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THE EFFECT OF COGNITIVE KNOWLEDGE AND PSYCHOMOTOR SKILLS FOLLOWING CPR TRAINING AMONG PAEDIATRIC NURSES

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ABSTRACT   Retention of cardiopulmonary resuscitation (CPR) knowledge and skills is a key factor in determining the competency of pediatric nurses' in performing lifesaving procedures of child basic life support (BLS). The aim of this study was to investigate the extent to which the nursing personnel acquire and retain CPR cognitive knowledge and psychomotor skills following paediatric CPR training. A quasi-experimental research which includes a pre-test, CPR training program, a post-test, and a retention-test was conducted. A convenient sampling was used to select the 105 registered nurses and CPR knowledge was assessed by a multiple-choice questionnaire and observational checklist. The results revealed that the mean CPR knowledge scores and psychomotor skills were significantly increased from baseline, p<0.001. Study concluded that the CPR training is effective in increasing knowledge and skills of nurses. It is recommended to have frequent refresher CPR training and implementation of other techniques to improve the pediatric nurses' competency retention.

KEYWORDS : Cardiopulmonary Resuscitation, CPR knowledge and skills, Competency Retention

Background

Cardiac arrest can lead to very high morbidity and mortality in adults and children (Avisar L,et al., 2010). Nearly 40% of cardiac arrests occur in hospital of which only 27% are reported to survive (Tibballs J and Kinney S, 2006). Hence, it is clear that providing high quality CPR is one of the most important factors to influence these survival rates (Roy KM, Miller MP, Schmidt K, et al,2011). The basis of providing high quality cardio-pulmonary resuscitation (CPR) lies in the education and training of health care providers involved in the care of sick children (Akhuzaheya LM, Gharaibeh MK and Alostaz ZM,2012).

Therefore, it is evident that nurse's competency in CPR is a critical factor in determining successful outcomes in patients with cardiac arrests (Hemming T, Hudson M, Durham C, et al, 2003). A key factor determining CPR competence is the retention of CPR cognitive knowledge and psychomotor skills (Akhuzaheya LM, Gharaibeh MK and Alostaz ZM, 2012). However, significant evidences are convincing enough to show that CPR knowledge and skills are poorly retained across populations (Arshid M, Lo TYM and Reynolds F, 2009; Grześkowiak M,et al,2009)

Though many studies have documented on the quality of CPR, very few researchers have focused on pediatric CPR. Thus, there are still large gaps in our knowledge of pediatric CPR retention. The aim of the study is to evaluate the acquisition and retention of child CPR cognitive knowledge and psychomotor skills among paediatric nurses.

Research Objectives

1. To determine whether there is a significant relationship between memory retention factors and retention of knowledge and skills of child CPR.
2. To identify if the frequency of BLS training attended since graduating influences the knowledge and skills retention.
3. To determine the awareness of nurses on the difference between neonate, child and adult CPR algorithms.
4. To assess whether or not the retained knowledge and skills of child CPR meets the current standards and client needs.
5. To identify if the level of education and working experience influences the ability to retain knowledge and skills.

Methods

Research Design

A quasi-experimental design was adopted for this study.

Study Setting

This study was conducted in a Public Hospital in Kuala Lumpur. It is a government tertiary referral hospital, located on 150 acres of prime land with 83 wards and 2302 beds. it has total of 1600 registered nurses.

Population

The target population includes all the registered nurses who work in pediatric settings of the study hospital.

Sampling

Convenience sampling was used to select the 105 registered nurses who work in Pediatric Institute of study hospital. The inclusion criteria were the participants who work in Pediatric Ward , Pediatric Intensive Care Unit, Burn Unit, Day Care (URH), Klinik Pakar Kanak-Kanak (KPKK), Pediatric High Dependency Ward (PHDW) were included.

The participants who work in neonatal units and Maternity Neonatal Intensive Care Unit (MNICU) were excluded for this study.

Instruments

A self-designed survey form, CPR psychomotor skills assessment checklist ⁽Madden C, 2006) and self-designed Multiple Choice Questions (MCQs) were used as instruments.

Self-designed survey form consisted of three parts; sociodemo graphic data of the participants, Items related to work experience & trainings (7 items) and perceived factors (12 items).

Self-designed Multiple Choice Questions (MCQs) consists of 21 item related to child BLS. The same sets of paper were used for all three phases of the study - pre-test, post-test and retention test.

Child CPR psychomotor skills were assessed based on numerical scoring system adapted from Madden C (2006). The scoring system which uses penalty points for CPR skill errors were used to assess CPR skills components (18 items). Penalty points were assigned for failing to perform or incorrectly perform CPR skill components and the lower the penalty points, the better their CPR skills. The Cronbach Alpha test was carried out to examine the reliability of the instrument (r = 0.712).

Data Collection

The initial step of the study was to conduct pre-test to assess the

cognitive knowledge and psychomotor skills on CPR. Then, 8 hours of BLS (CPR) training were provided, which included the child BLS, airway management and Healthcare Providers Course (Irish Heart Foundation, 2010). At the end of the training post-test was conducted and re-test (after 30 days) was conducted to assess retention of learning outcomes.

