IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 12, Issue 2 Ser. I (Mar. – Apr. 2023), PP 53-71
www.iosrjournals.org

Simulation Based Training (SBT) to Improve Skills of Neonatal Resuscitation among Midwives in Primary Healthcare Centres in Rivers State, Nigeria

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Abstract
This study assessed effectiveness of training on NR algorithm among midwives in Primary HealthCare (PHC) centres in Rivers State, Nigeria, with the aim to determine the effectiveness of SBT in improving level of knowledge of NR algorithm among midwives in PHC centres in Rivers State, Nigeria. Orem's Self-Care Nursing Theory was used in the study. The study utilized quasi experimental design with a total population of 270 midwives, attached to Rivers State PHC Management Board (RSPHCMB). Purposive sampling technique was used to select a sample of 79 midwives. Data was collection using adapted Paediatrics Association of Nigeria Conference (PANCOF) NRT (training) questionnaire and observation checklist. Data analysis was done for socio-demographic data, research questions and hypotheses (tested at 0.05 alpha level of significance), using simple percentage, mean, standard deviation, paired T-test and ANCOVA respectively. Findings indicated SBT improved level of knowledge, behaviour and skills with pre-test and posttest mean of 1.48 and 1.58; 2.42 and 3.91 and 1.42 and 1.65; mean gain of 0.10(3.3%), 1.49(23.5%) and 0.23(7.50%) for knowledge, behaviour and skills respectively. Also, results suggested t-value 5.821, 20.428 and 11.281; ANCOVA F-value ($F=_{(13.378)}$, df = 1/64, p<0.05) and ($F=_{(54.123)}$, df = 1/64, p<0.05), and ($F=_{(7.244)}$, df = 4/61, p<0.05); (F= 6.876, df = 4/61, p<0.05) and ($F=_{(4.339)}$, df = 4/61, p<0.05) was significant, however, previous NRT did not affect improvement of skills as ANCOVA F-value ($F=_{(1.509)}$, df = 1/64, p>0.05) was insignificant. In conclusion, SBT is effective in improving level of knowledge, behaviour and skills of NR algorithm among midwives. Therefore, continuous SBT is recommended to improve midwives' effective use of NR algorithm in PHC Centres in Rivers State, Nigeria.

Keywords*: Simulation, Training, Skills, Resuscitation, Midwives*

Date of Submission: 02-03-2023 Date of Acceptance: 14-03-2023

I. Introduction

Neonatal resuscitation is the process and actions undertaken by health care providers to help a newborn baby breathe and its heart beat at birth (PokestarFanBot, 2017). Neonatal resuscitation practice is the regular application of World Health Organization (WHO) recommended guidelines on neonatal resuscitation by all health care providers who take part in the delivery of newborns (WHO, 2019). It is essential for midwives and all maternity healthcare providers to be skilled in NR in order to reduce the number of neonatal deaths

arising from birth asphyxia (Ohning, 2019). Perinatal asphyxia occurs in the newborn that is unable to successfully initiate spontaneous respiration after birth, if the infant is not assisted to breathe immediately and could cause neonatal death if not well managed (Disu *et al.,* 2015; Bettercare, 2019). Perinatal asphyxia is responsible for most neonatal deaths in Low-and-Middle-Income Countries (LMICs). And in Nigeria, it is the cause of 26% of perinatal deaths (Disu *et al.,* 2015; Reisman *et al.*, 2016). Das *et al.* (2019) highlighted the critical need for enhanced training in resuscitation skills for birth attendants due to the major role perinatal asphyxia plays as a contributory cause of perinatal mortality.

Training on NR started as Neonatal Resuscitation Programme (NRP) and was first introduced by the American Heart Association (AHA) and the American Academy of Paediatrics (AAP) to meet the increasing demand for and provide training programme for healthcare workers in evidence-based newborn care. Localized institutional NR training of health workers in Nigeria began over a decade ago with 357 doctors and 370 nurse/midwives, drawn from the geo-political zones. They were trained between 2008 and 2012 based on the NRT manual and step down training was done afterwards at a ratio of 1:22 with 1:18 for doctors and 1:26 for nurses (Disu *et al.,* 2015). Several countries that established the NRP witnessed decreased deaths during labour and childbirth (Disu *et al.,* 2015). Drake *et al.* (2019) posited that on-the-job-training (OJT) evidently improved medical attendants' skills in many LMICs who are the only professionals in primary health facilities. Das *et al.* (2019) demonstrated that master trainers become familiar with job aids and practicing with simulators during training. In addition, successful experience of implementation within existing public health system, increase in number of healthcare workers who practice NR and decrease in fresh stillbirths shows that scaling up of intervention package was feasible and successful (Das *et al.,* 2019).

However, there is urgent and critical need to continue training healthcare workers on essential newborn care and NR to reduce fresh stillbirths and ensure newborns survive. Likewise, additional documentation needs to be undertaken to ascertain profitability of investments and the long term effects (Drake *et al.,* 2019). Furthermore, on-the-job-training (OJT) tools could improve retention of helping babies Breathe (HBB) skills in HBB programme. Similarly, there is need to elicit mastery of skills retention beyond 4-6weeks after training and identification of OJT packages that improve competency and practice. Additionally, it is important to establish the duration, timing and methods, and tools of OJT, as well as the effectiveness of having OJT as a routine approach (Drake *et al.,* 2019).

Further, Lin and Cheng (2015) posited that there is increasing use of simulation in paediatric institutions to teach effective paediatric resuscitation. Simulation-based training (SBT) is an effective means for teaching concepts of paediatric resuscitation. It is widely used in teaching crisis resource management training (CRM), airway management, cardiopulmonary resuscitation (CPR) and NR procedural skills. Debriefing is a vital component of simulation-based resuscitation education. However, it was suggested that health care educators could achieve optimal learning outcomes through use of high-fidelity simulation (HFS), among other simulation based practices. According to Disu *et al.* (2015), the NRT in Nigeria has increased in scope with adequate step-down trainings; however, further entrenchment of the cascades of training would help more babies in Nigeria to live. Furthermore, Reisman *et al.* (2016) opined that on-going refresher training and structured practice are productive, although, barriers to the success of NRT programmes and subsequent decrease in newborn mortality in LMICs remain retention of knowledge and skill over a long period of time. In same vein, research gaps in simulation-based education have been revealed by current literature and it was noted that this could indicate future areas of research in paediatric resuscitation (Lin & Cheng, 2015). Thus, this study on effectiveness of training on neonatal resuscitation algorithm among midwives in Primary Health Care (PHC) Centres in Rivers State, Nigeria, is an attempt to bridge this gap.

Objectives

To determine effectiveness of Simulation Based Training (SBT) in improving the level of knowledge of Neonatal Resuscitation (NR) algorithm among midwives in PHC centres in Rivers State, Nigeria.

Research Question

How effective is Simulation Based Training (SBT) in improving the level of knowledge of Neonatal Resuscitation (NR) algorithm among midwives in PHC centres in Rivers State, Nigeria?

Hypothesis

H_0: SBT does not significantly improve level of knowledge, behaviour and skills of NR algorithm among midwives in PHC centres in Rivers State, Nigeria.

Theoretical Framework

The theories underpinning this study on effectiveness of training on neonatal resuscitation algorithm are the Pedagogical Facilitator, Training, Learning and Virtual Reality (FTL & VR) Model for Simulation-Based Learning (SBL) in Healthcare and Dorothea Orem's Self-Care Nursing Theory (Orem Model of Nursing).

The Pedagogical FTL and VR Model for Simulation-Based Learning in Healthcare

Keskitalo and Ruokamo (2015) designed the pedagogical model, for SBL in healthcare. It is a virtual reality (VR) and SBL environment for healthcare. The model is based on principles of the FTL model that are derived from teaching, studying and learning (TSL) processes, as well as the characteristics of meaningful learning and previous pedagogical models. It draws significantly from socio-constructivist and socio-cultural perspectives of learning. The FTL is a process of facilitation, training and learning and relies on students' activity for learning to occur.

In FTL, facilitating is teaching, because teaching in a simulation-based learning environment is more an act of facilitating students' learning. Facilitators plan, guide and evaluate the students through the instructional learning process, as well as assess their own performance as facilitators. Also, in the FTL model, training is studying, since one of students' activities is training to master the specific skills needed in healthcare. Fourteen partly intertwined and overlapping characteristics of meaningful learning, explain training in the FTL model and these include: experiential, experimental, emotional, socio-constructive, collaborative, active, responsible, reflective, critical, competence-based, contextual, goal-oriented, self-directed and individual. Facilitators place emphasis on these characteristics, to secure meaningful learning amongst the students in the learning environment (Keskitalo & Ruokamo, 2015).

