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Perception of interns on laboratory medicine curriculum in the clinical practice

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Abstract

Introduction: Around 70-80% diagnoses are based upon laboratory medicine. Traditionally, laboratory medicine subjects like Biochemistry, Pathology and Microbiology were limited to the first two years of Bachelor of Medicine & Bachelor of Surgery (MBBS) basic sciences curriculum. With recent advances, laboratory medicine is being included in the clinical years as well. Patan Academy of Health Sciences (PAHS) has included laboratory medicine curriculum in clinical years. This study aimed to know the perception of interns on laboratory medicine curriculum in the clinical practice.

Method: This was a descriptive cross-sectional study conducted among interns (fifth batch) of MBBS, PAHS. Ethical clearance was taken from the Institutional Review Committee, PAHS (Ref. drs2007091393). Research questionnaires were constructed and validated by faculties of laboratory medicine. A total of 43 out of 65 Interns had responded the questionnaires emailed. Responses were noted on four-point Likert scale as strongly agree, agree, disagree and strongly disagree.

Result: A total of 26(60.47%) interns had strongly agreed; 14(32.56%) had agreed that they perceived the importance of filling laboratory requisition form with all the required information. A total of 37(86.03%) interns agreed that they were aware about possible errors that can occur in laboratory testing procedures. A total of 36(83.72%) interns had agreed that they felt free to communicate with lab personnel when lab report did not correlate with clinical features.

Conclusion: Interns perceived that the lab medicine curriculum learning was beneficial to them for understanding of the laboratory process and its importance in patient diagnosis and management.

Keywords: intern; laboratory medicine; perception

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Introduction

Laboratory medicine has a significant role in evidence-based medicine practice.[1] With innovations in the laboratory science, currently 70–80% of diagnoses are based upon laboratory medicine, compared to 10-15% forty years ago.[2] Laboratory medicine is a crucial component of health system as it aids in making clinical decisions, providing doctors, nurses, and other health care personnel with essential information for the prevention, diagnosis, treatment and management of disease.[3]

Laboratory medicine curriculum that includes Pathology, Biochemistry and Microbiology are addressed in first two years of basic sciences in traditional Bachelor of Medicine and Bachelor of Surgery (MBBS) curriculum and are not included in the clinical years.[4-7] The retention of basic science knowledge among senior medical students has been observed to be significantly decreased, especially in the areas of biochemistry, microbiology, and pharmacology.[8] Patan Academy of Health Sciences (PAHS), School of Medicine, has included laboratory medicine curriculum in the third year of clinical year to fulfill the gap of basic science knowledge in clinical science and to orient students on hospital laboratory as well as providing a skill for the interpretation of laboratory tests. Furthermore, revisiting of this content in the light of their clinical relevance in laboratory medicine course will help to overcome the erosion of knowledge in clinical years learnt during basic science years.

In this study, we aimed to find out the perception of interns on the laboratory medicine curriculum implemented at PAHS MBBS curriculum that will help to understand usefulness of its learning in clinical practice.

Method

This was a descriptive cross-sectional study conducted among interns (fifth batch) of MBBS, PAHS in March 2021. Research questionnaire was constructed and validated by six faculties with two each from Biochemistry, Microbiology and Pathology who were involved in the delivery of laboratory medicine curriculum. Twenty 21 questionnaires were prepared based on these phases of laboratory total testing process subcategorized into pre-examination, examination and post-examination phase constituting seven, nine and five questionnaire respectively.[9] Responses were noted on four point Likert scale as strongly agree, agree, disagree and strongly disagree. Google form for this questionnaire is prepared in the principal investigator's email account.

