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A Sample of Simulation Design: Individualized Supportive Developmental Care in Neonatal Intensive Care

Abstract

Each year the number of preterm births increases. It is important for the healthcare professionals to use the individualized supportive developmental care practices in the neonatal intensive care units for a good start to life of these infants. However, it is risky for the future healthcare professionals to learn these practices safely in the real clinical environment for both the newborn and family health. For this purpose, a simulation design was prepared based on necessity of teaching the individualized supportive developmental care practices, which are required to be used commonly for newborns, in a safe care environment.

Keywords: Care, Preterm, Simulation design, Newborn

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Introduction

Every year 15 million preterm infants are born worldwide.[1] The rate of preterm birth varies between 5% and 18% in 184 countries and is gradually increasing.[2] In the UK, approximately 100,000 infants are admitted to the Neonatal Intensive Care Units (NICUs) due to preterm birth or an illness[3] and approximately one million children die every year because of preterm birth complications.[1]

The advancements in medical intervention and treatment have increased the survival rate of all preterm infants, including ones with an extremely low birth weight.[4] When preterm infants stay in NICU, they are exposed to required recurrent, but painful medical interventions and stress. Aside from the physiological changes, such as the environmental stress factors, increasing heart rate, blood pressure and respiratory rate, it may cause decreased oxygen saturation rates as well. For this reason, the newborn infant has a great risk in cognitive, linguistic, neuropsychological and behavioral deficiencies throughout life.[4] Infants may alter physiological functions based on the increasing energy expenditure in order to overcome these changes, recover slowly and these alterations may negatively affect organization of the neonatal central nervous system.[5] Preterm infants try to develop under the influence of stimuli that are not present in the uterine environment. Because of the potentially negative effects of the NICU environment on the quality of life of preterm infants and their families, the researchers have made many different developmental interventions in order to mitigate the negative effects. These interventions were designed to create the closest uterine environment in order to encourage normal growth and development.[6] Als[7] (1982), analyzed the effect of the NICU environment on the developing brain of the preterm infant and suggested a framework in order to interpret the behavioral hints of an infant and to respond these and presented care based interventions in order to deal with the harmful effects of the environmental stress on the infant. The positive effects of these “developmental interventions” in the NICU on the brain structure, motor organization and development and longer term cognitive and behavioral results were shown.[4,7–9]

For a start to a good life, it is significant that health professionals apply individualized supportive developmental care on the newborn infant. However, the fact that the health professionals learn about these practices safely in the real clinical environment poses risks for both the newborn and the family health. For this reason, a simulation design was prepared based on the requirement of teaching the individualized supportive developmental care practices which are required to be used widespread on the newborn infants under risk in the safe care environment.

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Simulation Based Learning and Importance of the Design

As a teaching strategy, simulation is designed based on the assumptions of the teaching design in order for the participants to learn and evaluate on the learning outcomes properly because simulation based learning involves a dynamic process, and, it is essential to structure all the stages beforehand for an effective simulation in order to achieve successfully this process. Furthermore, adopting five correct principles in the simulation design (proper content, proper target group, proper method, proper time, and proper budget) is significant for achieving this success.[10] In the publication conducted by Karen[11] (2015) to examine simulation design, it is stated that the process begins with the evaluation of learner needs similar to the simulation design stages of International Nursing Association for Clinical Simulation and Learning (INACSL), and then it is required to identify the simulation aims and measurable goals. Moreover, the significance of designing the simulation by taking into account the required and accessible resources following the completion of the initial stages is emphasized in this literature.[11] Since a well-designed simulation will minimize the problems to be encountered in the application stage, each stage of the design must be written in detail.[11–14] It is important to transfer what was designed during the simulation design process to a template for standardizing the required steps. Providing the standardization organizes the simulation process and supports the consistency of the scenario in addition to guiding development, application and assessment of the simulation.[15–18] Below is a simulation design on individualized supportive developmental care in the NICU, which was prepared based on a simulation design template. For an evidence-based valid design, it is required to write the scenario based on current evidence obtained from articles, clinical guidelines and course books and to have it reviewed by the experts. This design was reviewed by the experts for conforming its validity. The fact that content validity is sufficient means that the created design represents all the dimensions of the subject up to a degree. When the content validity is considered to be sufficient, it is required to have the scenario tested in a pilot study with a small group of learners similar to the targeted population. Accordingly, the pilot application of the design was carried out with a group similar to the target group and readjustments were made.