Courses in the FTL model are subdivided into introduction, simulator briefing, scenarios and debriefing in simulation-based environment. The introductory phase is handled by the facilitator and consists of the following activities: presentation of the course topic, important concepts, and explanation of the concept of simulation, pedagogical models and methods to be used for the training. The simulator briefing is the phase in which participants familiarize themselves with the simulation, and have hands-on-time with the environment and the equipment. Scenarios are broadly introduced by the facilitator in this phase (Keskitalo & Ruokamo, 2015). Likewise, the simulator briefing phase helps students to know and understand what is expected of them. Participation of trainees in the simulation occurs in the scenarios phase with the students. The debriefing is the final phase where the students' performance is encouraged, guided and monitored by the facilitators. In FTL model, training is student-centred but facilitators lead the introduction and simulator briefings. Also, learning occurs mostly during the debriefing phase as the students reflect on their own learning; hence, the debriefing phase is situated under the learning phase in the FTL model (Keskitalo & Ruokamo, 2015).

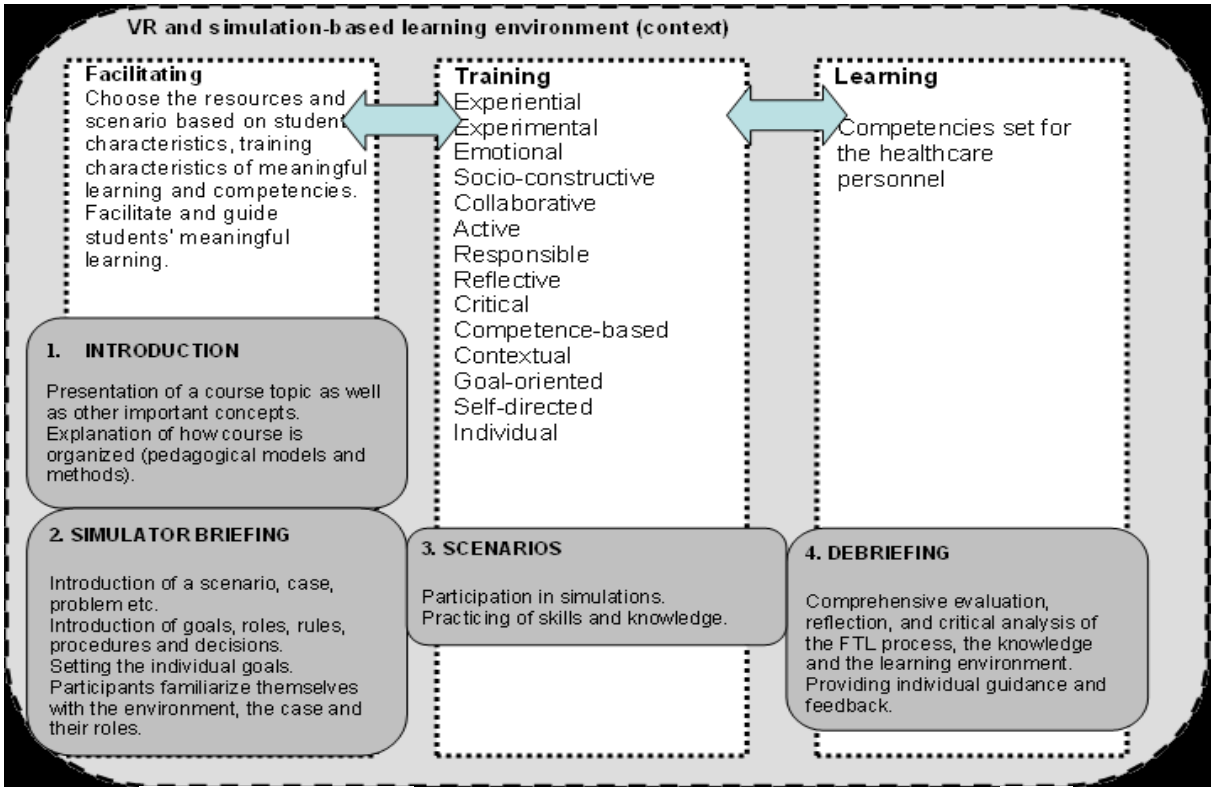

Figure 2.1: **Pedagogical Facilitator, Training, Learning and Virtual Reality Model for Simulation-Based Learning in Healthcare (adapted from Keskitalo & Ruokamo, 2015)**

Application of Pedagogical Model for Simulation-Based Learning in Healthcare

This study on SBT to Improve Skills of Neonatal Resuscitation among Midwives in Primary Healthcare Centres in Rivers State is to determine effectiveness of SBT in improving the level of knowledge of Neonatal Resuscitation (NR) algorithm among midwives in PHC Nigeria. The study was based on the assumptions of the FTL & VR model and involved facilitation, training and learning. Learning occurs through trainees' simulation based activity. Teaching was by facilitation in a simulation-based learning environment. Facilitators planned, guided and evaluated the students in the instructional/learning process. It was subdivided into introduction, simulator briefing, scenarios and debriefing in simulation-based environment.

Facilitators handled the introductory phase which involved presentation of the course topic, important concepts and explanation of the concept of simulation, pedagogical models and methods to be used for the training. Participants familiarized themselves with simulation and had hands-on-time with the environment and the equipment in the simulator briefing phase and scenarios were broadly introduced by the facilitator in this phase too, to helps trainees to know and understand what is expected of them. Participation of trainees in the simulation occurs in the scenarios phase and the debriefing was the final phase where the trainees were encouraged, guided and monitored in their performance by the facilitators. The training centred on the students learning needs but facilitators lead the introduction and simulator briefings.

Orem's Self-Care Nursing Theory (Orem Model of Nursing)

Dorothea Orem developed Self-Care Nursing Theory (Orem Model of Nursing) between 1959 and 2001 as a grand nursing theory, with a broad scope and covering major concepts relevant in all situations in nursing. Orem viewed nursing as acting to provide or assist people maintain or improve human functioning, by effectively caring for themselves as they would do at home. The model focuses on each individual's ability to perform self-care, through practice of activities they initiate and perform by themselves, in order to maintain life, health, and well-being. The self-care nursing theory consists of three theories which are interrelated viz: 1). The self-care theory; 2). Self-care deficit theory, and 3). Nursing Systems Theory which is further subdivided into wholly compensatory, partial compensatory and supportive-educative theories (Gonzalo, 2019).

Self-Care Deficit Theory

Wayne (2019) posited that self-care deficit implies deficiency in performance or completion of activities of daily (ADL) living such; as feeding, dressing, bathing and toileting. ADL are referred to as things individuals do regularly for themselves such as personal hygiene, feeding, home keeping, grooming, work and recreation. However, some patients might have difficulties in performing self-care. Self-care means an individual can perform ADL independently throughout life to promote and maintain personal well-being. Whereas, self-care deficit, is the inability of an individual to perform self-care as a result of the effect of temporary limitations such as; those one might experience while during recovery from surgery, chronic illness (depression) or deliberate unwillingness to perform the activities required to care for himself or herself. Assisting in ADL are nursing skills. It is the responsibility of the nurse to coordinate services for patients, to regain independence in a safe and supportive environment that meets patient's special needs.

This theory applies to situations whereby nursing is needed and this is could be when in the case of an adult (or a dependent, the parent or guardian) is unable or limited incapability in providing continuous effective self-care. Nursing methods utilized to help are: Doing things or acting on behalf of others; guiding, supporting and teaching another person as well as promoting an environment for personal development in relation to meet future demands (Gonzalo, 2019).

