

Original Articles

The Training of Dual Professionals via Evidence-Based Learning

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Background : In order to obtaining a quality test result, specimen collection plays an important role. There are 2 professions generally involved in specimen collection; nurse and medical technologist. They are trained and practiced on their own system; eventually, gap among them might sometime lead to problem that has impacted to the patient. **Objective :** To solve problems on specimen collection, we decided to do the dual profession co-training by the evidence-based learning method. **Methods :** A total of 12 sessions of 4 training process were offered continuously for 6 years. They were 1,231 participants; 861, 302, and 68 for nurses, medical technologists and others, respectively. An outcome of the training and their competency on specimen collection was assessed. **Results :** There was a great improvement on their competency after the co-training ($p < 0.01$). It was the best way on problem solving because it worked as pro-active process. In addition, there were transferred tacit knowledge between the two professions; a net-working also settled to co-operate for future issues. As the viewpoint of trainers, knowledge and experiences learned from the co-training dual profession lead to several outcome; three textbooks and teaching materials related specimen collection had been written. There were at least 2 projects developed under the co-operation between the two professions and presented in a national meeting contest. **Conclusion :** The beneficial gains from dual professionals co-training were not only increased the trainee competency but also the trainer knowledge management.

Key Words: ● Specimen collection ● Co-training program ● Evidence-based learning

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Introduction

It is recognized that clinical laboratory service plays an important role in patient care management and clinical laboratory service differs from other medical service. The unique role of clinical laboratory is producing the

quality test results of individual patient. Therefore, to achieve the quality test result, one must understand the whole process of clinical laboratory testing. Clinical laboratory process is composed of two main phases; the non-analytical phase and analytical phase. The non-analytical phase is subdivided into pre-analytical and post-analytical phases. Nowadays, the analytical phase of clinical laboratory testing is very well controlled. Since it is the most concerned of medical technologist

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who performed the test, and there are tremendous techniques of double-checking the test results, as well as awareness of the post-analytical phase has been seriously taken care and well regulated because it is one of the processes of the laboratory quality control. Every clinical laboratory performs tests incorporated with the internal quality control and external quality control. It leads to the steady improvement in analytical phase. This practice is widely universal accepted on controlling analytical phase with both internal and external quality control system, in addition to the shift of automation technology in most of clinical laboratory. However, there are some difficulties on the non-analytical phase especially on the pre-analytical phase because it deals with human errors. Pre-analytical errors contribute to large proportion of the total laboratory errors. Some reports on pre-analytical error are about seven folds of the analytical one.¹ Later, other also reports of high error of the pre-analytical phase.^{2,3} In order to achieve continuous clinical laboratory improvement, it is important to focus on all phases, especially the pre-analytical one. There are many potential errors occurred in the pre-analytical process especially the specimen acquisition i.e. incorrect tube or container, incorrect patient identification, inadequate volume, invalid specimen (e.g. hemolyzed sample), collected at the wrong time, and improper transport conditions.⁴ Interestingly, there is a unique system on specimen acquisition. In many clinical laboratories medical technologist need not have her hand directly on the patient to produce testing results. The specimen can be obtained almost anywhere e.g. ward or out patient department and directly send to the laboratory. In general, there are two healthcare professions involved in specimen acquisition; the nurse and medical technologist. Each healthcare profession has her deep roots. The tie between these two healthcare professions is very challenging. Focusing on patient's

benefit, the laboratory needs to get a good specimen that represents the real patient situation to produce a quality test results. In order to meet this goal of prevent problems on specimen acquisition; boundaries between the two professions must be liquefied. So far, the best way of solving problem on specimen acquisition is blending the tacit knowledge of both professions to gear for patient centered.

The Human Asset Development (HAD) program for the clinical laboratory realizes this urgent need and has been set up the short course training program entitled "Impacts of specimen collection on quality test result". The aim of this study is to improve competency on specimen collection for the dual profession thru evidence-based learning.

Materials and Methods

Participants

Two professions were participated in this study. There were 861 and 302 nurses and medical technologists, respectively. And also a small group of clinical laboratory assistant (CLA) and nurse-aid of total 68 persons were participated. Training program entitled "Impacts of specimen collection on quality test result" and evidences drawn from the dual-profession have been used. This program started in the mid year of 2005 and ended by the end of 2010.

Methods

There were 4 steps involved in the training program.