Interns who had completed at least six months of internship program were included for the data collection. Interns were chosen for this study as they were in the position to request lab investigation during patient care under supervision. Email address of the interns were obtained from Dean Office, PAHS. Google form link for questionnaire was emailed by principal investigator along with information sheet that included the objective of the study and instruction on the use of google form. The approximate time to fill the questionnaire was 15-20 minutes. Reminder email was sent on 7th day of sending Google form. Those who returned the filled questionnaire were considered as voluntarily participating in the study. Reply of the email was waited for next seven working days. Email replied afterwards were not included in the study. The result was imported in an excel sheet and result was expressed in total number. Ethical approval for the study was taken from Institutional review committee-PAHS (ref no: drs2007091393).

Result

Out of total 61 interns, 43(70.49%) had responded the questionnaires. Twenty-six (60.47%) interns strongly agreed and 14(32.56%) interns agreed that they had learned the importance of filling laboratory requisition form. Twenty-five (58.14%) interns strongly agreed that the venipuncture learned during lab medicine posting was very useful in clinical posting, however, three (6.98%) interns strongly disagreed and four (9.30%) interns disagreed this statement. Twenty nine(67.44%) interns agreed that laboratory environment and laboratory staffs cooperation gave them appropriate platform for learning, however, 8(18.60%) and 2(4.65%) interns had disagreed and strongly disagreed this statement respectively. A total of 22(51.16%) interns had agreed that they were confident about selecting appropriate containers for sample collection. Nine(20.93%) interns had disagreed that they had learned about proper sample collection techniques in terms of volume, transport and storage. A total of 20(46.51%) had strongly agreed that they had learned the importance of counseling patients about proper sample collection methods if they are to collect specimen themselves. Likewise, 27(62.79%) had agreed that they had learned the importance of counseling about patient preparation for laboratory tests to reduce pre-analytical variations, Table 1.

A total of 15(34.88%) and 22(51.16%) interns had strongly agreed and agreed respectively to the statement that they had learned how laboratory practice internal and external quality controls to generate precise and accurate report. However, 5(11.63%) interns disagreed to this statement. Twenty nine (67.44%) interns agreed that they had learned

Table 1. Perception of interns on laboratory medicine curriculum during pre-examination phase

SN	Questionnaires	Total responded intern number = 43			
		Strongly Agree, n(%)	Agree, n(%)	Disagree, n(%)	Strongly Disagree, n(%)
1	I learned the importance of filling laboratory requisition form with all the required information precisely.	26(60.47)	14(32.56)	2(4.65)	1(2.33)
2	The venipuncture that I learned during lab medicine posting is very useful now in my clinical posting.	25(58.14)	11(25.58)	4(9.30)	3(6.98)
3	Laboratory environment and laboratory staffs cooperation gave me appropriate platform for learning.	4(9.30)	29(67.44)	8(18.60)	2(4.65)
4	I am confident about selecting appropriate containers/ vials for sample collection.	13(30.23)	22(51.16)	7(16.28)	1(2.33)
5	I learned about proper sample collection techniques in terms of volume, transport and storage.	5(11.63)	28(65.12)	9(20.93)	1(2.33)
6	I learned the importance of counseling patients about proper sample collection methods if they are to collect specimen themselves.	20(46.51)	19(44.19)	3(6.98)	1(2.33)
7	I learned the importance of counseling about patient preparation for laboratory tests to reduce pre-analytical variations.	8(18.60)	27(62.79)	6(13.95)	2(4.65)

Table 2. Perception of interns on laboratory medicine curriculum during examination phase

SN	Questionnaires	Total responded intern number = 43			
		Strongly Agree, n(%)	Agree, n(%)	Disagree, n(%)	Strongly Disagree, n(%)
1	I learned about usage, storage requirements and indications of blood and blood components.	6(13.95)	29(67.44)	8(18.60)	0(0.00)
2	I learned how laboratory practice internal and external quality controls to generate precise and accurate report.	15(34.88)	22(51.16)	5(11.63)	1(2.33)
3	I learned that different methods can be used in laboratory testing and its sensitivity and specificity can vary.	15(34.88)	21(48.84)	7(16.28)	0(0.00)
4	I know gold standard test for definitive diagnosis of different diseases.	9(20.93)	26(60.47)	8(18.60)	0(0.00)
5	I learned different staining techniques and interpret their results.	11(25.58)	24(55.81)	5(11.63)	3(6.98)
6	I learned that laboratory analytical procedures are performed as per standard protocol.	10(23.26)	26(60.47)	7(16.28)	0(0.00)
7	I learned about different procedures that are involved in identification of organisms and antibiotic sensitivity test.	10(23.26)	26(60.47)	6(13.95)	1(2.33)
8	I am aware that the quality of laboratory reports depends on the quality of samples.	16(37.21)	24(55.81)	2(4.65)	1(2.33)
9	I am aware about possible errors that can occur in laboratory testing procedures.	17(39.53)	20(46.51)	5(11.63)	1(2.33)