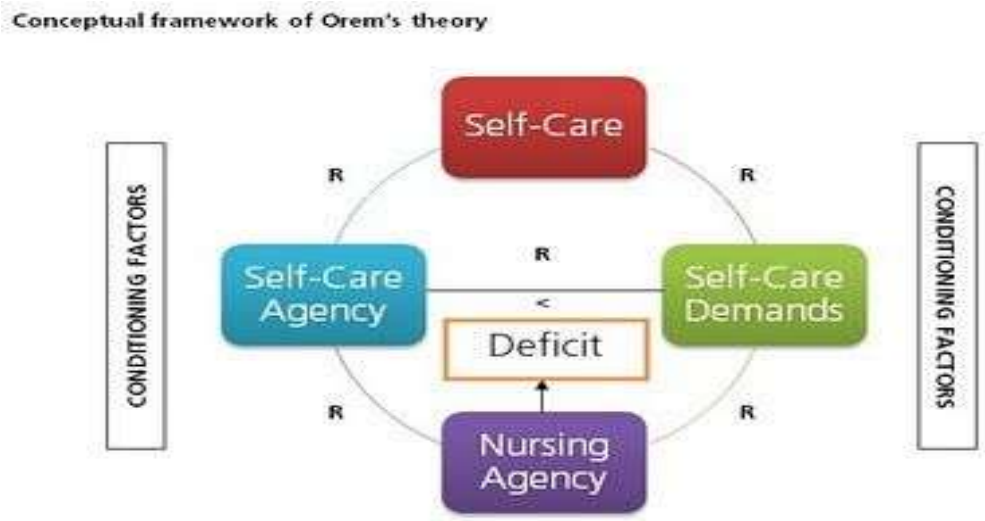

Figure 2.2: **Conceptual Framework of Dorothea Orem's Self-Care Nursing Theory (Orem Model of Nursing) (adapted from de Lara, 2010)**

Application of Self-Care Deficit Theory to the Study

Self care deficit is created when self-care demands exceed self-care and dependent care ability, requiring nursing to come in to fill the therapeutic gaps. Neonates have potential for self care such as; crying baby to draw attention of others to act on their behalf and fulfill their needs; nurses can understand neonates need to be left to rest by subtle self-pacifying behaviours such as; non-nutritive sucking while sleeping and newborn may develop apnea or bradycardia as signals of not tolerating a procedure (Neiman, 1997). The newborn has three universal self care deficits that take priority in the first few hours of life such as: Impaired gas exchange related to inadequate surfactant levels as evidenced by grunting, and intercostal retractions suggestive of hyaline membrane disease; ineffective thermoregulation related to prematurity and low birth weight as evidenced by poor flexion and lack of subcutaneous fat stores needed for non shivering thermogenesis, and altered nutrition: less than body requirements related to respiratory distress as evidenced by respiratory rate greater than 60 per minute and nil per oral (NPO) status (Neiman, 1997). The nurse provides wholly compensatory and partial compensatory roles to assist the newborn achieve improved gas exchange, maintain thermal homeostasis and adequate hydration, output, and glucose levels. The nurse acts for or does for another by assessing, suctioning, chest physiotherapy, maintaining equipment and IV/medication support. The nurse also provides a supporting environment for the newborn to achieve homeostasis by feeding, bathing, maintaining neutral thermal environment, protecting from injury. These nursing interventions are implemented and accomplished per the care plan (Neiman, 1997).

Concept of Neonatal Resuscitation Algorithm

Shiel (2018) defined neonatal, resuscitation and algorithm as follows: Neonatal is derived from the word neonate and refers to anything that has to do with a newborn. A neonate is a newborn baby that is within the first 4 weeks (28) days of life after birth and is no longer a neonate after a month (that is, 4 weeks). Resuscitation is a way of helping a person to breathe so as to bring them back to life while algorithm is the guideline describing a set of activities undertaken to restore a person's (newborn) breathing to avert death (Shiel, 2018; Paediatrics Medicine Wikibooks, 2019). The Paediatrics Medicine Wikibooks (2019) stated that NR algorithm outlines the process involved in helping a baby with breathing difficulty to breathe in order to sustain life. The physiological changes that occur at birth, enable a newborn that was mostly dependent on its mother for oxygen while in-utero to start breathing on its own for life sustaining oxygen. This is the normal course of life for most newborns. However, a few, about 10% would require assistance to start off their breathing and just 1 % would only breathe successfully with more vigorous attempt to breathe. Chadha (2010) and Kattwinkel *et al.* (2010) noted that the American Heart Association (AHA) and the American Academy of Paediatrics (AAP) designed the NR algorithm in order to standardize NR practices and to aid in recalling the sequence for resuscitation. Poor outcomes results from inability to comply with the guidelines. The 2015 AHA and AAP have updated NR algorithm of include performing the steps as outlined below:

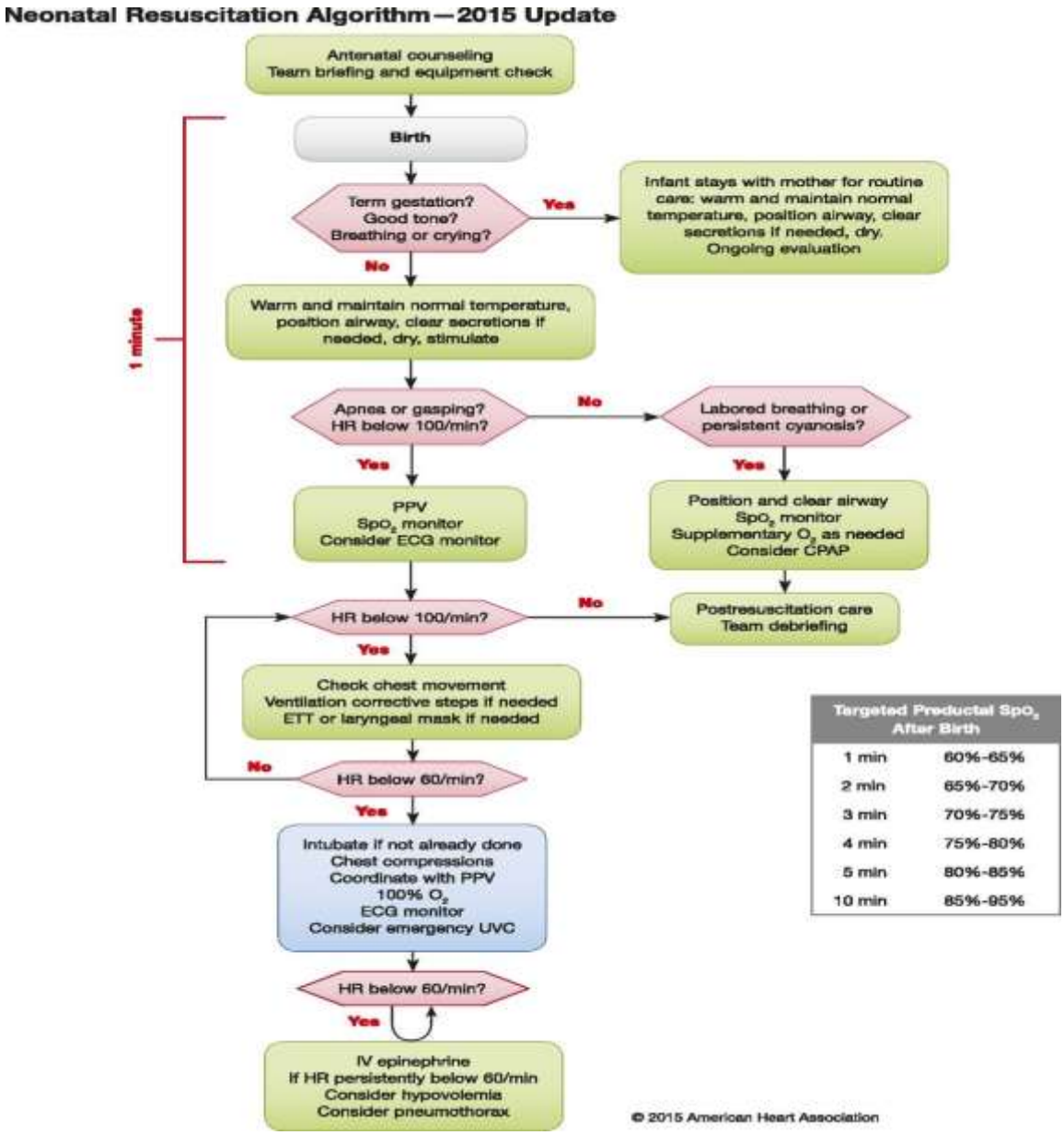

Figure 2.3: **The 2015 American Heart Association Neonatal Resuscitation Algorithm (adapted from Kattwinkel *et al*., 2010)**

Kattwinkel *et al*. (2010) expounded that the first step in the algorithm starts way before the baby is born, during the antenatal care, through counseling for mothers to maintain good health (diet, exercise, rest & healthy lifestyle- non smoking) and to report all observed abnormalities to the healthcare service provider. Also, there should be adequate maintenance of delivery equipment at all times and team briefing for every labour case managed. At the onset of neonatal resuscitation, the newly born infants should be rapidly assessed for parameters that indicate asphyxia by asking some basic questions: 1). is the pregnancy full-term? 2). is the infant breathing or crying? 3). is there good muscle tone? The baby is dried, placed directly on the mother's chest and covered with dry linen for skin to skin contact and initiation of breast feeding if response to all three questions is positive because there is no need to resuscitate the infant.