Data analysis
Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 21. Descriptive analysis was done for both continuous and categorical variables. Regression analyses were done to analyze changes in Multiple Choice Questions (MCQ) scores (General Linear Model ANOVA and posthoc analysis of ANOVA) and psychomotor skill scores (Friedman test and Wilcoxon Signed Ranks). The linear regression used to measure the factors on retention scores and changes in retention scores (knowledge and skill).

Ethical Approval
Ethical approval was secured from National Medical Research Register (NMRR-10-1197-7868), Malaysia and Clinical Research Centre (CRC), Ministry of Health (MOH), Malaysia. Permission to access the study site was obtained from hospital director and Head of the Pediatric Department. Written informed consent was obtained from all the participants. The participants were explained about the purpose, method and the extent of the study. Confidentially was assured to the participants. The participants were informed about the right of participation and the right of withdrawal from the study any time.

Results
A number of 105 participants enrolled in this study. The mean age of the participants were 29.21 ± 8.17, with age ranging from 23 to 56 years old. Majority of them were Malay 91.4% and female (98.1%). More than three fourth of the participants acquired diploma qualification (85.7%) with 10 years of working experience (80.0%). Nearly half of the nurses' have attended BLS course before (48.6%) and 21% of the respondents have attended PALS course before.

Table 1: Demographic characteristics, working experiences, mean knowledge scores and skill penalty points in 3 phases of study,

Independent variables		n= 105 (%)	Mean Knowledge scores + SD			Interaction		Mean Skill penalty points + SD			F	
			Pre-test	Post-test	Retention test	F	P	Pre-test	Post-test	Retention test	X^2	P
Age (years)	20 – 29	77 (73.3)	12.92 + 2.89	16.61 + 1.94	16.25 + 2.12	0.498	0.737	142.73 + 53.43	3.71 + 9.776	20.13 + 29.50	131.05	0.000
	30 – 39	16 (15.3)	13.12 + 2.22	16.44 + 2.45	16.62 + 1.63			114.38 + 63.19	3.12 + 7.04	15.94 + 22.08	27.83	0.000
	>40	12 (11.4)	13.00 + 2.37	16.50 + 1.93	15.42 + 2.23			120.91 + 58.69	5.00 + 11.62	12.27 + 21.61	14.00	0.001
Attended PALS	Yes	22 (21.0)	13.73 + 2.45	17.27 + 2.03	16.64 + 1.87	0.236	0.790	133.41 + 65.24	3.91 + 14.94	16.36 + 23.61	37.97	0.000
	No	83 (79.0)	12.76 + 2.77	16.39 + 1.97	16.10 + 2.12			137.71 + 54.24	3.92 + 7.71	20.45 + 3.65	136.10	0.000
Paediatric working experience (years)	<6	78 (74.3)	13.18 + 2.79	16.61 + 1.98	16.23 + 2.09	0.841	0.501	135.44 + 53.10	3.68 + 9.83	19.30 + 28.99	134.70	0.000
	6 – 10	20 (19.0)	12.20 + 2.73	16.70 + 2.16	16.20 + 2.14			129.25 + 69.17	4.50 +9.58	15.75 + 22.61	28.68	0.000
	>11	7 (6.7)	12.67 + 1.21	15.67 + 1.97	16.00 + 1.79			180.00 + 38.99	5.00 + 8.37	36.67 + 48.44	11.27	0.004
Working experience (years)	<10	84 (80.0)	12.95 + 2.85	16.60 + 1.97	16.27 + 2.01	0.150	0.861	141.16 + 54.22	3.88 + 9.73	19.29 + 28.80	142.09	0.000
	>10	21 (20.0)	13.00 + 2.19	16.48 + 2.18	15.95 + 2.33			112.75 + 59.53	3.25 + 8.93	16.00 + 22.75	30.52	0.000
Work setting	PICU	14 (13.3)	12.29 + 3.00	17.36 + 1.34	16.71 + 1.86	1.352	0.236	140.71 + 49.88	2.14 + 4.26	27.50 + 34.12	25.08	0.000
	General ward	50 (47.6)	13.04 + 2.86	16.12 + 2.04	15.82 + 2.31			136.90 + 60.61	5.72 + 12.77	18.50 + 26.88	77.37	0.000
	Others	40 (38.1)	13.00 + 2.44	16.83 + 2.07	16.21 + 2.07			136.88 + 54.19	2.38 + 5.31	18.75 + 30.86	70.48	0.000

Mean score of participants' CPR knowledge in the pre-test was 12.96 + 2.72 and post-test was 16.57 + 2.00. The increase in scores between the pre-test and post-test (3.60 ± 0.287) was found to be statistically significant. In the re-test mean score of CPR knowledge was 16.21 + 2.07 in the retention phase. The decrease in scores from post-test to re-test. Nevertheless, the increase in scores between pre-test and re-test was also found to be statistically significant (P< 0.001).

