J Coll Student Dev*. 2005;46(3):223–236. doi: 10.1353/csd.2005.0023
31. Solberg VS, Viliarreal P. Examination of self-efficacy, social support, and stress as predictors of psychological and physical distress among Hispanic college students. *Hisp J Behav Sci*. 1997;19(2):182–201. doi: 10.1177/07399863970192006
32. Rodriguez N, Mira CB, Myers HE, Morris JK, Cardoza D. Family or friends: who plays a greater supportive role for Latino college students? *Cultur Divers Ethnic Minor Psychol*. 2003;9(3):236–250. doi: 10.1037/1099-9809.9.3.236
33. Yusoff MS, Esa AR, Mat Pa MN, Mey SC, Aziz RA, Abdul Rahim AF. A longitudinal study of relationships between previous academic achievement, emotional intelligence and personality traits with psychological health of medical students during successful periods. *Educ Health (Abingdon)*. 2013;26(1):39–47. doi: 10.4103/1357-6283.112800
34. Reisbig AM, Danielson JA, Wu TF, et al. A study of depression and anxiety, general health, and academic performance in three cohorts of veterinary medical students across the first three semesters of veterinary school. *J Vet Med Educ*. 2012;39(4):341–358. doi: 10.3138/jvme.0712-065R
35. Gonzalez EC, Hernandez EC, Coltrane AK, Mancera JM. The correlation between physical activity and grade point average for health science graduate students. *OTJR (Thorofare, NJ)*. 2014;34(3):160–167.
36. Sheard M. Hardiness commitment, gender, and age differentiate university academic performance. *Br J Educ Psychol*. 2009;79(1):189–204. doi: 10.1348/000709908X304406
37. Currie LK, Pisarik CT, Ginter EJ, Glauser AS, Hayes C, Smit JC. Life-skills as a predictor of academic success: an exploratory study. *Psychol Rep*. 2012;111(1):157–164. doi: 10.2466/11.04.17.PR0.111.4.157-164
38. Keating XD, Castelli D, Ayers SF. Association of weekly strength exercise frequency and academic performance among students at a large university in the United States. *J Strength Cond Res*. 2013;27(7):1988–1993. doi: 10.1519/JSC.0b013e318276bb4c