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A Clinical Case Study on the Management of Newborn Diagnosed with Respiratory Distress Syndrome at NICU,CHUK Teaching Hospital,Kigali City,Rwanda Between May and June, 2021

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Management,Newborn, Diagnosed, Protocol ,Respiratory Distress Syndrome,NICU,CHUK Teaching Hospital,

ABSTRACT

Background: RDS is a type of neonatal respiratory disease that is caused most often by a lack of surfactant in the lungs.RDS is strictly associated with preterm birth, with the incidence increasing as gestational age decreases. In 2019, approximately 17 deaths per 1,000 live births had been reported worldwide.Of these,approximately 70% of the neonatal mortalities in resource-limited settings predominantly in East Africa. Worldwide, 13 million preterm babies were born annually and the highest percentage from the resource-limited setting.Despite there were numerous different neonatal conditions admitted,such as birth asphyxia, bronchiolitis, prematurity of apnea, neonatal pneumonia and many others.I was interested in considering the trend and strategy used in the management of the newborn diagnosed with respiratory distress syndrome admitted on NICU ward,CHUK so as to compare the theory and current practice by the multidisciplinary team.

Purpose: The case study aimed at finding out and analyzing between theories and current practice of the management of a newborn diagnosed with respiratory distress syndrome admitted at the Neonatal Intensive care Unit (NICU),CHUK.

The method: To conduct this study the researcher reviewed and audited the management procedures carried out by the multidisciplinary team on admission of this case of RDS.

Results: This study found that the national neonatal protocol /guideline was followed .The nurses used that as reference in managing the child's condition. However,the administration of surfactant was not initiated in the national guideline for the management of RDS,but it is noted in the international guideline and standard. I realized that growth and monitoring charts were not in the patient file.Also the study found out that found vital signs monitors in the NICU were inadequate,but recommendations were provided by the researcher.

Conclusion: The day of birth and the first 28-days of life - the neonatal period – are the most susceptible periods for a child's survival and health. Newborn health champions such neonatologists nurses,midwives and other health professonals have been at the forefront of advocating for robust policies and programs to mitigate global neonatal mortality.

INTRODUCTION

RDS is a type of neonatal respiratory disease that is caused most often by a lack of surfactant in the lungs.RDS is strictly associated with preterm birth, with the incidence increasing as gestational age decreases(1). Most cases of RDS occur in babies born before 28 weeks of pregnancy,problems with the baby's lung development. In 2016, 2.6 million deaths, or roughly 46% of all under-five deaths, occurred during this period(2). Neonatal mortality (NM) is a major public health challenge worldwide(2). In 2019, approximately 17 deaths per 1,000 live births had been reported worldwide.Of these,approximately 70% of the neonatal mortalities in resource-limited settings predominantly in East Africa. Worldwide, 13 million preterm babies were born annually and the highest percentage from the resource-limited setting(2).

Respiratory distress syndrome is defined as respiratory distress that happens in a newborn infant after the onset of breathing, within the first few hours of life, and is primarily due to an absence of the pulmonary surfactant system(5). Respiratory distress syndrome (RDS),has been known previously as hyaline membrane disease, is the most common cause of respiratory failure in neonates, especially in those born prematurely(5). RDS is caused by surfactant deficiency due to premature birth with gestational age< 35weeks. It also causes a diffuse air sac collapse .edema and alveolar cell injury.Respiratory distress syndrome (RDS) remains a significant problem for preterm babies, although management has evolved gradually over the years resulting in improved

survival for the smallest infants but with unacceptable rates of bronchopulmonary dysplasia (BPD) at least in part due to reduced use of postnatal steroids(6).

However, this condition under discussion is Respiratory distress syndrome (RDS) which is the most common cause of respiratory failure in preterm infants(3).Treatment consists of respiratory support and exogenous surfactant administration(3). Commonly, surfactant is administered intratracheally.Treatment consists of respiratory support and exogenous surfactant administration(3). Current neonatal resuscitation guidelines advise to stabilize preterm infants on continuous positive airway pressure (CPAP) initially and administer surfactant as early rescue therapy < 2 h after birth, but only if respiratory compromise is suspected(3). International consensus guidelines on management of RDS have been published;however, recent developments in the field of less invasive surfactant administration prompt the need for a UK national consensus on surfactant use in preterm infants with,or at risk of, RDS(4).

Literature Review

As management of respiratory distress syndrome (RDS) advances,clinicians must continually revise their current practice(6). Optimising outcome for babies with RDS includes prediction of risk of preterm delivery, need for appropriate maternal transfer to a perinatal centre and timely use of antenatal steroids(6).Delivery room management has become more evidence based,and protocols for lung protection including initiation of CPAP and titration of oxygen should be implemented immediately after birth. Surfactant replacement therapy is a crucial part of management of RDS, and newer protocols for its use recommend early administration and avoidance of mechanical ventilation(6). Methods of maintaining babies on non-invasive respiratory support have been further developed and may cause less distress and reduce chronic lung disease(6).