about usage, storage requirements and indications of blood and blood components. A total of 16(37.21%) and 24(55.81%) interns strongly agreed and agreed on the statement that they had were aware regarding the quality of laboratory reports depends on the quality of samples. Likewise, 26(60.47%) interns had agreed that they know the gold standard test for definitive diagnosis, learned about the laboratory analytical procedures were performed as per standard protocol and learned about different procedures that are involved in identification of organisms and antibiotic sensitivity test. Five (11.63%) interns disagreed that they learned different staining techniques and interpret their results along with possible errors that occurred in laboratory testing procedures. A total of 15(34.88%) interns had strongly agreed about learning different methods used in laboratory testing and variation in its sensitivity and specificity, Table 2.

Table 3. Perception of interns on laboratory medicine curriculum during post-examination phase

SN	Questionnaires	Total responded intern number = 43			
		Strongly Agree, n(%)	Agree, n(%)	Disagree, n(%)	Strongly Disagree, n(%)
1	I am able to correlate different test results clinically.	14(32.56)	26(60.47)	3(6.98)	0(0.00)
2	I am confident to trust the reports generated in the laboratory.	4(9.30)	30(69.77)	6(13.95)	3(6.98)
3	I feel free to communicate with lab personnel when lab report does not correlate with clinical features of patients.	16(37.21)	20(46.51)	6(13.95)	1(2.33)
4	I know the turnaround time for different tests and its importance during patient counseling.	13(30.23)	24(55.81)	6(13.95)	0(0.00)
5	I am confident about interpreting test results and accordingly advise for further management/planning.	11(25.58)	28(65.12)	3(6.98)	1(2.33)

Twenty-six(60.47%) interns had agreed on their ability to correlate different test results clinically, however, only three (6.98%) disagreed to this statement. A total of six(13.95%) and three(6.98%) interns had disagreed and strongly disagreed to the statement that they were confident to trust the reports generated in the laboratory. Sixteen(37.21%) and 20(46.51%) interns strongly agreed and agreed respectively that they felt free to communicate with laboratory personnel when repots did not correlate with the clinical features of patients. Similarly, 24(55.81%) and 28(65.12%) interns agreed that they knew the turnaround time for different tests and its importance during patient counseling and confident about interpreting test results and advise for further management respectively, Table 3.

Discussion

The field of laboratory medicine is constantly changing. Previously for many years, it was considered that the purpose of laboratory is only limited to "testing". However, at present purpose of laboratory has been replaced as "prevention, diagnosis, monitoring, and treatment of the disease" with the wider spectrum.[10] Without adequate laboratory tests knowledge, healthcare professionals are more likely to order tests incorrectly and interpret test results improperly, that can result in subpar case management, higher expenses per patient, and adverse consequences.[11,12] Contrasting to such evolution and purpose of laboratory medicine, still traditional curriculum is being followed in medical schools. This curriculum with few notable exceptions, typically covers the overall concepts of pathophysiology rather than the intricacies of pathology practice as part of routine non pathologist physician activity.[13]

