

Evaluation of the retention of knowledge, skills and competency of post-neonatal resuscitation training among house officers

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ABSTRACT

Introduction: The Neonatal Resuscitation Programme (NRP) was first introduced in Malaysia in 1996 to train doctors and nurses working in paediatrics and obstetrics departments who are involved with the care of newborns soon after delivery. Prompt and effective neonatal resuscitation has been documented to reduce mortality and neonatal asphyxia. The programme has been revised every five years and is now in the 8th edition. NRP training was made into a key performance indicator (KPI) by the Ministry of Health in 2016 for all house officers to be trained in this programme during their 2-year posting and this is usually conducted during the paediatric posting. This study aims to evaluate the retention of their knowledge, skills and competency at 3, 6, and 9 months after the initial NRP training.

Materials and Methods: A total of 34 house officers were enrolled in the study on joining the paediatric unit of Hospital Kulim. They were given the "Textbook of NRP" to prepare for the theory paper that consisted of 30 multiple-choice questions (MCQs). Two to four weeks later they went through a day of training on the resuscitation of the newborn using low-fidelity simulation manikins. They were taught to recognise a newborn who needed resuscitation after delivery, prepared the equipment for resuscitation and learned the skills of resuscitation. The skills included the initial steps, bag valve mask ventilation, intubation, cardiac massage, umbilical vein cannulation and use of medications. They were also taught the performance of objective structured clinical examination (OSCE) A and B. They were evaluated at 3, 6, and 9 months after the completion of their training using the MCQs and the performance checklist in the NRP textbook.

Results: The results showed that there was a significant reduction in their knowledge retention as shown by their performance in multiple choice questions. Similarly, there was a significant loss of competency in their skills and competency in resuscitation using bag mask ventilation, intubation and performance of OSCE A and OSCE B. However, their performance at initial steps showed no significant reduction.

Conclusion: In view of the observed deterioration a refresher course in NRP before transferring out to the districts is recommended to improve their overall performance.

KEYWORDS:

Neonatal resuscitation, evaluation of knowledge and skills

INTRODUCTION

The Neonatal Resuscitation Programme (NRP) was initiated with training of 37 instructors who then went on to train other doctors and nurses in the Ministry of Health (MOH). The result was a substantial number of 2806 local instructors and 14,000 candidates trained after eight years. The MOH made it into a key performance indicator (KPI) in 2016 for all house officers (HOs) to be trained in NRP. However, no study had been done to evaluate its effectiveness that is the retention of their knowledge, skills and competency after the training. This study aims to evaluate the retention of knowledge and skills over 3 months, 6 months and 9 months post-NRP training.

MATERIALS AND METHODS

This is a single-arm intervention study. HOs who have undergone the training in NRP were evaluated on their skills and competency at 3, 6 and 9 months. A total of 34 participants were enrolled. The multiple-choice questions (MCQs) were administered to the participants prior to the practical resuscitations sessions. The training in NRP included reading material, i.e., textbook on NRP, undergoing the practical resuscitations skill which included the initial steps, bag valve mask ventilation, intubation and then performed the Objective Structured Clinical Examination (OSCE) A and the mega code OSCE B. OSCE A referred to the procedure of resuscitation till bag valve mask ventilation and OSCE B referred to the full mega code starting from initial steps till intubation, cardiac massage, and medications. At each skill, they were taught how to assess the response to resuscitation before proceeding to the next step. They also needed to show leadership and teamwork as well as when to call for help. For each skill, they will be assessed using a checklist available from the NRP.

The participants were evaluated on their retention of theoretical knowledge using MCQs, and on their skills and competency at 3, 6 and 9 months post-NRP training using low fidelity manikins. Scoring was done using the checklists available in the NRP.

This article was accepted: 16 May 2024
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Table I: Repeated measures analysis of MCQs assessment at 3, 6 and 9 months.

		Value	F	Sig.
MCQ performance	Pillai's trace	0.385	6.568 ^b	0.006
	Wilks' lambda	0.615	6.568 ^b	0.006
	Hotelling's trace	0.626	6.568 ^b	0.006
	Roy's largest root	0.626	6.568 ^b	0.006
MCQ performance versus Gender	Pillai's trace	0.167	2.103 ^b	0.147
	Wilks' lambda	0.833	2.103 ^b	0.147
	Hotelling's trace	0.200	2.103 ^b	0.147
	Roy's largest root	0.200	2.103 ^b	0.147

Table II: Repeated measures analysis of the skills of initial steps at 3, 6 and 9 months.