Simulation Design

Date: 05.11.2016	**File Name**: Individualized Supportive Developmental Care
Scenario Developer(s): Zehra KAN ÖNTÜRK	**Development Date**: 01.04.2015
Validity Date of the Scenario: 10.04.2015	**Revision Date**: 10.04.2015
Discipline: Nursery	**Target Participant Group**: 4th year
Location: NICU	**Place of Debriefing**: Debriefing Hall 1
Scenario Duration: 15 min	**Debriefing Duration**: 30 min
Scenario Level: Level II*	

*Level I: Undergraduate 1st, 2nd, and 3rd year; Level II: 4th year; Level III: Postgraduate

The initial stage of the design involves determining the needs and measurable goals in the same line and deciding on the type of simulation.[12] In that sense, the general information regarding the initial stage of the design and the demographic information of the patients for the determined needs were created.

General Information

Today's Date: 10.14.2015	**Patient name and surname**: Infant (Azize) K.
Gender: Boy	**Age**: 35 + 3 GW
Height/Weight/BMI: 2100 g/ 43 cm	**Race-Religion**: Islam
Caregiver: NICU Nurse, Parent	**Allergies**: Unknown
Primary Medical Diagnosis: Preterm	**Surgical Operations/Interventions & Date**: None

Past medical history: The infant (Azize) K. was born to a mother with premature rupture of membrane in the 30 + 2 gestation week through caesarean with an Apgar score of 6. He is male. Because of being preterm and having postnatal respiratory problems, he was transferred to NICU

Current medical story: Now the infant is in 35 + 3 gestation week with a good general state, fed through nasogastric catheter with IV vascular access.

Social history: He is the first child of the couple Azize and Kadir K.

Demographic information of the patient

The designer must also make planning regarding the preparedness of participants that provides information on the participants' knowledge, skills, attitudes and behaviors. The preparation of the participants must be completed before starting the prebriefing stage. In this simulation design, for the pre-scenario preparation of the participants:

Knowledge competencies

- Explains the synactive theory,
- Summarizes the principles of individualized supportive developmental care,
- Lists the application principles of neonatal Nasogastric (NG) probe,
- Knows the kangaroo care principles.

Skill and attitude competencies

- Uses the principles of individualized supportive developmental care,
- Applies the nasogastric probe on the neonatal,
- Be able to apply the kangaroo care,
- Provides the team communication in the NICU.

Individual preparation of the participant

- Reading the sections of the studies given in the references,
- Reading the lecture notes,
- Watching videos related to kangaroo care and neonatal nasogastric probe application.

For the best simulation application, predetermined measurable learning objectives must be determined. While creating the objectives and goals, participant requirements determined at the beginning are important. Measurable objectives are an important part of the design and guide the participants as they prepare for the simulation experience. Measurable objectives must be written with short wording about a single behavior that is supposed to take place after a learning session or in a short time period. Moreover, they must include the performance criteria of the participants. Valid and reliable tools must be utilized for measuring these performance criteria.

Simulation objectives and learning outcomes

Principle objective of the scenario: For the participant to provide an effective care by determining the individualized supportive developmental care needs of the neonatal.

Learning outcomes

- Observes and examines the newborn infant in line with the patient information,
- Determines the priorities based on the patient assessment results and accordingly plans, applies and evaluates the individualized supportive developmental care process,
- Provides communication with the patient and the family and applies the kangaroo care,
- Establishes an effective communication with the team members.

The simulation scenario must represent the patient and his/her status in a realistic way. Maximizing the reality of the simulation is important for the students to understand the situation and to manage this situation when the clinic practice takes place. For this, the audial, visual and tactile ways of the learning must be included when writing by creating situations that will create perception of reality. In addition, the designed scenario must be enriched in terms of physical, conceptual and psychological compatibilities based on the aims in a realistic way.

Fidelity

The environment where the scenario will take place is the Neonatal Intensive Care Unit (NICU). In the scenario, SIM Baby simulator will be used manually. The simulator must be installed with Intravenous (IV) catheter and nasogastric catheter (NG) and monitored. In the beginning of the scenario, the display characteristics of the simulator are as follows: the newborn infant is diapered, NG is inserted, a vascular access is established on the left hand and the infant is sleeping on the open bed radiant warmer. The monitor light is on in the open bed radiant warmer, the infant is not nested and his position is not supported, and an alcohol swab was forgotten next to his nose. As a moulage, the baby diaper was given the image of having urine, and it was half full.