In this study, 70.41% interns had responded the questionnaires which was higher than the other related studies.[14,15] The perception of interns was towards strong agreement in the understanding of the pre-examination, examination and post examination phases of diagnostic laboratory process during lab medicine posting in clinical years. This showed that interns had appreciated the learning during lab medicine in third year of MBBS curriculum. The laboratory is not error free and majority of errors, 48.0-68.2 %, occurs during pre-examination phase errors followed by post examination phase, 18.5-47.0% and examination phase, 7-13%.[16-18] Pre-examination phase commences from the treating physicians filling the test requisition form, billing, and registration in laboratory, sample collection and transport to the laboratory. Majority of the laboratory errors occurs even when the laboratory personnel are not involved such as inappropriate filling of test requisition form, wrong container use, inappropriate transportation etc. Therefore, It is essential for clinical person to understand workflow of the laboratory and able to communicate in laboratory in case of result discrepancy.[14] This study also showed that students had appreciated the understanding of the potential errors in laboratory, counselling of the patient for the test, choosing the appropriate vial for the test. This understanding could decrease errors during pre-examination phase. Studies showed that proper education and training to the clinicians improved the test ordering and minimized laboratory related errors.[19,20]

Although there is no involvement of clinician in the examination and post examination phase, better understanding of the laboratory process, quality assurance in lab, sensitivity and specificity of different laboratory methods in biochemistry, microbiology and pathology provides remarkable insight in the interpretation of result to reach to the accurate diagnosis.[19,21] In this study, most of the interns perceived that they had learned about quality control measures undertaken in lab, sensitivity and specificity of different methods, staining techniques, antibiotic susceptibility test and interpretation of different lab

results along with its clinical correlation.

Differences in the understanding of turnaround time could create confusion among patients. It is important to know the turnaround time of the laboratory tests so that appropriate follow up dates could be planned.[19] This study showed that interns learnt about the turnaround time of different laboratory results that helped the graduates to plan follow up visit.

Although very few interns had disagreed to questionnaires. One of the reasons could be that faculty could not convince the importance of laboratory medicine to students. Another reason could be that students were not motivated enough that lab medicine posting was as important as major subjects like medicine and surgery. Likewise, other reason could be that they failed to remember what they had learned in third year of MBBS as laboratory medicine posting was of only two weeks and such posting is not included in later years.

In addition to the applicability of laboratory medicine learning in the clinical practice, it could also provide a platform to integrate the learning of biochemistry, microbiology and pathology in the basic science year.[14] Such vertical integration fosters a gradual increase of learner participation through a stepwise increase of knowledge-based engagement in practice.[22] Therefore, adopting the lab medicine curriculum in third year MBBS course helps students not only improve clinical practice but also contextualize the learning of basic science.

Even though these perceptions were measured approximately two years after the curriculum implementation, interns found the learning to be applicable in clinical practice. This partially substantiates the importance of lab medicine curriculum in MBBS program. This importance was foreseen during the adoption of the lab medicine curriculum in PAHS MBBS program which was absent in traditional curriculum. Therefore, inclusion of lab medicine in MBBS program is recommended to implement in other medical undergraduate program of Nepal that can empower the medical graduates with necessary laboratory understanding for the diagnostic accuracy.

Conclusion

Interns perceived that the laboratory medicine curriculum learning was beneficial to them for understanding of the laboratory process and it importance in patient diagnosis and management.

