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Effect of Introducing Continuous Professional Program on Medical Laboratory Scientists' Knowledge Toward Routine Microbiology Analysis

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Abstract

Background: Continuing professional development is an integral part of healthcare system. healthcare professionals need to update their knowledge and skills to face the changes in healthcare environment. with the information overload, healthcare providers need skills in access information and apply it in practical context. The recent approach of Continuing professional development is to be active; competency focused, reflect on practice and enhance self-awareness. Objectives: The main goal of this study is to introduce continuous education program in the microbiology laboratory. While the secondary objectives are to: (1) Assess effect of introducing continuous education program on Medical Laboratory Scientists' Knowledge and skills toward routine urine Analysis; (2); Assess effect introduce continuous education program on Medical Laboratory Scientists' Knowledge and skills toward routine stool Analysis. Methodology: This is quantitative-experimental pretest-posttest design took place in tertiary multispecialty hospital (University Hospital Sharjah), in United Arab Emirates between January 2020 till April 2020. The sample consisted of 10 Medical laboratory scientists who were selected and assigned into educational groups. Participants had attended the introductory meeting and perform the self-assessment and pre-test were included in the study. Results: The mean score of correct answers in terms of Urinalysis pretest were 56.36 (S. D±18.58), and become 64.7970 (S.D ± 16.32), with mean difference 8.43. (P=.023). while, the mean score of correct answers in terms of practical urinalysis pretest were 76.2500 (S. D±9.22331) with mean difference 25. (P=.033), and become 79.2000 (S.D ± ±7.48034). In the light of stool analysis pretest, the participants scored 56 (S.D ±9.04065) and become 57 (S. D±9.45222) posttest with mean difference 1.1% with p=.067. As p value > 0.05 that mean the result was not statistically significant. Regarding the practical stool analysis pretest, the participants scored 55 (S.D ±24.90724) and become 80 (S. D± ±16.23012) posttest with mean difference 25.56% with p=.033. A significant difference existed between post-test scores which proof the effectiveness of education session. Conclusion: This study reported baseline and immediate post education session results of Introducing Continuous Professional Program on Medical Laboratory Scientists' Knowledge toward Routine Microbiology Analysis. Pretest-posttest design was used. The most important findings were the relatively low pre-test knowledge scores among Medical Laboratory Scientists' and the significant improvement in knowledge and the same for practical sessions for most test items following the educational intervention.

Keywords

Urinalysis, Stool Analysis, Knowledge, Skills, Continuing Professional Development (CPD), Medical Laboratory Scientists (MLSs)

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1. Introduction

1.1. Background

Laboratory medicine is undergoing continuous changes, due to medical information improvement, novel analytical technologies development and introduction of new tests. In order to ensure the best possible laboratory service to the patient, it is essential for laboratory medicine specialists to keep abreast with a broad range of new-emerging issues that have the potential to influence laboratory practice and patient care. The most appropriate way to achieve this goal is integration of continuing professional development (CPD) in the clinical laboratory education continuum [1].

Health professional boards worldwide are increasingly requiring practitioners to demonstrate their engagement with CPD in order to maintain competence in light of the ever-changing scope of practice and technological advances in the medical sciences (Ifeoma et al. 2015). The enforcement of this requirement varies from country to country and between professions. The objective of CPD is to maintain high standards of competence in terms of knowledge, skills, and behavior [2]. Literature exists indicating that CPD in the health professions is effective in improving healthcare, patient outcomes, and population health.

Continuing professional development (CPD) in Medical Laboratory Scientists (MLS) is aimed at equipping laboratory professionals with the necessary skills to enhance practice. The laboratory scientists are usually the first contact between the patient and health care system in aspects of diagnosis and monitory of diseases [3]. Medical laboratory technologists (MLTs) are required to gain credit for continuous professional development for relicensing as well as for their own career‐long learning. International studies have shown that MLTs who undertake continuing medical education (CME) have improved productivity, enhanced professional flexibility and high work fulfilment [4].