If assessment yields any negative response, the baby would require one or more of the following actions; warmth, position, clear airway, dry, stimulate, re-position; ventilation; chest compressions, and administration of epinephrine and/or volume expansion in the order listed, depending on the condition of the baby (Kattwinkel *et al*., 2010)). The three vital signs of respiration, heart rate (HR) and colour would determine whether to carry out further actions. Also, each step is to be completely performed in about 30 seconds followed by re-evaluation and progression to the next step. It should take about 60 seconds (referred to as the Golden

Minute to re-evaluate and commence oxygenation of the baby where necessary. The respiration; apnea, difficult breathing or gasping and HR (more or less than 100 beats per minute) of the baby will determine if the resuscitation should continue or stop. The HR needs to be monitored consistently through auscultation of the precordial pulse or palpation of the umbilical pulse for quick and more accurate estimation of the pulse than palpation at other sites (Kattwinkel *et al*., 2010). However, current research favours the 3-lead ECG which is more reliable than pulse oximetry for HR detection (Hainstock & Raval, 2020).

Respiration and HR must be evaluated at an interval of 30-second and if the baby still has poor breathing, muscle tone and HR < 100 beats per minute (bpm), there will be need for tracheal suctioning of the newborn (Kattwinkel *et al*., 2010). Some important additions have been made to the updated 2015 NRP algorithm guidelines such as: 1) use of 3-lead electrocardiography (ECG) to monitor (HR) and initiating intubation before chest compressions. However, the recent guidelines does not recommend routine intubation for tracheal suctioning in case of meconium aspiration, 2) ensure thermoregulation of all newborn infants between 97.7°F and 99°F (36.5°C & 37.5°C), and 3) delay cord clamping for all vigorous newborns (Hainstock & Raval, 2020). Stimulation is done by gently and firmly flicking the soles of the baby's feet and rubbing the back of the baby. Tracheal suctioning should be at HR of < 100 bpm, positive pressure ventilation (PPV) and continue to the newborn starts breathing, becomes pink in colour and has a HR >100 bpm. Apnoeic, (gasping) newborn that has a HR of < 100 bpm or turns bluish should be assisted to breath by PPV, and a cyanotic should be given supplemental oxygen. Assess after about 30 seconds of ventilation and/or provision of supplemental oxygen and continue with care after resuscitation and newborn is breathing, becomes pink and has a HR of > 100 bpm. The circulation will be supported by PPV and chest compression at a HR of > 60 bpm, and must be continued till the HR reaches > 100 bpm and the newborn is pink (Kattwinkel *et al.,* 2010). There is need to continue with chest compression and PPV when HR < 60 bpm and assess after about 30 seconds. PPV and chest compression should be accompanied with the administration of epinephrine if HR is still < 60 bpm and repeated every three to five minutes as required. In case baby's condition does not improve following placental abrupt, placenta praevia or blood loss from the umbilical cord, there will be need for volume support if baby is in hypovolaemic shock and is pale, has delayed capillary refill, weak pulse and a low HR. The above NR algorithm should be practice in every delivery of a newborn that requires resuscitation. Apgar score is a simple useful guide to neonatal well-being and resuscitation, it is only a guide. The information about a newborn's response to resuscitation should be communicated at the time points. Acidosis and survival falls within the one minute score and brain damage may occur within the five minute score. Referral to a higher level facility for expert care should be considered depending on the baby's persisting condition (Kattwinkel *et al.,* 2010).

Neonatal Resuscitation Training

Training is derived from the word train which means the method (s) and all the activities employed to help people gain particular knowledge and skill. Training is therefore the actual process undertaken to enable people acquire knowledge and skill in order to improve their ability in performing a particular task (Chand, n.d.; Collins English Dictionary, 2020). The American Heart Association (AHA) and the American Academy of Pediatrics (AAP) started the NRP to teach newborn care based on evidence-based approach, as well as address the increasing need for an educational programme. In Nigeria, localized training of health workers in institutions in neonatal resuscitation was commenced over a decade ago with 357 doctors and 370 nurse/midwives, drawn from the geo-political zones. They were primarily trained between 2008 and 2012 using the NRP manual. The overall ratio of step down training afterwards was 1:22 with 1:18 for doctors and 1:26 for nurses (Disu *et al.,* 2015).

Meaning of Simulation Training

Simulation is the process of creating models of something new or existing which imitates or depict real life situation, to understand how it works, in order to facilitate learning and predict its outcomes. Simulation trainings are training tools often used by corporate learners. They mimic real time scenarios and are very effective. They serve employees in acquiring relevant skills of practice devoid of any risk. SBT employ strategies such as images, graphics, and sound to create a game-like environment for the learners (Longman Dictionary of Contemporary English, 2020; Hughes, 2017).

Purpose of Simulation Trainings

Simulation trainings are useful for the following reasons: to bring about behavioural change; useful in training; train large numbers and enables risk-free learning, improves retention of knowledge and promotes immediate feedback (Hughes, 2017). Simulation trainees can put real knowledge and skills into practice through physical, hands-on activity instead of just taking lectures and reading books on theory. Simulations help in

addressing real life problem effectively, safely and efficiently. It provides a method of analysis that is easy to verify, communicate and understood (Gold Sim Technology, 2020; The AnyLogic, 2020).

SBT on Neonatal Resuscitation Algorithm

According to Arnold (2011), current trends in the NRP curriculum promote and emphasize use of simulation. In the past, NRP mostly engaged learners in lectures accompanied by use of skill stations, based on low-tech mannequins to impart knowledge and technical skills but without a formal debriefing process. Presently however, complex behavioral skills essential during resuscitation of the newborn are handled by use of simulation-based methods. Simulation training is important in structuring training for delivery of improved healthcare to patients. Pertinent aspects of simulation training include deliberate practice, feedback, and retention of skills, outcome measurement and curriculum integration (Garvey & Dempsey, 2020). NRP instructors are trained in simulation basics and debriefing through watching a DVD. Requirement for instructors now include: possession of knowledge and skills needed to conduct simulation-based training by designing simulation scenarios and debrief using reflective questions.

The hallmarks of SBT are behavioral and teamwork skills rather than individual technical skills and provides the opportunity for multidisciplinary teams to train together. Healthcare professionals were previously trained in silos: nurses in nursing school, physicians in medical school. However, when a patient condition becomes critical, healthcare providers are expected to work successfully as a resuscitation team, not having had an opportunity to practice working together. The result is medical errors due to deficiencies in teamwork, leadership, and communication, rather than technical or cognitive deficiencies (Srivastava, 2020). Simulation-based NRP will provide the opportunity for practice and improvement of critical skills in a safe environment for learners, patients and multidisciplinary healthcare teams (Arnold, 2011).

Knowledge of Neonatal Resuscitation Algorithm

Cambridge Dictionary (2020) defined knowledge as the understanding an individual has about something based on information gained through experience and learning. Knowledge is the state of being aware and familiar with the truth and fact of an issue or person (LoveToKnow, 2018). Knowledge types include declarative, procedural, contextual, and somatic knowledge and help students understand how to apply information gained within a given context (Bakken & Dobbs, 2016). Midwives knowledge of neonatal resuscitation algorithm, is the understanding they have about the guidelines, and how to follow the steps and implement the action outlined in the algorithm, in order to save lives of newborns that are experiencing breathing challenge at birth.

Midwives' proficiency in use of knowledge and skill of neonatal resuscitation in labour room, paediatrics ward and paediatrics intensive care unit is critical to ensuring the safety and health of the newborn. Effective Neonatal resuscitation requires that healthcare professionals have sufficient knowledge and skills. Regrettably, frequent malpractices in the resuscitation of neonates are common and persist among health professionals. Midwives, nurses and residents exhibited substandard knowledge and skills of neonatal resuscitation and training on neonatal resuscitation algorithm is necessary to improve their competency (Gebreegziabher *et al.*, 2014).