		Value	F	Sig.
Skills of initial steps	Pillai's trace	0.126	1.581 ^b	0.228
	Wilks' lambda	0.874	1.581 ^b	0.228
	Hotelling's trace	0.144	1.581 ^b	0.228
	Roy's largest root	0.144	1.581 ^b	0.228

The skills of initial steps i.e., preparation of the equipment for resuscitation, providing warmth, drying, suction and positioning. Table II showed that there was no significant reduction in skills and competency of initial steps ($p > 0.05$).

Table III: Repeated measures analysis of the skills at doing bag-mask ventilation and intubation at 3, 6 and 9 months.

		Value	F	Sig.
Skills at doing bag-mask ventilation	Pillai's trace	0.403	7.434 ^b	0.003
	Wilks' lambda	0.597	7.434 ^b	0.003
	Hotelling's trace	0.676	7.434 ^b	0.003
	Roy's largest root	0.676	7.434 ^b	0.003
		Value	F	Sig.
Skills of intubation	Pillai's trace	0.326	5.327 ^b	0.013
	Wilks' lambda	0.674	5.327 ^b	0.013
	Hotelling's trace	0.484	5.327 ^b	0.013
	Roy's largest root	0.484	5.327 ^b	0.013

Table IV: Repeated measures analysis of OSCE A - resuscitation skills till completion of bag valve mask ventilation at 3, 6 and 9 months.

		Value	F	Sig.
OSCE A skills	Pillai's trace	0.302	4.755 ^b	0.019
	Wilks' lambda	0.698	4.755 ^b	0.019
	Hotelling's trace	0.432	4.755 ^b	0.019
	Roy's largest root	0.432	4.755 ^b	0.019

Table V: Repeated measures analysis of OSCE B - resuscitation skills at performing a mega code at 3-, 6- and 9-months post NRP.

		Value	F	Sig.
OSCE B skills	Pillai's trace	0.473	8.964 ^b	0.002
	Wilks' lambda	0.527	8.964 ^b	0.002
	Hotelling's trace	0.896	8.964 ^b	0.002
	Roy's largest root	0.896	8.964 ^b	0.002

The results were analysed using IBM Statistical package for Social Studies (SPSS) version 26 software. Descriptive statistics were used to depict the participants' socio-demographic characteristics. Repeated measure analysis was used to determine the difference of retention of knowledge, skills and competency at 3, 6, and 9 months respectively after the initial NRP training. The significance level was set at 0.05.

A total of 34 HOs participated in the study and completed the training in NRP. They passed the MCQs and were able to perform the initial steps, bag-mask ventilation, intubation, OSCE A and the mega code OSCE B. They were evaluated at 3, 6 and 9 months after the initial training.

RESULTS

The study included a total of 34 participants. Participants were graduates from 13 different universities, with majority coming from AIMST University (16, 47.0%). This was followed by Sultan Abdul Halim Mu'adzam Shah International Islamic University (UniSHAMS) and USM KLE, each contributing three participants (8.8% each). Two participants (6.0%) each coming from SEGi University and Cyberjaya University College of Medical Sciences (CUCMS). The remaining eight participants comes from difference universities. There were 25 females (73.5%) and nine (26.5%) males with an aged ranged from 26 to 29 years.

All 34 HOs in the initial study participated in the first evaluation at three months. However, this number reduced to 30 at the second evaluation at six months and to 24 at the 3rd evaluation at nine months. The participants had left the paediatric department during the follow-up. They were posted to other disciplines in the hospital. Analysis of repeated measures revealed a statistically significant difference ($p < 0.05$) in the performance of MCQs on the first, second, and third assessments. However, gender did not differ significantly in performance ($p > 0.05$; Table I below).

The skills of initial steps i.e., preparation of the equipment for resuscitation, providing warmth, drying, suction and positioning. Table II showed that there was no significant reduction in skills and competency of initial steps ($p > 0.05$).

Table III demonstrates a statistically significant decrease in skills at bag-mask ventilation from the first to the second to the third examination ($p < 0.05$). Also, a substantial deterioration in intubation skills during the evaluations conducted at 3-, 6-, and 9-months after NRP ($p < 0.05$).

Table IV demonstrated that in OSCE A resuscitation skills of a neonate requiring up to bag and mask ventilation were significantly decreased across the three examinations at 3-, 6, and 9-months ($p < 0.05$).

OSCE B skills, which include the administration of advanced resuscitation techniques (mega code) such as intubation, cardiac massage, umbilical vein cannulation and intravenous medicines, decreased significantly during the three evaluations at 3-, 6-, and 9-months ($p < 0.05$), as shown in Table V.