As knowledge regarding human development and learning has grown at a rapid pace, the opportunity to shape more effective educational practices has also increased. Taking advantage of these advances, however, requires integrating insights across multiple fields from the biological and neurosciences to psychology, sociology, developmental and learning sciences and connecting them to knowledge of successful approaches that is emerging in education [5].

1.2. Significant of the Study

Educational programs directed to health care professionals can improve knowledge and their skills. However, changing practice is more challenging, but can be achieved with more targeted educational interventions [6]. A handful of studies have documented the effect of education on knowledge and practice [7, 8, 9]; however, no studies were noted in the literature that reported the effect of Introducing Continuous Professional Program on Medical Laboratory Scientists' Knowledge and skills toward Routine Microbiology Analysis in the United Arab Emirates (UAE).

1.3. The Purpose of the Study

The main goal of this study is to introduce continuous education program in the microbiology laboratory. While the secondary objectives are to: (1) Assess effect of introducing continuous education program on Medical Laboratory Scientists' Knowledge and skills toward urine Analysis; (2); Assess effect of conducting continuous education program on Medical Laboratory Scientists' Knowledge and skills toward stool Analysis.

2. Methodology

2.1. Design / Setting / Sample

This is quantitative-experimental pretest-posttest design took place in tertiary multispecialty hospital (University Hospital Sharjah), in United Arab Emirates between January 2020 till April 2020. The sample consisted of 10 Medical laboratory scientists who were selected and assigned into educational groups. Participants had attended the introductory meeting and perform the self-assessment and pre-test were included in the study.

2.2. Inclusion and Exclusion Criteria

A recently joined Medical laboratory scientists who did not receive their (joining/refreshment) training in microbiology lab were excluded. On the other hand, those who have one-year experience in microbiology lab in their current location (UHS) were included.

2.3. Program Description and Outline

The principal investigator developed the 7.5 hours program. The program included: (1) introduction to urinalysis and stool examination theory and practice, which covered Urinalysis specimen collection and pre-analytical criteria; (2) Urinalysis Interferences & result correlation; (3) Examination of urine sediments; and (5) Routine stool examination of normal and infected specimens. The Program included group discussion, and individual instruction. Several interactive educational activities were employed such as practicing troubleshooting and problem-solving skills by conducting case simulation and group discussion of routine and unusual encountered cases. Teaching materials included standardized online materials and books (Textbook of urinalysis and body fluid analysis [10], Clinical diagnosis and management by

laboratory methods by John, J. & Matthew, H., CDC database and UpToDate database) and (MEDIALAB online courses and case simulator).

2.4. Instruments

Validity is considered to ensure that the tools are measuring what it intended to measure, (Heale & Twycross, 2015). All questioners are validated by interviewing the senior staff to ensure that the questions are understandable and designed in a way that meet its purpose [12]. This done by reading out the questions to the senior staff and asking them to write down their understanding. Feedback matched with the intention of the questioner questions. As mentioned earlier multiple tools were used to increase the project validity.

The research instrument was self-administered ". The tool consists of 10 questions; 4 multiple choice questions for stool analysis, and 6 multiple choice questions for urine analysis. In addition, two practical questions were included in pre-post assessment. The tool is identified as discriminating between levels of expertise. Test-retest reliability is established (r>.80) by repeat testing in a continuing education class of Medical Laboratory scientists (N=10). Internal consistency reliability is established (alpha r>.70) with items reflecting both knowledge and skills domains. Participants completed a demographic questionnaire in addition to the context tool.

2.5. Study Procedure

Participants who agreed to participate in the study were given the survey as a pre-test, then participated in the education session, and finally were assessed via the survey following the educational program (post-test). On the other hand, participants' skills were assessed and monitor pretest and assessed posttest. The study schema is included in Figure 1. Rationale for selecting this design was to determine whether participants improved their knowledge and skills after the education session.

2.6. Ethical Consideration

A package of questionnaires with printed participant code numbers, an information sheet, and a consent form were delivered to each participant. Each participant was informed about the nature of the study and instructed to return the signed consent and completed questionnaire to the principal investigator by using the self-addressed envelope that was provided in the package. Formal permission was obtained from University Hospital Sharjah (UHS), Ethical approval Ref NO: Ref. No.: UHS-HERC- 024-09122019.

