EVALUATION OF STANDARD OF CARE ULTRASOUND CURRICULUM FOR EMERGENCY MEDICAL OFFICERS

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ABSTRACT

The use of Point-of-Care Ultrasound (PoCUS) in emergency has setting revolutionized medical practice in emergency medicine nationally and internationally. Introduction of ultrasound enables first-line doctors in a resource-limited setting to obtain rapid information and expedite diagnosis-making. Hence, there has been a rapid increase in utilization of bedside critical care ultrasonography in Emergency Department and more hands-on courses are being provided to ensure adequate bedside training are provided. However, standards of monitoring in its competency for its use are lacking. This study aim to evaluate the effectiveness of ultrasound curriculum implementation for period of six months and factors contributing towards retention of knowledge. Total subjects were twenty-six Medical Officer based in Emergency Department from Sabah Women and Children Hospital (SWACH). The components of ultrasound proficiency include point-of-care echocardiography, lung scan, extended FAST in trauma, obstetric and gynaecology, 2-point Compression Test and ultrasound guided central venous catheterization. Subjects had completed online questionnaire test one week prior to 2-Day Course and then were tested again after six months period curriculum. Six subjects were excluded from the study as they could not complete the second reassessment after six months period. The mean±SD scores of the subjects from both the pre-curriculum and post-curriculum were 13.20±4.1 and 25.75±2.4 respectively. There is a statistical significance between the score ($p < 0.05$) thus, null hypothesis is rejected. Implementation of periodic evaluation would help subjects retention in ultrasound knowledge and skill. Significant factor that contribute to knowledge retention is learning ultrasound from media platform (5.05±2.635). Another interesting finding is that subjects with no previous ultrasound training in the past 1 year fare better than those who had (7.86±3.485).

INTRODUCTION

- Emergency and Trauma Department (ETD) in the SWACH coverage area has a population of 452,058. Monthly statistic in 2018 ranged from 8000 - 1000 patients, which makes daily visit ranging the lowest from 260 to highest of 340 patients. From observation, there has been an increasing trend of ultrasound utilization in ETD.
- Prior cross-sectional studies have shown that ultrasound knowledge and skill can be acquired through dedicated training after short period of 90-minute didactic lecture and hands-on training [2, 3].
- A longitudinal study was performed to evaluate the efficiency of ultrasound curriculum versus a stand-alone workshop among internal medicine residents. Residents who were not exposed to longitudinal curriculum had a statistically significant decline in correct identification of ascites (50%), thyroid (29%), pleural effusion (50%), and inferior vena cava (30%). The author concluded that addition of a longitudinal ultrasound curriculum may result in improved knowledge retention of the residents.

OBJECTIVES

1 Evaluate the effectiveness of 6 months ultrasound curriculum among medical officer in Emergency Department
2 Study the contributing factors associated with retention of knowledge and skills among doctors.

METHODOLOGY

Figure 1: Central Venous Catheterization under Ultrasound guided using dummy vein model.

Figure 2: Focused echocardiography hands-on-training.

Figure 3: Bedside Hands-on Training

The study was conducted from August 2018 until February 2019. The subjects were all Medical officers of ETD from SWACH. A training curriculum were developed for Point-of-Care Ultrasound training. The module covers focused cardiac ultrasound, airway and lung ultrasound, venous thromboembolism scan, obstetric and gynaecology ultrasound, central venous catheterisation under ultrasound guide, inferior vena cava and aorta ultrasound, eFAST and ultrasound protocols such as RUSH and CAUSE protocols [Figure & 8]. The structure of the curriculum involve induction phase which is then followed by continuous training over 6 months interval period.

Prior the curriculum initiation, subjects were evaluated via online 30 Multiple-Choice Questions (MCQs). Subsequently, the participants underwent 2-day hands-on skill course ultrasound. The participants in the course would receive total 10 hours of didactic hands-on practice which covers total of 10 core topics. Stations utilised a live healthy model volunteers to demonstrate a normal findings and subsequently followed by learning abnormal pathological image interpretation using video presentation.