References

1. Badrick T. Evidence-based laboratory medicine. The Clinical biochemist Reviews. 2013;34(2):43-6. PubMed
2. Young DS. How does one interpret a marginally abnormal serum chemistry test? Journal of Occupational Medicine. 1982:104-8. PubMed
3. Group TL. Laboratory Medicine: A National Status Report. Centers for Disease Control and Prevention, Division of Laboratory Systems National Center for Preparedness, Detection, and Control of Infectious Diseases; 2008. Full Text
4. Upadhyaya Kafle S, Singh M, Kafle N, Sinha A, Guragain P, Rimal HS. Introducing Clinical Pathology Course to Fourth Year Medical Students as a Bridge between Pre-clinical and Clinical Medical Sciences. Kathmandu University Medical Journal. 2022;20(1):97-101. PubMed
5. Gottfried EL, Kamoun M, Burke MD. Laboratory medicine education in United States medical schools. Am J Clin Pathol. 1993;100(6):594-8. PubMed
6. Kumar K, Indurkhya A, Nguyen H. Curricular trends in instruction of pathology: a nationwide longitudinal study from 1993 to present. Human pathology. 2001;32(11):1147-53. PubMed
7. Marshall R, Cartwright N, Mattick K. Teaching and learning pathology: a critical review of the English literature. Medical education. 2004;38(3):302-13. PubMed
8. Ling Y, Swanson DB, Holtzman K, Bucak SD. Retention of basic science information by senior medical students. Academic medicine : journal of the Association of American Medical Colleges. 2008;83(10 Suppl):S82-5. DOI
9. Burtis CA, Ashwood ER, Bruns DE. Quality Management. In: Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 5th ed. Elsevier Saunders; 2012. OFFLINE BOOK
10. Cadamuro J. Disruption vs. evolution in laboratory medicine. Current challenges and possible strategies, making laboratories and the laboratory specialist profession fit for the future. Clinical chemistry and laboratory medicine. 2023;61(4):558-66. DOI
11. Saffar H, Saatchi M, Sadeghi A, Asadi Amoli F, Tavangar SM, Shirani F, et al. Knowledge of Laboratory Medicine in Medical Students: Is It Sufficient? Iranian journal of pathology. 2020;15(2):61-5. DOI
12. Group TL. Laboratory Medicine: A National Status Report. Centers for Disease Control and Prevention, Division of Laboratory Systems National Center for Preparedness, Detection, and Control of Infectious Diseases; 2008. Full Text
13. Smith BR, Aguero-Rosenfeld M, Anastasi J, Baron B, Berg A, Bock JL, et al. Educating Medical Students in Laboratory Medicine: A Proposed Curriculum. American Journal of Clinical Pathology. 2010;133(4):533-42. PubMed
14. Khromova V, Gray TA. Learning needs in clinical biochemistry for doctors in foundation years. Annals of clinical biochemistry. 2008;45(Pt 1):33-8. PubMed
15. Hill J, Rolfe IE, Pearson SA, Heathcote A. Do junior doctors feel they are prepared for hospital practice?

A study of graduates from traditional and non-traditional medical schools. Medical education. 1998;32(1):19-24. DOI

16. Randell E, Schneider W. Medical errors in laboratory medicine: Pathways to improvement. Clinical Biochemistry. 2013;46(13):1159-60. DOI
17. Plebani M. Errors in clinical laboratories or errors in laboratory medicine? Clinical chemistry and laboratory medicine. 2006;44(6):750-9. DOI
18. Sciacovelli L, Lippi G, Sumarac Z, West J, Garcia Del Pino Castro I, Furtado Vieira K, et al. Quality Indicators in Laboratory Medicine: the status of the progress of IFCC Working Group "Laboratory Errors and Patient Safety" project. Clinical chemistry and laboratory medicine. 2017;55(3):348-57. PubMed
19. Freedman DB. Towards Better Test Utilization - Strategies to Improve Physician Ordering and Their Impact on Patient Outcomes. Ejifcc. 2015;26(1):15-30. PubMed
20. Stanfliet JC, Macauley J, Pillay TS. Quality of teaching in chemical pathology: ability of interns to order and interpret laboratory tests. Journal of clinical pathology. 2009;62(7):664-6. DOI
21. Hickner J, Thompson PJ, Wilkinson T, Epner P, Sheehan M, Pollock AM, et al. Primary care physicians' challenges in ordering clinical laboratory tests and interpreting results. Journal of the American Board of Family Medicine : JABFM. 2014;27(2):268-74. PubMed
22. Wijnen-Meijer M, van den Broek S, Koens F, ten Cate O. Vertical integration in medical education: the broader perspective. BMC Medical Education. 2020;20(1):509. DOI