Abrha, Asresu, Araya and Weldearegay (2019) asserted that adequate knowledge of newborn resuscitation prevents the consequences of perinatal asphyxia, and appropriate knowledge and use of resuscitation procedures for newborn, is vital in the diagnoses and management of life-threatening conditions in newborns, and hence reduction of complications resulting from mismanagement. Notwithstanding, healthcare professionals' knowledge about neonatal resuscitation is inadequately reported.

Behavioural Skills of Neonatal Resuscitation Algorithm

The Texas Council for Developmental Disabilities (2013) posited that behaviour is the way a person act and expresses thoughts and ideas. It is the way an individual relates with himself/herself. Behaviour can be overt (open; for example coughing) or covert (hidden, for example, muttering under ones breath), and measurable, that is, behaviour can be defined and described, including narrating how it occurs, when it begins, ends and how often. It serves to achieve or prevent something. Behavior is learned. Additionally, behavior is characterized as comprising of has three elements; what prompts (triggers) the action, known as antecedent; followed by the action (the behavior) and the result, also known consequence. Hence, the acronym ABC is used to describe this sequence of behaviour. Garvey and Dempsey (2020) stated that resuscitation is most often an interdisciplinary process and the goal of neonatal resuscitation programmes (NRP) is to enable participants acquire and improve on cognitive, technical and behavioral skills needed to manage newborns at delivery. Also, it teaches essential teamwork skills, so that each person is fully aware of what is required and their role. Simulation learning environment places greater emphasis on teamwork.

Simulation and debriefing are seen as integral components, for instance, like NRP, professional sports teams typically train almost every day, to simulate offensive and defensive moves which they repeat to perfection, and their performance are video-recorded at training, and during games for analysis, for individuals and as well as the team. Critical components to enhance performance are debriefing and feedback and the teams essentially "train to win." In the last 20 years, NRP has come a long way but there is need to improve. Participant receives automated feedback and during training participants are engaged in skills stations, integrated skills stations followed by team based simulation with debriefing afterwards. The important part of the learning process is the debriefing.

Williams, Lasky, Dannemiller, Andrei and Thomas (2010) noted that assessment of vigilance and workload management, raised questions as to how to apply appropriate teamwork behaviours, and how to include them in team training programmes. Vigilance and workload management are teamwork state behaviours and information sharing. And inquiry and assertion feature as teamwork event behaviour. In order to determine relationships, between these behaviours and errors among resuscitation teams, it was observed that fewer errors occurred among vigilant team members, although fewer less correct step were observed too. Furthermore, errors were preceded by more assertions which could indicate the presence of other causes of errors. It is pertinent to note that errors were resolve directly by teammates and did not necessarily serve as opportunities to teach their teammates.

Skills of Neonatal Resuscitation Algorithm

Meriam Webster Dictionary (2020) and SkillScan (2012) defined skill as the use of knowledge to efficiently and competently perform an activity or work. There are three main types of skills: transferable/functional, personal traits/attitudes and knowledge-based skills: Transferable/ functional skills include, performing task and work functions as a result of one's ability and aptitude, for examples, organizing duties in work place and writing a book. Skills of personal traits/attitudes relate to personal attributes that are developed as children and through life experiences that help in performing duties at work, for example, being hard working and perseverance at work, while knowledge-based skills are performed as a result of knowledge acquired through training, for example, being able to resuscitate a baby (SkillScan, 2012).

Garvey and Dempsey (2020) stated that 1% of newborn need to be ventilated (PPV), chest compressions, intubation and administration of drugs (volume expanders & cardiac medications) during resuscitation. Availability of personnel that are adequately trained in these techniques of resuscitative measures is important. Simulation training is pertinent in standardized newborn resuscitation training programmes all over the world. Simulation consolidates theory and practical skills in a risk-free environment and deliberate practice, key measures of outcome assessment and appropriate, timely debriefing are essential components of simulation based medical education. Simulation based healthcare is encourages practice and it is not "practice that makes perfect," but that "perfect practice makes perfect." Simulation is beneficial when learning new skills. Simulation bridges the gap between from theory and practical learning. It facilitates a risk-free educational environment, the learner is the priority, and eliminates fear of mistakes or patient harm and enhances development of skill and self-confidence. Some of the skills of neonatal resuscitation algorithm are:

Technical skills

According to Garvey and Dempsey (2020), teaching technical skills and assessing competency remain crucial in neonatal stabilization. Simulation provides a low risk environment for observation of skills and for direct feedback to be obtained. In order to advance skills and knowledge, learners motivation improve by systematic completion of predefined objectives, with immediate feedback and this is known as deliberate practice. All steps in the resuscitation algorithm are equally important and the prompt and effective completion of each may eliminate the need for subsequent steps. Therefore, though difficult where advanced resuscitative steps are infrequent and unpredictable, it is crucial that each skill be optimized. Essential technical skills of neonatal resuscitation are:

Provision of Intermittent Positive Pressure Ventilation (IPPV)

PPV is the cornerstone of neonatal resuscitation with about 5% of term newborns and a higher percentage of preterm infants requiring respiratory support. PPV is a more frequently utilized, effective and challenging neonatal resuscitation skill.

Endotracheal Intubation

Endotracheal intubation is a core neonatal resuscitation skill and is an alternate airway in newborn resuscitation. Recent changes in guidelines regarding management of meconium delivery and preterm infants, has resulted in significant reduction in use of intubation (Garvey & Dempsey, 2020).

Chest Compressions

Chest compressions are a basic skill in newborn resuscitation, although it is only required in about 0.3% of deliveries. Chest compressions are crucial to restoring spontaneous circulation; however, studies indicate decreased survival and poor neuro-developmental outcome resulting from prolonged chest compressions. Optimization of skills of hand positioning, rate and depth of compressions as well as their timing with IPPV breaths and allowing for full chest recoil are necessary for effective chest compression (Garvey & Dempsey, 2020).

Adrenaline/Access

Administration of adrenaline is recommended in neonatal resuscitation, when the heart rate is <60 beats per minute, despite adequate ventilation and chest compression (Garvey & Dempsey, 2020).

Retention of Skills

Teaching non-technical skills is essential in newborn resuscitation team activity. Simulation is beneficial for the acquisition and improvement of skills, but retention of skills remains a challenge. Studies reveal skills decay significantly as early as 2 months after NRT. Booster sessions have been shown to improve retention but are required to be quite frequent to be of benefit. Different methods of improving retention have been examined. Frequent, short, targeted sessions may be more feasible while maintaining benefit. Recent guidelines highlighted the necessity for neonatal task training to occur more frequently than every 2 years (Garvey & Dempsey, 2020).

Effect of Previous NRT on Improvement of Level of Knowledge, Behaviour and Skills of Neonatal Resuscitation Algorithm

Collins Dictionary (2020) defined the word previous as anything or event or thing that happened or existed in the past. Whereas training is the act and art of teaching an individual to acquire knowledge, and learn the skills that are needed to perform a particular job or activity. Saylor Academy (2020) enumerated different types of training to include:

1) Skills training, which is training to gain the proficiency needed to perform ones duties in the workplace;

2) Professional and legal training, is training in one's own professional field to update ones knowledge. It is usually done in an ongoing basis. Legal training is pertinent because the laws change often, so, there is need to continuously update to keep abreast of current knowledge and for efficient and effective practice.

Also, there is

3) Technical or technology training, which is for technical training of an individual. Depending on the type of job, it is required to teach the new employee the technological aspects of the job.

4) Quality training is useful in familiarizing employees with the means of preventing, detecting, and eliminating non-quality items, particularly in production-focused business.

5) **Team training** serves to empower team members' team-development skills, and to improve on their decision making and problem solving abilities, in order into achieve desired business results.

6) Managerial training is done for people who have spent a long time with an organization, and have been identified as a candidate for promotion, whereas,

7) **Safety training** is done to protect employees from injuries caused by work-related accidents.

Studies aimed at assessing the effect of neonatal resuscitation training programmes showed an improvement in the knowledge, skills and degree of comfort in the execution of interventions of the healthcare providers both in high as well as low-resource settings. However, such improvement did not always have a sustainable and long-term improvement in clinical practice in the delivery room owing to several factors such as: low quality of clinical practices, absence of leadership, supervision, unavailability of medical supplies and equipment, and low involvement of health workers in organizational training programmes (Trevisanuto, 2015).