Step 1 : The short course training program was given to the two professions: nurse and medical technologist who work in the same hospital on the same time. This first step was performed 6 times within 2 years in various hospitals. Every training session took 1.5 days.

Step 2 : A group meeting of the HAD teams was set up to evaluate the outcome of step 1. This gained result was evaluated and used to develop patterns and

training styles as well as making training contents that served trainee's need.

Step 3 : In the following year, the modified short course training program was given to both professions: nurse and medical technologist at the same time. They came from various hospitals of the same region of Thailand. The total of 4 training courses was held.

Step 4 : Short course training program was provided upon special requested; contents of program were adjusted upon trainee's requisition. Each course took 1.5 days. The essential of specimen collection was stated. Contents were case study, demonstration, question-answer and role play. At the end of each course, the instructor would sum up the important points and a conventional lecture was given. Assessment on training outcome was performed by the pre- and post-tests. The pre- and post- tests were the same types of question. Each question composed of several sub-questions. However, numbers of sub-question for each question were varied upon their nature. The full score of each question was also varied. It was set up at one score for each sub-question. In this study, the passing score of each question was not assigned; because the passing score

would discourage the participant. This training outcome was expected on the improving of competency via the comparing between pre-test taken before training and post-test taken after training. There were 2 courses held in provincial hospitals.

Statistical Analysis

The training outcome of the participants was assessed by the improving of competency on specimen collection. We measured their competency by comparing the pre- and post-test scores. Paired t-test was applied and the chosen significance level was $\alpha = 0.05$.

Results and Discussion

As demonstrated in [Table 1](#), there were a great number of participants. Total numbers of nurse were 4 times of medical technologist which was normally found in every hospital. Most of healthcare personnel work in health center and hospital of Bangkok municipal was nurses and others. Although there were very few medical technologists in these institutes, nurses as well as others realized the problem on specimen acquisition. As shown in [Table 2](#), it demonstrated the willingness on improving their clinical laboratory services by voluntary

Table 1 Numbers of Dual Profession Participated in This Study

Participated institutes	Nurses	Medical technologists	Clinical laboratory assistants and nurse aids
Provincial hospital	150	180	12
Community hospital	400	100	18
University hospital	200	20	15
Health center and hospital of Bangkok Municipals	111	2	23
Total	861	302	68

Table 2 Frequency of being the host institutes for training program

Host institute	Numbers of training programs
University hospital (located in Bangkok)	4
Provincial hospital	2
Community hospital	4
Health center and hospital of Bangkok Municipals	2

Table 3 The training outcome as assessed by improving on their competency

Potential errors of specimen acquisition *	Before-training (Mean \pm SD ^{**})	After-training (Mean \pm SD)	Full score [†]	P-value
Patient identification	1.39 \pm 0.91	1.88 \pm 0.86	3	0.02 [‡]
Verified and confirmed of mandatory data prior venipuncture	0.41 \pm 0.58	1.04 \pm 0.92	2	0.01 [‡]
Venipuncture techniques	11.46 \pm 3.10	12.88 \pm 3.57	23	0.30
Anticoagulant and order of sampling	4.46 \pm 2.23	7.69 \pm 1.89	9	<0.01 [‡]
Infectious control	4.85 \pm 1.48	5.46 \pm 1.03	9	0.10
Ability on trouble shooting of blood collection	7.50 \pm 3.19	11.19 \pm 1.74	14	<0.01 [‡]
Total	46.15 \pm 11.52	56.35 \pm 12.62	60	<0.01 [‡]

*Potential errors of specimen acquisition was divided into several categories, each one has many questions;

**SD = standard deviation; †Each question is score of one therefore the full score of each category varies according to number of questions; ‡Statistical significance

served as the host institute of training program. This implied that healthcare personnel who involved in the clinical laboratory are focused on patients' safety.

