Evaluating Neonatal Resuscitation Skills of Nursing and Midwifery Students Using Objective Structured Clinical Examination (OSCE)

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A R T I C L E I N F O	A B S T R A C T
	Background & aim: Neonatal resuscitation training is mandatory for the staff providing maternity and neonatal services in order to ensure competence during the academic period. This study was conducted to assess the neonatal resuscitation skills of nursing and midwifery students. *Methods:* In this study, the skills of 48 nursing and midwifery students were assessed, using Objective Structured Clinical Examination (OSCE), which consists of seven "stations", lasting 28 minutes. In station 1, students' knowledge was assessed. In stations 2-7, students' skills in the initial steps of resuscitation, positive pressure ventilation, intubation, chest compression, medication prescription and management of cardiopulmonary resuscitation were assessed. Time management and students' re-evaluation of the infant were also assessed. The total score of OSCE was calculated to be 236. Also, students' self-evaluation regarding their competence in neonatal resuscitation and their satisfaction with OSCE were evaluated, using two self-structured questionnaires. *Results:* The mean score of students' skills in neonatal resuscitation was 97.85±23.15 out of 236. On average, students obtained 38%, 49%, 20% and 72% of the total score in the initial steps of resuscitation, positive pressure ventilation, intubation and chest compression, respectively. Also, the students obtained 45%, 29% and 56% of the total score in prescribing medications (drug dosage and route of administration), management skills in advanced resuscitation and knowledge on neonatal resuscitation, respectively. Students' self-confidence was lower than half of the optimal score, and their satisfaction with OSCE was high. *Conclusion:* The students' skills in neonatal resuscitation were lower than expected. As competence in this area is of high significance for the improvement of neonatal outcomes, holding training workshops through applying novel training methods is recommended.

Introduction

Timely and accurate resuscitation improves the outcomes of asphyxiated neonates (1, 2). Sufficient resuscitation at birth not only can lower neonatal mortality rates, but also can improve survival in infants (1). According to World Health Organization, 20% of five million neonatal deaths each year are related to birth asphyxia. Consequently, competence in neonatal resuscitation could potentially influence one million infants each year (1, 3).

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Neonatal resuscitation training is a standard practice for all nurse practitioners, midwives, respiratory therapists, nurses and physicians, providing services in maternity and neonatal settings (4-6). In fact, it is recommended that at least one skilled resuscitator be present in each childbirth (7-9).

To provide effective resuscitation, care providers should apply detailed information and employ their technical skills, competently (10, 11). Therefore, those who perform resuscitation, e.g., neonatal nurse practitioners and midwives, are expected to be competent and have the required knowledge and skills. These skills should be learnt through training during academic courses (12-14). Despite the time, resources and expenses allocated to such training, little is known about the outcomes of these educational programs and whether students' educational needs are met (10, 12).

Generally, previous studies have focused on resuscitation in adults (12). However, neonates differ considerably from adults as different levels of knowledge and skills are required for neonatal resuscitation. In fact, neonatal resuscitation is needed occasionally and relies on resolving respiratory problems rather than cardiac episodes (10, 15).

Although successful neonatal resuscitation is a critical task, little information is at hand about the factors affecting care providers' performance or knowledge. Moreover, there is insufficient data on the knowledge, skills and competence of midwifery, nursing and anesthesia students (2, 11, 16). Without such information, holding competence training programs for care providers and allocating resources for achieving efficient competence can be challenging (10).

One major factor contributing to this gap is the lack of valid and reliable tools for measuring knowledge, skills and competence level in neonatal resuscitation (1). In fact, reliable and valid instruments are necessary for assessing the quality of health care, provided for asphyxiated newborns (11). Consequently, Objective Structured Clinical Examination (OSCE) has been developed for the evaluation of neonatal resuscitation skills. In the late 20th century, OSCE was presented as the "gold standard" for the assessment of medical students (13). This tool can be used to evaluate a number of clinical skills, which cannot be measured by other instruments (15).

The objective of this study was to assess the students' knowledge, experience and level of competence while performing neonatal resuscitation. We also examined the relationship between knowledge about neonatal resuscitation, self-confidence and providers' total skills.

Materials and Methods

This study was conducted at Mashhad University of Medical Sciences in 2011. In this descriptive study, 48 M.Sc. students of neonatal nursing, midwifery and anesthesia (bachelor's degree) were enrolled. The students were all healthy, without a prior history of severe stress over the last six months.

After obtaining informed consents from the students, demographic information and educational characteristics were collected, using self-report questionnaires. Afterwards, students' cognitive, technical and crew resource management skills in neonatal resuscitation were assessed, using OSCE, which comprises of seven "stations". OSCE was implemented at the School of Nursing and Midwifery of Mashhad University of Medical Sciences.