Effect of Years of Experience on Improvement of Knowledge, Behaviour and Skills of Neonatal Resuscitation Algorithm

The term 'years' is plural for year and it means 12 months of 365 or 366 days in the Gregorian Calendar which begins in January and ends in December (Merriam Webster Dictionary, 2020). Collins Dictionary (2020) defined experience as knowledge or skill gained from doing a particular job or activity. Years of experience means the number of year of professional experience of an individual not college coursework: College years would definitely be considered as years of experience too if the student also worked consistently in that field while studying. It is usually a general requirement and guideline for hiring workers and is much more to help applicants self-filter (Meloni, 2012). Alhassan, Fuseini, Osman and Adam (2019) reported low

level of experience of midwives in neonatal resuscitation when assessing knowledge and experience of neonatal resuscitation among midwives in Tamale.

Empirical Review

Studies on Effectiveness of SBT on Knowledge of Neonatal Resuscitation Algorithm

Abdu *et al*, (2019) investigated knowledge and practice of immediate newborn care among midwives and nurses in public health facilities of Afar Regional State, Northeast Ethiopia and aimed to assess the knowledge and practice of immediate newborn care among nurses and midwives in public health facilities of Afar Regional State, Northeast Ethiopia. The study employed institution based cross-sectional study design using interviewer-administered questionnaire and observation checklist on 357 nurses and midwives working in 48 public health facilities (45 health centers & 3 hospitals) in April 2018. Univariable and multivariable logistic regression analyses were carried out to estimate odds ratio with 95% confidence interval and p-value less than 0.05 was used to declare statistical significance.

Results of the study showed that 53.8% midwives and nurses had adequate knowledge and good practice of immediate newborn care. Working in hospital, being a female and interest in providing newborn care had positive association with adequate knowledge of immediate newborn care. Whereas having work experience of < 5 years, inadequate knowledge, excess work load and lack of interested in providing immediate newborn and working in health centre had negative association with good immediate newborn care practices. It was concluded that a significant number of nurses and midwives had inadequate knowledge and poor practice on immediate newborn care. Therefore, providing a comprehensive newborn care training and creating an opportunity for nurses and midwives working at health centers to share experience with those working in hospitals are crucial in improving midwives and nurses' knowledge and skills on newborn care.

Another study on training interventions on Helping Babies Breathe among health workers in tertiary hospital of the Republic of South Sudan: A non-randomized quasi-experimental study was carried out by Draiko *et al.* (2018), aimed at examining the effects of the Helping Babies Breathe (HBB) training interventions programmes on the knowledge, psychomotor skills, and competency of health workers in managing birth asphyxia, and reducing mortality of newborns experiencing asphyxia within 24 hours. This study used pre- and post-test design (quasi experimental study) with 70 health workers; 40 were in the intervention group and 30 in the control group. Health workers from Juba Teaching Hospital comprised the intervention group and purposive sampling and computer-generated number was used to select the participants.

Participants were evaluated before and after the training from February to June 2017. A post training skill and competency evaluation was performed using a NeoNatalie newborn simulator and was repeated after three months of implementation for intervention and control group. There was significant reduction in early newborn mortality due to asphyxia within 24 hours in the intervention group and control measure at pre and post implementation showed within the intervention than the control. Knowledge, psychomotor and competency of health care workers improved immediately after training and early newborn mortality reduced by half at the end of three months. It is recommended that training of health workers on HBB should be scaled up in most of the health facilities in South Sudan.

Studies on Effectiveness of SBT on Improvement of Behaviour of Neonatal Resuscitation Algorithm

Rakshasbhuvankar and Patole (2014) conducted a study on benefits of SBT for neonatal resuscitation education: A systematic review with the aim of assessing the evidence supporting benefits of simulation-based training (SBT) in neonatal resuscitation education (NRE). It was a systematic review and was conducted using the Cochrane methodology, searching PubMed, Embase, PsycInfo and Cochrane databases. Also, related abstracts were scanned and full texts of the potentially relevant articles were studied and randomised controlled trials (RCT) and quasi-experimental studies with controls (non-RCT) assessing SBT for NRE were eligible for inclusion in the review. Findings of the review revealed one RCT SBT improved resuscitation score ($p = 0.016$) and resulted in more number of critical actions ($p = 0.017$) and decreased time to achieve resuscitation steps ($p = <0.001$). The remaining two RCTs and the non-RCT did not find any difference between SBT and alternate methods of instruction. None of the four studies reported clinical outcomes (performance in a simulation scenario, theoretical knowledge, & confidence in leading a resuscitation scenario). Therefore, evidence regarding benefits of SBT for NRE is limited. There are no data on clinical outcomes following SBT for NRE. Large RCTs assessing clinically important outcomes are required before SBT can be recommended widely for NRE.

Rovamo, Nurmi, Mattila, Suominen and Silvennoinen (2015) investigated effect of a simulation-based workshop on multidisplinary teamwork of newborn emergencies: An intervention study, in order to evaluate the impact of crisis resource management (CRM) and anesthesia non-technical skills instruction on teamwork during simulated newborn emergencies. The study involved 99 participants of two delivery units (17

pediatricians, 16 anesthesiologists, 14 obstetricians, 31 midwives & 21 neonatal nurses) divided into an intervention group (9 teams) and a control group (6 teams). Findings of the study showed CRM instruction did not improve the intervention group's teamwork performance. The instruction of non-technical skills before simulation training did not enhance the acquisition of teamwork skills of the intervention groups over the corresponding set of skills of the control groups. The teams led by an anesthesiologist scored the best. Experience of team leaders improved teamwork over the CRM instruction.

Studies on Effectiveness of SBT on Improvement of Skills of Neonatal Resuscitation Algorithm

Neonatal resuscitation training for midwives in Uganda: Strengthening skill and knowledge retention was studied by Mildenberger, Ellis and Lee (2017) with the aim of improving birth outcomes for babies in a regional referral hospital in Uganda by strengthening factors that influence the retention and application of neonatal resuscitation skills. An evaluation of a neonatal resuscitation programme was carried out to better understand the gap between training and effective practice. Practical skill testing of local midwives using a neonatal resuscitation doll pre- and post-training: follow up testing at 1 month and 12 months as well as focus groups and interviews was done. Findings revealed that participants' knowledge improved significantly immediately following the workshop, and remained high after 1 month, but fell by 12 months post-training. Interviews with hospital staff revealed knowledge retention and skill application as facilitators and barriers to practice respectively. The findings of the study demonstrated a need not for refresher training and for improved organizational and administrative support for the newly assigned trainers, since lack of refresher training post-workshop was the most important barrier identified.

Garvey and Dempsey (2020) studied simulation in neonatal resuscitation. It was a review in order to highlight current evidence in the use of simulation based learning for NRT and its effectiveness in the attainment and maintenance of high quality skills along with the development of new interventions and technologies in neonatal resuscitation. Findings indicated that in tertiary centres with highly experienced teams, resuscitations guidelines are not strictly adhered to in over 90% of cases. Neonatal resuscitation programmes now utilize simulation as a key component of their course content.

A study on simulation-based team training for improved self-assessed ability of physicians, nurses and midwives to perform neonatal resuscitation was conducted by Malmström, Nohlert, Ewald and Widarsson (2017). The aim of the study was to evaluate the effect of simulation-based team training on self-assessed ability of personnel to perform neonatal resuscitation. The study was a one day questionnaire based evaluation of four domains; communication, leadership, confidence and technical skills of simulation-based team training course in neonatal resuscitation from 2005 to 2007 in Sweden. It involved 110 physicians, nurses and midwives who filled out questionnaires before and after the training period. The response rate was 84%. Results indicated improvements in the participants' self-assessed ability to perform neonatal resuscitation all four domains after training ($p < 0.001$). There was significant improvement in the technical skills domain among professionally inexperienced personnel compared to experienced personnel ($p = 0.001$). There was no significant difference between professions or time since training in any of the four domains. Improved confidence ($p = 0.007$) and technical skills ($p = 0.003$) was higher among personnel with less previous experience in neonatal resuscitation. The study showed that a one day course on simulation-based team training with video-supported debriefing improved the participants' self-assessed ability to perform neonatal resuscitation.