Following the course, the participants would continue with 6 months curriculum training of ultrasound. During this period, the participants would be required to gather total of 50 ultrasound videos and images and perform a 20-minute presentation about ultrasound related topics. At 6 months of curriculum, the subjects would repeat the theory examination.

Total 26 subjects were initialy recruited, but six were excluded as they discontinued the curriculum before the intended period or unable to complete the post curriculum theory. The mean scores of the subjects from both the pre-curriculum and post-curriculum were compared using the paired T test. Contributing factors such as duration of working, recent ultrasound training in the past 1 year, media learning, reading of books or journals and CME were studied via questionnaire. The questionnaire was given to subjects at duration of post training. The difference in the pre and post test scores were used to compare each factors. The mean scores of the subjects were compared using independent T-Test.

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RESULT

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre	13.20	20	4.099	.917
	Post	25.75	20	2.425	.542

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre & Post	20	.408	.074

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pre - Post	-12.550	3.818	.854	-14.337	-10.763	-14.701	19	.000

Figure 4: Paired T-test result for mean scores for pre-curriculum and post-curriculum training.

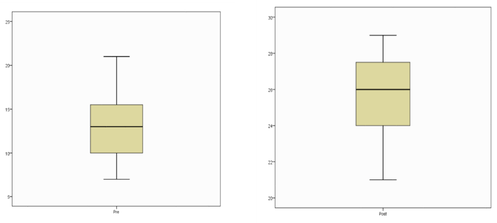

Figure 5: Mean score results for pre-curriculum and post-curriculum training.

- The mean±SD scores of the subjects from both the pre-curriculum and post-curriculum were 13.20±4.1 and 25.75±2.4 respectively [Figure 4 & 5].
- The difference of the scores were analysed using paired T test as the subjects are of same population. There is a statistical significance between the score ($p < 0.05$), and so null hypothesis is rejected.
- Significant factor that contribute to knowledge retention is learning ultrasound from media platform (5.05±2.635).
- An interesting finding is that subjects with no previous ultrasound training in the past 1 year fare better than those who had (7.86±3.485).

Recent ultrasound training in the past one year	N	Mean	Standard deviation	Standard error mean
yes	13	4.31	2.720	0.754
no	7	7.86	3.485	1.317

Facebook/Twitter	N	Mean	Standard Deviation	Standard Error Mean
yes	1	15.00		
no	19	5.05	2.635	0.604

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
difference between pre and post	Equal variances assumed	.049	.828	-2.527	18	.021	-3.549	1.405	-6.501	-.598
	Equal variances not assumed			-2.339	10.042	.041	-3.549	1.518	-6.929	-.169

Figure 6a &6b: Independent T-test results for difference in pre and post test scores with recent ultrasound training in past 1 year

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Differenc e	Std. Error Differenc e	95% Confidence Interval of the Difference Lower	Upper
difference between pre and post	Equal variances assumed	.	.	3.680	18	.002	9.947	2.703	4.268	15.626
	Equal variances not assumed			.	.	.	9.947	.	.	.

Figure 7a&7b: Independent T-Test results for difference in pre and post test scored with social media

DISCUSSION

- This is a small study conducted over a period of 6 months among medical officers which demonstrated good knowledge and skill retention after the introduction of ultrasound curriculum.
- A longitudinal curriculum may be the superior approach in ultrasound education, albeit a larger study may be required to prove this
- The subject recruitment was using convenient sampling for homogenous population given the same background and training, hence might not be true for other population given the similar curriculum and training in ultrasound.
- Subjects that did not go through a recent ultrasound training showed better results in the test
- Learning from social media had shown significant result contributing ultrasound curriculum

CONCLUSION

Implementation of structured curriculum for ultrasound training would provide a better knowledge and skills retention for medical officers in Emergency and Trauma Department.

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