The mean score for CPR performance in the pre-test was 136.81± 56.41 and post-test was 3.91± 9.63. The respondents' skill was improved by 97.14% from the pre-test to post-test and it is statistically significant at P< 0.001. In the re-test mean score for CPR performance was 19.62 ± 29.26. The decrease in scores from post-test to re-test was also statistically significant (P< 0.001).

There were no statistical significant in mean knowledge score between the pre-test, post-test and retention-test, in all the independent variable at p<0.05.

Table 2 : Effect of Perceived factors on knowledge scores and skills penalty points in 3 phases of the study

Perceived factors		n=105 (%)	Mean Knowledge scores + SD			Interaction		Mean Skill penalty points + SD			Interaction	
			Pre-test	Post-test	Retention	F	P	Pre-test	Post-test	Retention test	c2	P
Aging	Yes	24 (22.9)	13.96 + 2.33	16.71 + 2.16	16.17 + 2.43	2.571	0.079	116.67 + 62.29	5.21 + 10.27	15.21 + 22.53	36.071	0.000
	No	81 (77.1)	12.67 + 2.78	16.53 + 1.97	16.22 + 1.97			142.78 + 53.51	3.53 + 9.47	20.93 + 30.98	138.153	0.000
Inadequate sleep	Yes	28 (26.7)	13.96 + 2.33	16.71 + 2.16	16.17 + 2.43	3.066	0.049*	133.75 + 60.94	2.68 + 5.85	26.79 + 36.75	48.059	0.000
	No	77 (73.3)	12.67 + 2.78	16.53 + 1.97	16.22 + 1.97			137.92 + 55.04	4.36 + 10.68	17.01 + 25.81	126.45	0.000
Long gap between refresher courses	Yes	53 (50.5)	13.42 + 2.56	16.43 + 1.86	16.38 + 1.66	2.499	0.085	128.02 + 60.51	3.23 + 7.13	15.00 + 24.96	84.859	0.000
	No	52 (49.5)	12.50 + 2.83	16.71 + 2.15	16.04 + 2.43			145.77 + 50.92	4.62 + 11.67	24.33 + 32.65	89.564	0.000
Lack of practice	Yes	58 (55.2)	12.93 + 2.95	16.21 + 2.03	16.03 + 2.17	0.957	0.386	139.57 + 59.93	4.84 + 11.76	19.14 + 28.08	93.493	0.000
	No	47 (44.8)	13.00 + 2.45	17.02 + 1.89	16.43 + 1.94			133.40 + 56.18	2.77 + 5.97	20.21 + 30.95	80.563	0.000
Stress	Yes	71 (67.6)	12.77 + 2.91	16.41 + 1.90	16.25 + 1.98	0.934	0.395	138.73 + 58.05	3.96 + 7.78	18.87 + 29.81	114.437	0.000
	No	34 (32.4)	13.35 + 2.27	16.91 + 2.19	16.12 + 2.28			132.79 + 53.43	3.82 + 12.80	21.18 + 28.45	60.117	0.000

More than half of the participants were perceived that the factors contributing to their CPR competency retention were stress (67.6%), lack of practice (55.2%) and long gap between refresher training (50.5%). Majority of the participants (90%) were not perceived that the disease, smoking, unhealthy diet and lack of interest as factors affecting their knowledge and skills retention.

There was significant difference in mean knowledge score with regards to perceived inadequate sleep as a retention factor (p<0.05). The Friedman test showed significant differences in mean skill penalty points across the three phases of the study with regards to all perceived factors studied (p<0.001).

Discussion

The findings showed a significant increase in students' CPR cognitive knowledge. Findings on this study were similar to other studies that noted very small declines in knowledge at 6 months (Miotto HC, Couto B, Goulart E, et al,2008). Findings on child CPR skills retention were also consistent with previous literature and demonstrate a short retention span of skills in nurses' CPR competency (Miotto HC, Couto B, Goulart E, et al,2008).

The performance of skills deteriorates nearly to pre-training level in as short as 3 months decreased and the deterioration in CPR skill performance from post-training test to retention was observed to vary from 3 months, 6 months to 12 months. Despite the requirement for refresher course every two years, evidence suggested that shorter renewal intervals are required. A few hours dedicated to CPR training every two years may not be sufficient and retraining at intervals should be strongly considered (Woollard M, Whitfield R, Newcombe RG, et al. ,2006).

The drawbacks in implementation of frequent refresher course are staffing problems and financial constraints. To overcome these problems, refreshment course delivery methods should be modified or improved. These formats include use of realistic manikins, interactive multimedia courses, case-based presentations, integration of BLS content into a larger curriculum such as in nursing curriculum, non-computer-based self-directed learning and problem-based learning (Szögedi I, Zrinyi M, Betlehem M, et al,2010). These alternative training methods will enable refresher courses to be conducted in more frequent basis; hence will reduce the deterioration of CPR skill retention.

Conclusion

The study findings shows that CPR training course can be effective in increasing knowledge and skill of nurses; repetitive periodic CPR training courses might ensure nurses competency and reduce the potential risk of death and disability secondary to a delay in resuscitation.

Acknowledgement

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