DISCUSSION

Proficiency in neonatal resuscitation is necessary to ensure the safety and well-being of the newborn infant and plays a critical role in reducing mortality and morbidity. Most deliveries usually do not require resuscitation. However, about 10% will need some form of help to transition to the extrauterine life and another 1% will need more advanced resuscitation.¹

The World Health Organization reported that 37% of children under the age of 5 years died because of neonatal risk factors and out of these 23% died because of perinatal asphyxia.² Successful resuscitation within the first few minutes will reduce the neonatal mortality and morbidity. To achieve this the health care personnel involved in the care of the neonate needed to be trained and to be readily available. The NRP which was introduced in the US in 1986³ was adopted by Malaysia under the Perinatal Society. Training started in 1996 where 37 core instructors were trained and over 2-year period a further 2806 local instructors were trained.⁴ The adoption of this instructor programme nationwide was encouraging. It used the same premise as the America Academy of Paediatrics in that at least one person skilled in newborn resuscitation was presented at every birth and an additional person to be readily available if more extensive resuscitation was needed.

The success of this programme saw a reduction in neonatal and perinatal mortality and over 14,575 personnel were trained eight years later.⁵ In 2016 the MOH decided to make this resuscitation course into a KPI and decided that all HOs (100%) to be trained during their 2-year posting and this would be done during the paediatric posting, which is of three months duration. They were taught the basic knowledge and technical skills in neonatal resuscitation, and this had been shown in several studies to be effective soon after the course completion.

However, due to the time lapse after the training and lack of exposure, when they were subsequently transferred out to a district hospital about two years later it was postulated that there would be a deterioration in both the knowledge, skills and competency acquired during the initial training. The skills and competency were maintained during the Paediatric posting as they had to assist the medical officers during the standby for delivery at the labour room and operation theatre. It is hypothesised that their knowledge and skills would have deteriorated after leaving the posting. Most studies find a lack of sustained improvements in those who took the NRP and then rotated through other fields where they were not involved in neonatal resuscitation.^{6,9}

Evaluations of the house officers who had completed their NRP training and participated in the study showed a significant reduction at 3-, 6- and 9-months in the retention of their knowledge in the MCQs, skills and competency at doing bag valve mask ventilation, intubation and performance of OSCE A and B. OSCE A involved resuscitation until completion of bag mask ventilation and OSCE B is a mega code resuscitation which included intubation, cardiac massage and medication given via an umbilical vein cannula. The participants had left the paediatric posting

three months after the initial training and were rotating to other departments where they were not exposed to the neonates and deliveries and had no opportunities to have hands-on practice. It is postulated by the time they finished their 2-year housemanship and are ready to be posted to the districts the decay in their knowledge and skills and competency in resuscitation of the neonate might be even more apparent.^{10,11}

Retention of NRP skills deteriorated rapidly after course completion.¹² Documented decreased retention of skills was also reported by Kaczorowski et al.,⁸ who studied 44 residents and found that they had significantly lower scores 4 months later. A similar deterioration of knowledge after 4 months was shown by Curran et al.¹³

On the contrary in a study conducted among a small group of midwives at Ridge Hospital in Ghana, there was a substantial increase in neonatal resuscitation knowledge and performance. Although their numbers were small, the hospital performed >7000 deliveries per year. Their sustained retention could be due to their work in a high-risk referral centre, and they used these skills daily.¹⁴ A study conducted in a low-resource setting in Peru showed that helping babies to breathe knowledge and skills can be retained and even improved with simple, inexpensive interventions, including supervised on-the-job and peer-to-peer training. Short on-site training sessions and brief refresher training sessions using simulation and practice scenarios proved to be easy to integrate both at the level of health centres and a larger referral hospital.¹⁵

CONCLUSION

The overall decline in the knowledge, skills and competency of the house officers several months after the Neonatal Resuscitation Program (NRP) training was significant throughout the 3-, 6-, and 9-months period post training. In centres where the skills are maintained frequent practice, on-site training played an important role. A refresher course to improve the confidence in their skills and knowledge before posting to the districts might go towards ensuring their competence and this could be a subject of another study. An intervention that might help improve knowledge and skills includes introducing mock codes which can help providers become strong team members and team leaders by making them better prepared for serious situations in the delivery room. This can be done with appropriate planning and consideration for adult learning behaviours.^{16,17}

ACKNOWLEDGEMENT

We thank Director of Kulim Hospital and the department of paediatrics for their support in allowing this study to be done.

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