The medical materials in the environment were listed below. In addition to the medical materials, patient file, patient assessment form, NICU inspection form, doctor inspection form, shift inspection form and infant identification card are required.

☐ Stethoscope	☐ Disposable diaper
☐ NG materials	☐ IV Catheter
☐ IV infusion pump	☐ IV infusion pump set
☐ Feeding pump	☐ IV Pump
☐ O_2 set-hood-nasal cannula	☐ Sponge
☐ Pulse oximeter	☐ Injector 5, 10 mL
☐ Monitor	☐ Nonsterile gloves
☐ Monitor electrons	☐ Adhesive tape
☐ Open bed radiant warmer, Incubator	☐ Nurse uniform
☐ Neonatal Ambu	☐ Disposable gown, bone
☐ NG catheter	☐ İnfant dress
	☐ Treatment tray

In order to carry out the scenario within the determined objectives, all the simulation team members must be oriented toward their roles. For this, it must absolutely be planned which roles will be included earlier during the design stage.

During the design stage, the facilitator approach must be determined for each case depending on the simulation and must be included in order to put the participant to the main focus of the simulation or implement the important tasks. Facilitators are the people who are trained to provide guide, support, and structure during all the stages of simulation based learning. In addition, in cases where number of trainers is insufficient, voluntary participants assigned to aid the direction of the simulation scenario can be determined earlier.[12]

Roles

Four roles are needed for the implementation of this scenario. The first nurse (the first responsible nurse) will be chosen among the participants. The nurse (second nurse) who is present in the field in the beginning of the scenario and is to go off the shift, and the visiting doctor are in the role of facilitators. The fourth role is the parent. The parent and the second nurse are not among the trainers, and unknown by the participants, but they are professional actors knowing about the learning outcomes of the scenario as well as the current level of the students.

Important information regarding roles

The infant is sleeping in NICU. The First Nurse enters NICU and handoff the patient from the Second Nurse.

Second Nurse (Facilitator): Hand overs the patient to the Nurse and registers the handover data in the file.

First Nurse: Handoff the patient and assesses, determines the care priorities, provides individualized supportive developmental care, communicates with the doctor, carries out the requested practices and registers them. Communicates with the parent and initiates the kangaroo care.

Doctor (Facilitator): Visits the patients, notes the prescriptions and repeats the visits if necessary.

Parent: Receives information about the infant and participates in the care and Communicates effectively with the infant and the team.

Prebriefing guide

For each scenario/situation, a written standardized, pre-structured and consistent prebriefing guide must be prepared. This guide includes the information activities to build up trust about the environment, the expectations of the participants and the moderator as well as the principle rules. The orientation of the participants to the environment is also provided with this guide (equipment, simulator, method, assessment, roles, time management, extended/specific objectives, patient status

Duration	Scenario Group 1	Scenario Group 2
08:30-08:45	*Student Name Surname*	*Student Name Surname*
08:50-09:05	*Student Name Surname*	*Student Name Surname*
09:10-09:25	*Student Name Surname*	*Student Name Surname*
09:30-09:45	*Student Name Surname*	*Student Name Surname*
09:50-10:05	*Student Name Surname*	*Student Name Surname*
10:05-10:35	***DEBRIEFING SESSION***	

and limitations) before scenario.[12,13] The following steps are included in the preliminary information guide of this simulation design.

- Meeting the participants

Your shift starts at 08:00 today. You handoff your patient from the nurse leaving the shift. Today an infant is being followed up in NICU.

The infant (Azize) K. was born from a mother with membrane rupture at the 30 + 2 gestation week through caesarean section. He is male. Since she had postnatal respiratory problems after birth, He was transferred to NICU. During this process, respiratory support was provided, the examinations were made and care was provided. The infant is currently at the 35 + 3 gestational week, has a good general condition and comfortable respiration, is monitored, is fed through nasogastric catheter and has IV vascular access available.