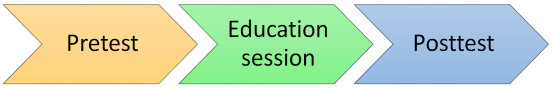

Figure 1. Study Schema.

3. Data Analysis

Descriptive statistics including percentages, means, and standard deviations were used to describe the sample and to summarize survey scores. Survey scores were reported as the percentage of correct responses. Paired-t tests were used to determine differences in mean scores pre- and post-intervention; p <.05 was considered statistically significant. Data were analyzed using Statistical Package for the Social Sciences (SPSS) Version 23 (IBM Corp., Armonk, NY).

4. Result Part

The sample of current study consisted of 15 participants attend introductory meeting then followed by 7 meetings. The final sample size was 10, as 3 staffs excluded because of annual leave, and 2 staff not included because of maternity leave, (18.8%), (12.5%), respectively. In addition, one staff is excluded because of not receiving the joining training in microbiology lab. Attendance was variant from meeting to another. The majority of participants attend the introductory meeting 11 (73%), while 3 (20%) were on annual leave and 1 (6.7%) was in maternity leave.

The mean score of correct answers in terms of Urinalysis pretest were 56.36 (S. D±18.58), and become 64.7970 (S.D ± 16.32), with mean difference 8.43. (P=.023). A significant difference existed between post-test scores which proof the effectiveness of education session but still did not met the author objective since mean score did not reach 80%.

Table 1. Paired t-test result of urinalysis "theoretical part".

	Mean.	S. D	Mean Differences	t	df	Sig
Urinalysis Pretest	56.3640	±18.58385	-8.43300	-2.725	9	.023
Urinalysis Posttest	64.7970	±16.32742				

The mean score of correct answers in terms of practical urinalysis pretest were 76.2500 (S. D±9.22331) with mean difference 25. (P=.033), and become 79.2000 (S.D ±7.48034). A significant difference existed between post-test scores which proof the effectiveness of education session but still did not met the author objective since mean score did not reach 80%.

Table 2. Paired t-test result of urinalysis "practical part".

	Mean.	S. D	Mean Differences	t	df	Sig
Urinalysis Pretest	76.2500	±9.22331	-2.95000	-2.511	9	.033
Urinalysis Posttest	79.2000	±7.48034				

In the light of stool analysis pretest, the participants scored 56 (S.D ±9.04065) and become 57 (S. D±9.45222) posttest with mean difference 1.1% with p=.067. As p value > 0.05 that mean the result was not statistically significant.

Table 3. Paired t-test result of Stool analysis "theoretical part".

	Mean.	S. D	Mean Differences	t	df	Sig
Stool analysis Pretest	56.2000	±9.04065	-1.10000	-2.905	9	.067
Stool analysis Pretest	57.3000	±9.45222				

Regarding the practical stool analysis pretest, the participants scored 55 (S.D ±±24.90724) and become 80 (S. D± ±16.23012) posttest with mean difference 25.56% with p=.033. A significant difference existed between post-test scores which proof the effectiveness of education session.

Table 4. Paired t-test result of Stool analysis "practical part".

	Mean.	S. D	Mean Differences	t	df	Sig
Stool analysis Pretest	55.0000	±24.90724	-25.56600	-2.514	9	.033
Stool analysis Pretest	80.5660	±16.23012				

5. Discussion

The aim of the study is to introduce practical training and education sessions based on Competency based-CPD into microbiology laboratory to improve the capabilities and confidence of general laboratory scientists. The present study found that the skills in urinalysis and stool analysis sections show a statistically significant improvement in both written and practical domains. While the result show that theoretical part of stool analysis was not statistically significant, but significant improvement after practical session.

Education is a complex process that is consist of two phases, the development of education materials and assessment of their implication on practice. The development of educational action research provides a framework that facilitate the development of effective education system which focus on the process and outcomes [12].