One must understands that process of specimen acquisition is handled by 2 professions. Each one has been learned, trained, and practiced for a long period. All has knowledge and developed experience, leading them becomes the tacit one. To bring, tie and blend their tacit knowledge together without conflict confronting is challenged through the evidence based co-training process. All of the HAD instructors must keep in mind that learning is a natural process as well as teaching is facilitation of growth. Evidence alone does not decide; combine with other knowledge is very necessary. An innovative strategy that can transfer evidence-based knowledge among them should be used. Gap between evidence and practice must be filled. The HAD team has discussed evidences drawn from both professions during step 1 and step 3, and then deeply digested and the appropriate contents were re-adjusted to fit and serve their problems. Application of current teaching contents drawn from evidences that provided by both professions of previous ones were used. The potential errors of specimen acquisition performed in both professions were assessed. As demonstrated in Table

3, there was a great improvement on their competency after the co-training (a total of statistically significant at $P < 0.01$). The outcome of this study is shown in [Table 4 and Table 5](#). Table 4 demonstrated benefits of dual professions co-training. From the direct contact between the two professions via discussion, presenting their real time situation and problems under the closed supervision of instructors with a friendly environment; the sincere and willingness of trouble shooting were observed. Therefore, there are many benefits gained from the co-training on dual professions. Benefits expressed to not only the participants but also the HAD instructors. Moreover, there was a direct impact to the patient; she /he received the better medical services. Besides the benefits, Table 5 shows the touchable products of the program; textbooks were written based on information retrieved from the training. The competency of attended medical technologists expressed on problem solving, they were able to create project to overcome their problems. Several projects had been constructed; fortunately, two out of various ones won the national project contests.

Teaching materials were created from evidence-based problems that encountered by the two professions. Several techniques had been used; both active learning e.g. case study, frequent asked question, question-answer,

Table 4 Benefits of dual professions co-training

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- A. This is a proactive of problem solving.
 - B. The co-training provides an opportunity to understand jobs and duties of each other. The great way of conflict reduction.
 - C. The tacit knowledge transfers between two professional groups. Each profession shares her tacit knowledge to the other, and also among their professional group. Especially problems on specimen collection, medical technologist has a chance to explain the necessary of obtaining a quality specimen and to provide the information and various precautions on specimen collection.
 - D. A great opportunity of the two professions knows each other, builds up friendship and forms the net-working of healthcare profession that could bring up future co-operation on research and others.
 - E. It is the best chance of the HAD instructors to learn and to acquire facts as well as real time problems in the clinical laboratory practice. These retrieved data would serve as excellent information for writing book, specimen collection guideline as well as teaching material for medical technology student. It is a way to meet the social expectation.
 - F. It has the direct impact to the patient in terms of patient safety.
 - G. It is the continuous quality improving process.
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Table 5 The end products of the dual professions co-training

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- A. One chapter in the textbook entitled "Clinical Laboratory Risk Management"^{5*}
 - B. Textbook entitled "Impacts of Non-Analytical Factors on Quality of Laboratory Tests"^{6*}
 - C. Textbook entitled "Phlebotomy"^{7*}
 - D. Two winning projects from the national project contest
 - a. The pre-analytical quality model of Phayao hospital laboratory^{8†}
 - b. Inner-customer relationship towards quality services^{9‡}
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*Authors are the HAD instructors; †created and presented by medical technologist from Phayao Provincial Hospital; ‡created and presented by medical technologist from Saraburi Provincial Hospital

demonstration and role play and passive learning by lecture. We should stated herein about the successes of evidence based learning of the dual professions was governed by several factors. This can't happen without a better understanding of barriers. Barriers of each profession was identified and cracked down by the HAD team, and fostered between interaction of medical technologist and nurse. Teamwork properly formed and managed under the safely and friendly environment of sharing problems maintained thru the session. The enthusiasm and professional reputation was the great driving forces. In addition, all of HAD instructors have

a strong, lengthy and consistence intention. Lastly, all parties, the medical technologist, the nurse and the HAD instructor aiming towards the same ultimate goal of quality health care services.

Conclusion

The results indicated that evidence-based learning was the powerful learning tool for dual professions. Both professions demonstrated the great competency on specimen collection. Not only improving of competency but also increased of knowledge management.