One multiple-choice questionnaire (MCQ) and six checklists were prepared for examining the students. The researcher-made checklists were developed based on the Neonatal Resuscitation Program (NRP). The content validity of the checklists and the questionnaire was assessed and confirmed by 10 faculty members of midwifery, nursing, medical education and neonatology.

The reliability of OSCE and the checklists was assessed by calculating Cronbach's alpha coefficient (0.83 and 0.61-0.88, respectively). Also, by applying the split-half method, the reliability of MCQ was calculated to be 0.79. All necessary tools and clear instructions were provided for students in each station.

The seven stations in OSCE were defined as follows:

Station 1: A group station in which students' knowledge about neonatal resuscitation was assessed, using a 20-item MCQ (10 min).

Station 2: The medical histories of different neonates, requiring the initial steps of

resuscitation, were presented to the participants and they were asked to act accordingly.

Station 3: The medical histories of different neonates, requiring positive pressure ventilation (PPV), were presented to the participants and they were asked to act accordingly.

Station 4: The student's intubation technique was assessed.

Station 5: The student's chest compression technique was assessed.

Station 6: The medical histories of neonates, who required adrenaline, naloxone and normal saline, were assessed and students were required to record appropriate drug doses and routes of administration.

In the last station, students were required to manage an infant born through meconium, who needed advanced resuscitation. The neonate's heart rate was 86 bpm, according to the medical history; moreover, the infant was atonic and suffered from apnea. The students were asked to perform intubation, which resulted in a decrease in heart rate from 86 to 80 bpm. As a result, PPV was required, which reduced the heart rate (50 bpm); it should be mentioned that the infant was atonic and suffered from apnea.

In this step, students were required to do chest compressions; however, the infant's heart rate decreased to 40 bpm, despite the compressions. Therefore, medications were needed for the infant, which resulted in an increase in heart rate and improved the infant's condition. In this station, students were required to apply PPV, perform chest compressions and prescribe medications. Each station lasted three minutes, except for station one. In stations 2-5 and 7, five observers assessed students' performance, using rating scales with 10, 6, 7, 6 and 20 items, respectively. Each item was rated, using a three-point scale (i.e., correct, incorrect and not performed).

The checklists were used in order to assess students' technical competence, crisis resource management skills, time management and re-evaluation of infants' status at the end of their performance. Furthermore, in stations 5 and 7, in case the students asked for help, the observer acted as a member of the resuscitation team.

In station 6, students' replies regarding the appropriate drug dosage and route of administration were scored by two faculty members, using checklists. One single observer evaluated the students in each station. The total score of OSCE was calculated to be 236. The total scores in stations 1-7 were 20, 20, 36, 48, 36, 18 and 58, respectively.

In this study, students completed a self-report questionnaire regarding their competence in neonatal resuscitation. The students also completed a self-assessment questionnaire regarding their satisfaction with OSCE. These two questionnaires consisted of six items, graded by a five-point rating scale, ranging from 0 to 4 (very low to very high).

Data were analyzed by SPSS version 11.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were calculated, and the values were reported as mean ± standard deviation.

This study was approved by the Research Ethics Committee of Mashhad University of Medical Sciences.

Results

In this study, the mean age of the students was 25.34±4.6 years. Previous work experience in the obstetric ward was reported by 22.8% of students. The students had passed 3.15±2.94 hours of theoretical courses and 1.76±3.11 hours of clinical training in neonatal resuscitation before inclusion in the study. On average, they had performed 1.12± 0.67 cases of resuscitation under expert supervision and 1.72±0.35 cases alone.

In OSCE, 84.6% of students had poor skills in neonatal resuscitation (< 50% of the total score). The mean score of students' skills in neonatal resuscitation was 97.85±23.15 out of 236 (41% of the total score). As indicated in Figure 1, students obtained 56%, 38%, 49% and 20% of the total score in station 1 (knowledge about resuscitation), station 2 (the initial steps of resuscitation), station 3 (PPV) and station 4 (intubation), respectively. Also, they obtained 72%, 45% and 29% of the total score in station 5 (chest compression), station 6 (appropriate drug dosage and route of administration) and station 7 (management of advanced resuscitation), respectively.
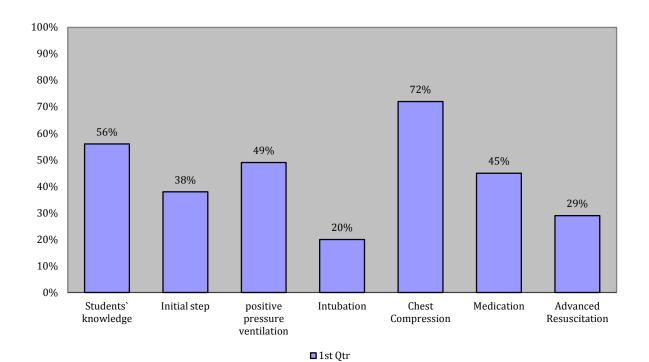
Figure 1. The percentage of students' total score

Moreover, students' performance in some key actions in neonatal resuscitation was evaluated. In station 2, only 5.1% of students checked the equipments sufficiently. Also, 30.8% of students did not properly position the infant's neck, and 56.4% showed an unsatisfactory performance in this regard. According to the results, 61.5% of students showed unsatisfactory performance in mouth and nose suction. Moreover, 71.8% of students did not remove the wet linen, and 76.9% failed to re-evaluate the infant's response.