Healthcare sector is highly evolving and the demand are changing faster than previously [13]. Qualification in healthcare is no longer exclusively based on certification; communication, professionalisms and updated practice that fulfil community needs are the characteristic of successful healthcare professional nowadays [13]. The concept of CPD programs consider professional development beyond knowledge acquisition and focus more on reflection on practice, lifelong learning and professionalism as an outcome of effective program [14].

Healthcare professionals need to continuously improve their knowledge, skills and performance to effectively function in an ever-changing healthcare environment. They depend on continuing professional development programs (CPD), either within or outside their institutions, to reflect on and update their clinical practice. Professional growth requires more than knowledge transfer; it requires curiosity, humility, self-awareness and a motivation for mastery. Educators can build on these factors and create effective learning experiences to develop complex skills including communication, interprofessional collaboration, teamwork, leadership and reflective practice [14].

The current study found that the score of knowledge and practice significant improved in both written and practical domains. The same results were found in a study conducted by Kociolek in 2017. The study aimed to assess Impact of a Healthcare Provider Educational Intervention on Frequency of Clostridium difficile Polymerase Chain Reaction Testing. The findings suggest that a multifaceted education session can successfully increase health care providers' knowledge and practice C difficile testing [15]. Similarly, largest improvement in knowledge was in Ethiopia, although the baseline scores were low, thus the potential to improve knowledge was the greatest after education session [8]. Overall, it appears that education does improve healthcare providers' knowledge.

A study conducted in Saudi Arabia by Alyaemni & Qassam (2017) aimed to explore the perceptions of MLTs towards CME activities and to predict factors that affect attendance. A self‐administered questionnaire was given to 103 medical laboratory professionals. Most laboratory technicians in the study reported favorable perceptions of CME programme, feeling that they increased professional confidence and competency [4]. Our study found that participants scored significantly higher after education session. This indicated

that education increased participants knowledge, but the doubts whether this knowledge will be sustained over a period of time. Our study concurs with other studies in the literature that found to improve knowledge [4, 8].

Another study conducted by Xie in china (2019) to compared the abnormal reporting rates before and after the implementation systematic training and quality control programs. After implementation of training and programs, the abnormal reporting rates were significantly increased [16]. In terms of training feasibility, a study conducted in United Kingdome by George to demonstrate the feasibility of integrating a centralized programme of laboratory-based surgical skills training into a higher surgical training programme and to evaluate its effectiveness and acceptability to trainees. The study found that centralizing laboratory-based skills training and integrating it into a clinical programme is feasible and acceptable and represents a paradigm shift in surgical training [17]. Moreover, a study conducted to Evaluate the effectiveness of a laboratory-based professional development program for science educators. The result found a significant improvement in self-efficacy, confidence, and job satisfaction [18].

6. Conclusion

This study reported baseline and immediate post education session results of Introducing Continuous Professional Program on Medical Laboratory Scientists' Knowledge toward Routine Microbiology Analysis. Pretest-posttest design was used. The most important findings were the relatively low pre-test knowledge scores among Medical Laboratory Scientists' and the significant improvement in knowledge and the same for practical sessions for most test items following the educational intervention. The education sessions proved to be effective in improving Medical Laboratory Scientists' knowledge and skills. Participants increased their score significantly after the sessions. Because the education classes proved to be effective for Medical Laboratory Scientists' working in University Hospital Sharjah it is recommended to implement sessions in practice. Further study is needed, however, with larger sample size.

Limitation

This study recognizes some limitations. First, it was conducted at a single site, which could limit generalizability. Second; study size is small, managing small group of staff is much easier in terms of staff availability and program convenience. In small sample size managing staff attendance and ensure resources availability is reachable than in large group. This project shows its applicability on small sample size.

Statement of Ethic

Formal permission was obtained from University Hospital Sharjah (UHS), Ethical approval Ref NO: Ref. No.: UHS-HERC- 024-09122019.

Disclosure Statement

The authors declare that they do not have conflict of interest. All the authors, read and approved the submitted version. All authors confirm that the manuscript is our own original work

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