Further, Shikuku *et al.* (2018) examined practice and outcomes of neonatal resuscitation for newborns with birth asphyxia at Kakamega County General Hospital, Kenya: a direct observation study. The aim of the study was to describe the practice of neonatal resuscitation (NR) and outcomes of newborns with birth asphyxia in a busy referral hospital. The study design was direct observations of 138 NRs by 28 healthcare providers (HCPs) conducted using a predetermined checklist adapted from the national pediatric resuscitation protocol. Descriptive statistics were computed and Chi Square tests were used to test associations between the newborn outcome at one hour and the NR processes for the observed newborns. Logistic regression models assessed the relationship between the survival status at 1 h versus the NR processes and newborn characteristics.

The findings suggested nurses performed 72.5% of the NRs. A warm environment was maintained in 71% of the resuscitations. Airway was checked for almost all newborns (98%) who did not initiate spontaneous breathing after stimulation. However, only 40% of newborns were correctly cared for in case of meconium presence in airway. Bag and mask ventilation (BMV) was initiated in 100% of newborns who did not respond to stimulation and airway maintenance. About 86.2% of resuscitated newborns survived after one hour. Removing wet cloth ($P = 0.035$), keeping baby warm ($P = 0.018$), meconium in airway ($P = 0.042$) and gestation age ($P = 0.007$) were associated with newborn outcome at one hour. In conclusion, mentorship and regular cost

effective NR trainings with focus on maintaining the warm chain during NR, airway maintenance in meconium presence, BMV and care for premature babies are needed for HCPs providing NR.

Studies on factors (previous training & years of experience) that affect effectiveness of SBT on improvement of knowledge, behaviour and skills of neonatal resuscitation algorithm

Another study was conducted by Alhassan *et al.* (2019) on knowledge and experience of neonatal resuscitation among midwives in Tamale. The study aimed at determining knowledge, experience in neonatal resuscitation and the factors associated with knowledge of neonatal resuscitation among midwives in Tamale. It was a cross-sectional study of midwives practicing in three large hospitals in Tamale. Questionnaire was used to collect demographic data on characteristics of participants, their knowledge and experience in neonatal resuscitation. The demographic characteristics of participants was analyzed using descriptive statistics. Pearson's correlation was used to determine associations between knowledge and some selected demographic features, while the one-way ANOVA was conducted to determine differences in level of knowledge based on the demographic features.

Results showed 98.1% of the participants had insufficient knowledge on neonatal resuscitation. The midwives at the Tamale Central Hospital demonstrated a statistically significantly higher level of knowledge (24.67 ± 2.79, $p = .014$), than those at the Tamale Teaching Hospital (22.92 ± 4.56, $p = .028$) and Tamale West Hospital (21.50 ± 6.24, $p = .021$). Also, there was a statistically significantly higher knowledge among midwives with first-degree qualification in midwifery and those with a Post-NAC/NAP midwifery certificate than those with a diploma in midwifery. Neonatal resuscitation training was associated with more knowledge in neonatal resuscitation ($r (158) = .195$, $p = .013$). Additionally, majority 55% of the participants in the study were not experienced in performing neonatal resuscitation. There were no differences in their level of experience based on their academic qualification, work place, and years of practice as a midwife.

Findings of the study showed that midwives generally have insufficient knowledge and experience about neonatal resuscitation despite their years practice as midwives. Factors associated with higher knowledge of neonatal resuscitation were midwifery training at the first-degree level, basic nursing training and work experience before midwifery training, and training midwives in neonatal resuscitation. Therefore, the low level of knowledge and experience of midwives in neonatal resuscitation requires an urgent need for government to provide more opportunities for all practicing midwives to be trained in this important lifesaving skill.

Ogunlesi, Dedeke, Adekanmbi and Fetuga (2008) examined Neonatal resuscitation: Knowledge and practice of nurses in Western Nigeria to assess knowledge of nurses in Western Nigeria about neonatal resuscitation. The study utilized cross-sectional survey and closed-ended questionnaire to evaluate appropriate action in some aspects of neonatal resuscitation among nurses in secondary health facilities in Western Nigeria. From the results, it was discovered that of the 179 nurses interviewed, 72.6% had worked in the labour room and the special care baby unit within the last 5 years, 14.0% had attended neonatal resuscitation training course within the last 5 years and 31.8%, 53.1%, 58.1%, and 35.2% had access to radiant warmers, ambu-bags, suction machine and oxygen delivery units respectively. The respondents had better knowledge of evaluation than of appropriate action (95.5% v.49.7%). Therefore, respondents' knowledge of appropriate actions to be taken during neonatal resuscitation was poor and requires intensive courses on neonatal resuscitation.

Study Area

The 386 functional Model PHC Centres distributed across Rivers State and managed by the Rivers State Primary Health Care Management Board (RSPHCMB) (Office of Director Planning, Research & Statistic, RSPHCMB, 2019) were used for the study. Rivers State is one of Nigeria's 36 states and was created from then Eastern Region of Nigeria by decree No.19 of 1967. Before then, the territory was referred to as oil Rivers protectorate, a name derived from its abundant wealth in oil and gas deposits. The strategic importance of Rivers State in the economic equation of Nigeria earned it the name, Treasure Base of the nation. The state comprises of 23 Local Government Areas namely, Ahoada East, Ahoada West, Bori, Khana, Obio-Akpor, Oyigbo Port Harcourt, Eleme, Ikwerre and Eche amongst others (Tukool.com, 2018). The cosmopolitan nature of the state, due to high concentration of multinational companies and individuals drawn from all over the country necessitated its choice for this study.

Population for the Study

The total population for the study consisted of about 270 midwives engaged by the RSPHCMB.

Inclusion Criteria

1. Registered midwives attached to PHC Centres of RSPHCMB and may have other qualifications.
2. Registered midwives who have or have not received previous training in neonatal resuscitation.
3. Registered midwives with at least three years of experience.

4. Registered midwives in rural or urban health facility**.**

Nature and Sources of Data
Primary data was used for the study. The data was collected directly from study participants in the course of two days NRT organized for the participants. The participants personally filled out pretest and post test questionnaire, and the observation checklist was ticked off by the researcher and two research assistants as the participants demonstrated skills of neonatal resuscitation algorithm during the debriefing sessions.

Method of Data Collection/Instrumentation
The researchers accessed midwives in PHC Centres in Rivers State, Nigeria with an administrative approval from the Permanent Secretary of RSPHCMB. The researchers organized a training workshop on neonatal resuscitation algorithm for midwives in PHC centres in Rivers State, Nigeria on the 4th and 5th of March at the auditorium of School of Midwifery, Emekuku Street, Port Harcourt. The two days training utilized PANCOF adapted and standardized AHA and APA NRP lecture modules for training of trainers. The midwives were splited into two groups and each group was exposed to a single day training session. The midwives filled out a total of 67 questionnaires each for pretest and posttest, that is, before and after the training. Also, the observational checklist for measurement of skills of neonatal resuscitation algorithm was ticked off by the researchers as the midwives demonstrated the skills of neonatal resuscitation algorithm during the practice sessions.
The study instrument was an adapted standardized questionnaire and observational checklist of the Paediatrics Association of Nigeria Conference (PANCOF) on National NRT for Trainers. The study instrument measured knowledge, behaviour and skills of neonatal resuscitation algorithm among midwives in PHC Centres in Rivers State, Nigeria. It was self administered It comprised of three sections: Section A for socio-demographic data (age, facility, educational qualification, previous training on neonatal resuscitation & years of experience); section B for knowledge, section C is behaviour and section D for observational checklist. The observational checklist measured skills of neonatal resuscitation algorithm. Scores were assigned to the responses. The criterion mean was set at 2.5 for taking decision.

Validity of Research Instrument
The research instrument was validated for face and content validity by the researchers

Reliability of Research Instrument
The study instrument was adapted standardized questionnaire and observational checklist of the Paediatrics Association of Nigeria Conference (PANCOF) on National NRT for Trainers.

Methods of Data Analysis
Data obtained from the pretest and post test questionnaires and observational checklist was collated and analyzed using SPSS software. Demographic data was analyzed using frequency tables and simple percentage and, the research questions were answered using mean and standard deviation while hypotheses were tested using paired sample T-test and ANCOVA at 0.05 alpha level of significance.
Ethical Approval
Ethical clearance for the study was obtained from Ethical Committee of University of Port Harcourt and the RSPHCMB Rivers State, Nigeria. Participants' informed consent was sought upon enlightenment of the benefits of their involvement in the study such as acquiring knowledge, behaviour and skill about neonatal resuscitation algorithm and that there is no anticipated risk. Due explanation was provided that participation is voluntary and participants could withdraw at any time without undue pressure or victimization. Similarly, participants were assured that whatever information obtained would be handled confidentially and not divulged to any person, and would be used for academic purpose only.