- Sharing the information about the simulator
- Understanding the expectations/objectives related to the scenario
- Meeting the requirements before the simulation
- (If applicable) receiving permission for taking photos/recording videos
- Providing privacy and a safe learning atmosphere
- Reminding safety issues
- Making all the participants understand the identified roles
- Providing the anticipated time chart
- Providing information about the debriefing session
- Questions

Scenario Process Outline

Timing		Manikin/Standardized Patient Actions	Environmental Factors	Expected Interventions	Clues
PHASE I (first 5 min)	Entrance-1 min	Patient. BT: 36.7 °C, R: 35/min, P: 110/min, SPO_2: 95%	**Physical Environment**: There is an incubator and an open bed radiant warmer in the area designed as NICU. The infant is sleeping in the open bed radiant warmer. The patient is with a diaper. The infant is monitored, has IV catheter on the left hand and NG. **Second Nurse**: the nurse who shall leave the shift is in the counter. She is registering data on the file.	**Second Nurse (Facilitator)**: Hands over the patient to First Nurse. Registers the data on the file. Tells that the parent came very early in the morning, milked in the lactation room for the feeding time at 9, and wants to see her infant. **First Nurse**: Takes the patient and examines. Asks questions to the Second Nurse if any. Writes the handover note. Plans the care.	**Second Nurse (Facilitator)**: Answers the questions, tells that she will leave the hospital a bit late and that they can call her if necessary.
	2-5th min Examining the patient and doctor visit	Patient BT: 36.7 °C, R: 35/min, P: 122/min, SPO_2: 95%	**Physical Environment**: An alcohol swab was forgotten next to the infant in the open bed radiant warmer. The monitor noise is high. The monitoring light is left on. The infant slid over towards the bottom section of the bed with feet touching its bottom section. **Parent**: She is milking in the lactation room.	**Second Nurse (Facilitator)**: Leaves the unit. **First Nurse**: Removes the alcohol swab next to the patient. Turns down the volume of the monitor. Turns off the monitoring light, provides care for changing the baby. Provides position, (midline, flexion, nesting, comfort). **Doctor (Facilitator)**: Comes to visit. Sees the patient. Receives information. **First Nurse**: Accompanies the doctor during the visit and provides information about the patient as she accompanies. **Doctor (Facilitator)**: Writes recipe and leaves the unit. • Vital Signs monitoring 24*1 Blood glucose monitoring 2 × 1 • NG removal • Breast milk (Trying breastfeeding) • Kangaroo Care	**Doctor (Facilitator)**: When he comes for visit, he warns First Nurse if there are any deficiency in checking and arranging the physical environment. Tells her what she must do.

(Continued)

Scenario Process Outline

Timing		Manikin/Standardized Patient Actions	Environmental Factors	Expected Interventions	Clues
PHASE II	6-10 min. NG Removal Application of Individualized Supportive Developmental Care	**Vital signs**: NG removal Before: BT: 36.7 °C, R: 40/min, P: 135/min, BP: 90/50 mmHg, SPO_2: 95% During: BT: 36.5 °C, R: 50/min, P: 164/min, BP: 90/50 mmHg, SPO_2: 93% Superficial respiration After: BT: 36.7 °C, R: 52/min, P: 170/min, BP: 90/50mmHg, SPO_2: 90%, Superficial respiration The infant is swaddled, touched, given pacifier, etc. and then the infant calms down if the self-calming down is facilitated. If these are not done, the infant continues crying. The vital signs continue as the ones after the process.	**Infant**: cries as the NG tapes are taken out. **During NG removal**: makes retching sounds. **After NG removal**: cries. makes hiccup sounds.	**First Nurse**: Monitors the vital signs, removes the NG, checks the autonomic/physiological system during and after the process, observes the stress symptoms of the infant, calms him down, supports the self-calming down behaviors, and registers.	**Doctor (Facilitator)**: Repeats the visit if necessary, inquires about the vital signs.
	10-15 min. Kangaroo Care	**Vital signs**: BT: 36.7 °C, R: 36/min, P: 121/min, SPO_2: 95%	**Parent**: She is worried. Knocks on the door. Comes with the breast milk she milked in her hand.	**Parent**:She tells that she wants to see the baby. **First Nurse**: Lets the parent inside. Takes the breast milk from her hand. Tells her to get dressed and wash her hands. Provides information about the infant. Provides information about the kangaroo care for the mother, gives position to the mother, prepares the infant and initiates the care.	**Parent**: If not told to get dressed and wash her hands by one of the nurses, she says she has done so formerly and asks whether she is going to do so again. Asks for information if information about the infant is not provided, asks questions about her baby. "How did he spend the night, how is his condition, did the doctor see, what is going to be done today?"