None of the students chose the right time for performing the initial steps of resuscitation. In station 3, 38.5% of students did not choose the correct size of the mask, and 30.8% showed unsatisfactory performance in this regard. Also, 79.5% of students had poor performance in PPV, and 61.5% did not pay attention to the rise and fall of the chest. In 74.4% of students, PPV took more than 30 seconds and almost half of the participants did not re-evaluate the infant's response.

In station 4, 74.4% and 66.7% of students did not check the equipments and the correct tube size, respectively. More than half of the students did not check the chest rise, 84.6% of students did not succeed in intubation, and 97.4% failed to complete the skills within three minutes.

In station 5, 66.7% of students did not use the correct method of chest compression. In 84.6% of students, this technique took more than 30 seconds and 82.1% of students performed unsatisfactorily in re-evaluation. In station 6, 57.9%, 76.3% and 97.4% of students recorded incorrect or incomplete data about the route of adrenaline, naloxone and normal saline administration, respectively.

The mean score of self-confidence in neonatal resuscitation was 11±4.57 out of 24. Students reported that they had less confidence in intubation skills, compared to other skills related to neonatal resuscitation. There was a significant correlation between students' knowledge and total performance (r=0.012). Also, students' self-confidence had a significant correlation with their total performance (r=0.048).

In this study, students' satisfaction with OSCE was 19.06±2.67 out of 24. In addition, 89.90% of students reported OCSE as a valid test for the assessment of neonatal resuscitation

skills, and 90% of students recommended that OSCE should be applied for the assessment of their skills.

Discussion

The development of OSCE for the evaluation of neonatal resuscitation skills and the assessment of students' knowledge, experience and competence in performing neonatal resuscitation was described in this article. In fact, this is the first report on the development of OSCE for the evaluation of neonatal resuscitation skills in our university.

In this study, 84.6% of students had poor skills in neonatal resuscitation, and students obtained less than 50% of the total score in five out of seven stations. Regarding knowledge about neonatal resuscitation, students obtained almost half of the total score, which indicated lack of knowledge in cardiopulmonary resuscitation. In terms of students' neonatal resuscitation skills, the findings were dissatisfactory in all stations except chest compression, in which students scored more than 70% of the total score. The lowest skill level was reported in intubation, which was 20% of the total score (Figure 1).

This study indicated that all students were incompetent in neonatal resuscitation skills, which was consistent with the findings of previous studies. In previous studies, approximately 30% of the steps of neonatal resuscitation were not performed or performed incorrectly (6).

The gap between the provided and needed courses for functioning as a competent resuscitator at medical schools has been already identified (17). Also, as the number of trainees continues to increase, opportunities for learning and practicing the necessary skills during medical training decrease (18, 19). As a result, the knowledge and clinical skills of care providers have been reported to be inadequate in this area of health care (6, 18).

Several studies have demonstrated that medical residents have relatively few opportunities for leading neonatal resuscitation, even by the end of their training (6). In our study, students showed the lowest competence in intubation, which was in consistence with previous studies. According to a previous study,

residents were successful in less than 50% of cases of intubation, despite the recent certification issued by NRP (6). Based on previous reports, students rarely perform more than 20 cases of intubation during their residency training (20), while 40-60 intubation attempts are required to attain proficiency (21). Moreover, in another study, less than two-thirds of graduated students were competent in neonatal intubation (22).

In our study, students' self-confidence was lower than half of the optimal score. A study showed that only 41% of residents felt confident to resuscitate infants (2). Our findings showed that students' skills in neonatal resuscitation were lower than expected. In fact, skill training included in academic curricula is not sufficient and students need additional workshops. These workshops should be presented by applying new training methods to ensure students' competence (23, 24).

Neonatal death comprises a significant portion of all deaths in children under five years of age. On the other hand, the Millennium Development Goal-4 calls for prompt action to save infants at risk. Therefore, significant attempts are required to improve students' knowledge and competence; this in fact might be the greatest effort towards achieving the Millennium Development Goals (23, 25).

Overall, according to the results, training workshops about neonatal resuscitation need to be held by using novel training methods. The use of our designed examination program is suggested to researchers and the staff who examine students' neonatal resuscitation skills.

Acknowledgments

Conflict of Interest

The authors declare no conflicts of interest.

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