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References

1. Plebani M, Carraro P. Mistakes in a stat laboratory: Types and frequency. *Clin Chem* 1997;43:1348-51.
2. Bonini P, Plebani M, Ceriotti F. Errors in laboratory medicine. *Clin Chem* 2002;48:691-8.
3. Carraro P, Plebani M. Error in a stat laboratory: Types and frequencies 10 years later. *Clin Chem* 2007;53:1338-42.
4. Lippi G, Guidi GC. Risk management in the pre-analytical phase of laboratory testing. *Clin Chem Lab Med* 2007;45:720-7.
5. Manochiopini S, Sirisali K, Vattanaviboon P, Wonglumsom W, Sirisali S. *Clinical Laboratory Risk Management*. Bangkok: STP Press; 2006.
6. Sirisali K, Manochiopini S, Pairoj L, Wonglumsom W. *Impact of Non-Analytical Factors on Quality of Laboratory Results*. Bangkok: STP Press; 2004.
7. Sirisali K, Manochiopini S, Vattanaviboon P, Wonglumsom W, Sirisali S. *Phlebotomy*. Bangkok: STP Press; 2011.
8. Tungkum K, Changhlo L, Pongtasanahem N, Kinnon T, Jinoros S. The pre-analytical quality model of Phayao Hospital. *Proceedings of the best practice on clinical laboratory quality; 2005 Sep 29-30; Bangkok, Thailand*. Bangkok: Faculty of Medical Technology; 2005. P. 24-33.
9. Jirungda S, Kumproum P. *Inner-customer relationship towards quality services. Proceeding of the star contest: empowering clinical laboratory professionals competency: the 5 years experiences*. Bangkok: STP Press; 2010. P. 37-43.

การอบรมร่วมสำหรับบุคลากรสองสายวิชาชีพโดยใช้วิธีการเรียนรู้ โดยหลักฐานเชิงประจักษ์

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ความเป็นมา : การเก็บสิ่งส่งตรวจจากผู้ป่วยเป็นปัจจัยที่ส่งผลกระทบต่อคุณภาพผลการวิเคราะห์ทางห้องปฏิบัติการ บุคลากรที่เกี่ยวข้องกับการเก็บสิ่งส่งตรวจมักจะเป็นพยาบาลหรือนักเทคนิคการแพทย์ ซึ่งทั้งสองวิชาชีพต่างก็ได้รับการฝึกอบรมตามแนวทางของตนเอง ดังนั้นในบางกรณีอาจเกิดปัญหาการเก็บสิ่งส่งตรวจที่ไม่ถูกต้องจนเกิดผลกระทบที่เป็นอันตรายต่อผู้ป่วย **วัตถุประสงค์ :** ศึกษาผลจากการฝึกอบรมร่วมบุคลากร 2 วิชาชีพเพื่อแก้ไขปัญหาผลกระทบจากการเก็บสิ่งส่งตรวจที่ไม่ถูกต้องโดยใช้ evidence-based learning **วิธีการศึกษา :** จัดหลักสูตรการอบรมร่วมอย่างเป็นขั้นตอน รวม 12 ครั้งในรอบ 6 ปีโดยมีบุคลากรเข้ารับการอบรมทั้งหมด 1,231 คน เป็นพยาบาล 861 คน นักเทคนิคการแพทย์ 302 คนและบุคลากรอื่นๆ 68 คน ทำการประเมินผลลัพธ์ที่เกิดขึ้น และประเมินศักยภาพในการเก็บสิ่งส่งตรวจของผู้เข้ารับการอบรม **ผลการศึกษา :** ภายหลังจากอบรมพบว่าศักยภาพในการเก็บสิ่งส่งตรวจจากผู้ป่วยของผู้เข้ารับการอบรมเพิ่มขึ้นอย่างมีนัยสำคัญทางสถิติ ($p < 0.01$) และยังพบว่าวิธีการแก้ไขปัญหาผลกระทบจากการเก็บสิ่งส่งตรวจที่ได้ประสิทธิภาพคือการทำงานเชิงรุก โดยเฉพาะอย่างยิ่งการแลกเปลี่ยนเรียนรู้ร่วมกันระหว่างการอบรมจนเกิดเป็นเครือข่ายการพัฒนาาร่วมกัน ได้ผลลัพธ์เป็นองค์ความรู้ที่เป็นรูปธรรม **สรุป :** การจัดโปรแกรมอบรมร่วมสำหรับบุคลากร 2 วิชาชีพ นอกจากผู้เข้ารับการอบรมจะได้รับประโยชน์แล้วยังเป็นการพัฒนาคณาจารย์ผู้จัดการอบรมจนเกิดการจัดการความรู้ที่ได้ผลลัพธ์เป็นรูปธรรม

Key Words: ● การเก็บสิ่งส่งตรวจ ● โปรแกรมการฝึกอบรม ● วิธีการเรียนรู้โดยหลักฐานเชิงประจักษ์

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