Time planning chart

For a successful simulation day, the planning and organization of the simulation activity is required. A consistent, detailed and realistic time chart must be prepared for the learning activity. Within this time plan, the duration of the simulation and the number of participants must be taken into account. In the sample time chart prepared by taking into account the number of participants below, it was planned that the participants shall enter the scenario one by one, and a group debriefing session shall be held.

In the last section of the simulation design template, the references, evidence-based guidelines, protocols or algorithms used while preparing the design must be included.

References, evidence-based guidelines, protocols or algorithms used in this scenario

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PHASE III–OUTCOME A	PHASE III–OUTCOME B	PHASE III–OUTCOME C
If learner carries out all the key attempts	*If learner carries out some of the key attempts*	*If learner is not able to carry out most the key attempts*
Patient Assessment Status: First Nurse makes all the attempts and cooperates with the parent if she informs the parent. Kangaroo care is initiated. **Vital signs during the kangaroo care**: R:34/min, P:115/min SPO_2: 96%	**Patient Assessment Status**: The infant feels uneasy if First Nurse makes some of the attempts. **Vital Signs**: R:40/min, P:135/min SPO_2: 94% The infant feels uneasy and if the parent is not informed sufficiently, she lets the initiation of the kangaroo care, but she feels unwilling and cautious and does not carry out the application sufficiently. **Vital signs during the kangaroo care:** R: 55/min, P: 160/min SPO_2: 90%, Superficial respiration The doctor cooperates with the parent and provides the continuation of the kangaroo care.	**Patient Assessment Status:** The infant cries if First Nurse does not make any of the attempts. **Vital signs**: R:46/min, P:148/min SPO_2: 94% The parent refuses to pick up the infant, telling that she is scared. She insists on seeing the doctor. Kangaroo care is not initiated.
Environmental Factors: The infant is calm and the vital signs are stable. The parent is agreeable and cooperative.	**Environmental Factors:** The doctor enters the unit to visit.	**Environmental Factors:** The doctor comes to visit. He examines the infant. He tells the nurses that the infant should be fed with cup feeding for now and asks for trying the kangaroo care again later. He lets the family out of the unit to provide information. The scenario ends.

Reaction stage	Description Stage	Analysis Stage	Summarizing Stage
• How did you feel? • What were your reactions when you first started? • How do you feel now?	• Can someone summarize the event from a medical perspective? • Are we seeing it in the same way? • From your perspective what was the main subject/conclusion about? • What kind of things did you do for the patient? • What were the aims of the scenario? • What were your personal aims?	• What do you think you did well? • If you had a chance to do it again, what would you like to change? • What do you think about what your friend says? • Did it really happen like that?	• If this discussion session is to be summarized, can you share your conclusions from your experiences today? • In brief, what are the key points we have learnt from this event? • What was the key assessment and application in this scenario?

Scenario process outline

This stage of the scenario is related to what occurs as the participants experience the scenario, and it includes the timing, patient actions, environmental factors, expected interventions and clues in line with the goals during the process.

Debriefing session guide

Basically in the debriefing process, the actions of the students throughout the simulation are mirrored. During the debriefing session, it is necessary to help students learn from the whole story. The difference between the ending of the students and the expected ending must be revealed. In this design sample, the method used in the debriefing is the method of Promoting Excellence and Reflective Learning in Simulation (PEARLS). PEARLS includes the phases, reactions, description, analysis and summarizing.[19]

For a best simulation design, it is absolutely a must to use coherent, complementary principle design stages. In addition, while creating the simulation design, all the details must be planned carefully and must be converted into a written format through a structured form. Within this scope, it is predicted that the quality of care will be enhanced with the use of the "Neonatal Intensive Care Individualized Supportive Developmental Care" simulation design sample – which is determined by taking into account the international and national needs and all of whose design stages are used - in the undergraduate education. For this reason, it is suggested that such and similar designs be prepared and made widespread in trainings.

Peer-review: Externally peer-reviewed.

Conflict of Interest: The author has no conflict of interest to declare.

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