Socio-Demographic Characteristics
Results of the socio-demographic characteristics of the respondents of this study indicated that majority, 35(52.2%) of the respondents were in the age bracket of 35-44 years of age. This showed that most of the participants in the study were in late adulthood. The findings of this study is in agreement with the result of WHO (2016) study on Midwives' Voices Midwives' Realities: Findings from a global consultation on providing quality midwifery care, in which majority, 75% of the English-language respondents were over 35 years of age with 25% under 35 years. Although the Africa English survey had a more even spread age distribution, 70% of Africa French survey respondents were over 35 years. Similarly, findings of the study by Arrish, Yeatman, and Williamson (2017) on midwives' role in providing nutrition advice during pregnancy: Meeting the Challenges? A qualitative study; revealed that majority of the midwives were older than 35 years of age.

Findings of the study indicates that majority, 67(100.0%) of the respondents were female. This is justified by the fact that females dominate the midwifery profession in RSPHCMB. In line with the findings of this study, Marino, James, Morgan and Lorenzoni (2017) posited that the healthcare industry is composed mainly of women. More than 76% of hospital employees are women. More than 77% of people who work in doctors' offices are women and more than 88% of home health workers are women. Also, women make up three-quarters of all hospital workers.... Results of the study by Bedoya-Vaca, Derose and Romero-Sandoval (2016) on gender and physician specialization and practice settings in Ecuador: A qualitative study, agrees with the findings of this study as they concluded that women may outnumber men in medicine in Ecuador and across many parts of the world, but a number of structural issues-economic, social, and cultural-must be addressed for women to establish themselves in a wide variety of medical specialties and practice settings and for countries to realize the benefit of the investments being made to train and employ them.

Likewise, the findings of the study showed that majority, 41 (61.2%) of the respondents were registered nurse/midwife (RN/RM). In line with the findings, Olusegun (2012) stated hat majority, not less than (70%) of the nurses in Nigeria still hold diploma certificates and had their training in the schools of nursing. Further, this is one of the problems that have continued to plague the nursing and midwifery profession, in addition to the issue of nurses with diploma qualifications obtaining degree qualification and it is a problem of global dimension in the nursing profession. Dolamo and Olubiyi (2011) agreed with this finding, noting that the Nursing and Midwifery Council of Nigeria (N&MCN) observed that majority of nurses that were trained in Nigerian are products of nursing educational system centred on procedure and diagnosis that was tailored only towards meeting the needs of hospital services.

Similarly, results of the study revealed that majority 28 (41.8%) of the respondents were within 8-12 years of experience. The finding of this study is in agreement with the result of WHO (2016) study on Midwives' Voices Midwives' Realities: which revealed that the years of experience of majority of the study participants' ranged from 2 years to 37 years. In contrast to the findings of this study, Alhassan *et al.* (2019) who studied knowledge and experience of neonatal resuscitation among midwives in Tamale opined that were no differences in midwives in their level of experience based on their academic qualification, work place, and years of practice.

Research Question

How effective is Simulation Based Training (SBT) in improving the level of knowledge of Neonatal Resuscitation (NR) algorithm among midwives in PHC centres in Rivers State, Nigeria?

Findings of the study showed a mean gain score of 0.10(3.3%) of level of knowledge of neonatal resuscitation for the midwives exposed to SBT. The midwives' pretest and posttest mean score was 1.48 and 1.58 respectively. It could therefore be deduced that to high extent, SBT improved the level of knowledge of neonatal resuscitation algorithm among midwives in PHC centres in Rivers State, Nigeria. The findings of this study, conforms with improved knowledge, psychomotor and competency of health care workers immediately after training and early newborn mortality reduced by half at the end of three months following a study by Draiko *et al.* (2018) on helping babies breathe among health workers in tertiary hospital of the Republic of South Sudan: A non-randomized quasi-experimental. Also in line with the findings of this study is that discovered by Abdu *et al.* (2019), who investigated knowledge and practice of immediate newborn care among midwives and nurses in public health facilities of Afar Regional State, Northeast Ethiopia and found out that 53.8% midwives and nurses had adequate knowledge and good practice of immediate newborn care.

Also, results of the study revealed a mean gain score of 1.49(23.5%) of behaviour towards of neonatal resuscitation for the midwives exposed to SBT. The midwives' pretest and posttest mean score was 2.42 and 3.91 respectively. It could therefore be deduced that to a high extent SBT improved behaviour towards of neonatal resuscitation algorithm among midwives in PHC centres in Rivers State, Nigeria. In contrast to the findings of this study, is the result of a systematic review by Rakshasbhuvankar and Patole (2014) on benefits of SBT for neonatal resuscitation education, in which none of the four studies reported confidence in participants leading of a resuscitation scenario.

Additionally, results of the study indicated a mean gain score of 0.23(7.50%) of skills of neonatal resuscitation algorithm for the midwives exposed to SBT. gain. The midwives' pretest and posttest mean scores were 1.42 and 1.65 respectively. It could therefore be deduced that to a high extent SBT improved skills of neonatal resuscitation algorithm among midwives in PHC centres in Rivers State, Nigeria. Similar to the result

of this study is improvement in skill application reported by Mildenberger *et al.* (2017) who studied NRT for midwives in Uganda: Strengthening skill and knowledge retention.

Test of Hypothesis

H_0: SBT does not significantly improve level of knowledge, behaviour and skills of neonatal resuscitation algorithm among midwives in PHC centres in Rivers State, Nigeria.

Findings of the study also showed the mean scores of pretest and post-test of the midwives as 1.42 and 1.65 respectively. Also, the t-value of 11.281 at degree of freedom 66 was significant at 0.000 probability level which is less than the 0.05 level of probability. Therefore, the null hypothesis is rejected. This indicates that SBT is significantly effective in improving skills of neonatal resuscitation algorithm among midwives in PHC centres in Rivers State, Nigeria. Similarly, Shikuku *et al.* (2018) study on practice and outcomes of neonatal resuscitation for newborns with birth asphyxia at Kakamega County General Hospital, Kenya: a direct observation study, demonstrated improvement in skills as findings suggested nurses performed 72.5% of the NRs. Warm environment was maintained in 71% of the resuscitations. Airway was checked for almost all newborns (98%) who did not initiate spontaneous breathing after stimulation. Bag and mask ventilation (BMV) was initiated in 100% of newborns who did not respond to stimulation and airway maintenance. But, only 40% of newborns were correctly cared for in case of meconium presence in airway.

The findings of the study could be summarized as follows:

1. It could be deduced from the pretest mean scores that the midwives had low level of knowledge, behaviour and skills of NR algorithm.
2. But, it could be inferred from the post-test scores and the mean gain scores that SBT improved level of knowledge, behaviour and skills of NR algorithm among midwives.
3. This indicates that SBT is significantly effective in improving knowledge, behaviour and skills of NR algorithm among midwives in PHC Centres in Rivers State, Nigeria.
4. Participants who had previous NRT had higher level of knowledge and behaviour towards NR algorithm among midwives in PHC Centres in Rivers State, Nigeria. This implies that previous NRT affected improvement in the level of knowledge and behaviour NR algorithm among midwives in PHC Centres in Rivers State, Nigeria, although, previous NRT did not affect improvement in skills of NR algorithm as there was no significant improvement in skills of those who had previous NRT and those who did not.
5. Further, to a high extent year of experience affected improvement in the level of knowledge, behaviour and skills of NR algorithm among midwives.

II. Conclusions

The following conclusions are draw based on the findings of the study:

1. The midwives had low level of knowledge, behaviour and skills of NR as indicated by the low pretest scores below the criterion mean score of 2.5.
2. SBT improved level of knowledge, behaviour and skills of neonatal resuscitation algorithm among midwives in PHC Centres in Rivers State, Nigeria.
3. Likewise, previous NRT significantly affected improvement of knowledge and behaviour of neonatal resuscitation algorithm among midwives in PHC Centres in Rivers State, Nigeria.
4. However, previous NRT did not significantly affect improvement in skills of neonatal resuscitation algorithm among midwives in PHC Centres in Rivers State, Nigeria.
5. Furthermore, years of experience improved level of knowledge, behavior and skills of neonatal resuscitation algorithm among midwives in PHC Centres in Rivers State, Nigeria.

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