The prevalence of RDS is estimated to be around 7% of all births, with the risk increasing with lower gestational age (6), while the prevalence of hypoglycemia ranges from 3% to 29% due to the transitory nature of blood sugar levels, ambiguity of symptom cut-offs(10). In the physical examination, focus on the respiratory system; note the quality of respiratory effort (grunting, flaring, retractions, air entry, adventitial sounds), as well as respiratory rate.Respiratory distress syndrome (RDS) is a primary pulmonary disorder that accompanies prematurity, specifically immaturity of the lungs, and to a lesser extent the airways(12). It is a disease of progressive atelectasis, which in its most severe form can lead to severe respiratory failure and death. The incidence and severity of RDS is

generally inversely related to gestational age. Approximate incidence:24 weeks: >80 %,28 weeks: 70%,32 weeks: 25%,36 weeks: 5%(12).

MANAGEMENT OF RESPIRATORY DISTRESS SYNDROME

Treatment for RDS usually begins as soon as a newborn is born, sometimes in the delivery room. Treatments for RDS include surfactant replacement therapy, breathing support from a ventilator or nasal continuous positive airway pressure (NCPAP) machine, or other supportive treatments(13) .Most newborns who show signs of RDS are quickly moved to a neonatal intensive care unit (NICU). There they receive around-the- clock treatment from healthcare professionals who specialize in treating premature newborns(13).

Surfactant replacement therapy - Respiratory Distress Syndrome, Surfactant helps keep the lungs open so that a newborn can breathe in air once he or she is born. Babies who have RDS get surfactant until their lungs are able to start making the substance on their own. Surfactant is usually given through a breathing tube. The tube allows the surfactant to go directly into the baby's lungs.

Once the surfactant is given, the breathing tube is connected to a ventilator, or the baby may get breathing support from NCPAP.Surfactant often is given right after birth in the delivery room to

try to prevent or treat RDS. It also may be given several times in the days that follow, until the baby is able to breathe better.

Some women are given medicines called corticosteroids during pregnancy(13).

These medicines can speed up surfactant production and lung development in a fetus. Even if you had these medicines, your newborn may still need surfactant replacement therapy after birth.

Breathing support - Respiratory Distress Syndrome. Newborns who have RDS often need breathing support, or oxygen therapy, until their lungs start making enough surfactant. Until recently, a mechanical ventilator usually was used. The ventilator was connected to a breathing tube that ran through the newborn's mouth or nose into the windpipe.Today, more and more newborns are receiving breathing support from NCPAP. NCPAP gently pushes air into the baby's lungs through prongs placed in the newborn's nostrils.

Table 1: Essential Drugs and their Doses adopted from *Rwanda basic pediatric protocol 2020*

Drugs	**Doses**
Adrenaline 1 in 10,000	Give 0.1ml/kg IV in resuscitation. To make this strength dilute 1 ml of 1 in 1000 adrenaline in 9 mls water for injection to make 10mls Severe viral croup 2ml of 1:1000 nebulized
Ampicillin	Neonate: 50mg/kg/dose 12 hourly IV or IM if aged < 7 days and 8 hourly if aged 8 - 28 days. Age 1 month and over: 50mg/kg/dose (Max 500mg) 6 hourly IV/ IM
Gentamicin	3,5;7.5 mg/kg/24 hr IM or slow IV
Caffeine	Loading dose oral/NGT: 20 mg/kg (or IV over 30 min). maintenance dose: 5 mg/kg daily oral (or IV over 30 min).

Antibiotic treatment of newborns at risk for infection

Empiric antibiotics (Ampicillin and Gentamicin standard dose) should be given as soon as possible after birth to all newborns (term and preterms) with any one of the following risk factors:

- Prolonged Rupture of Membranes (PROM)> 18 hours
- A mother with fever (Temperature > 380C)
- Suspected or confirmed chorioamnionitis
- Mother being treated for sepsis at any time during labour or in the last 24hours before and after birth.
- Treatment should be given for 48-72 hours and stopped if the baby has remained entirely well during this period and base-line septic work-up is normal
- Initiate laboratory investigations immediately but DO NOT withhold antibiotics.
- If there are no risk factors, then DO NOT initiate antibiotic treatment.
- A well-baby born preterm < 37 weeks or Low birth weight with no other risk factors for infection does not require routine antibiotic treatment(15).

Actual Case Presentation/Description at NICU Ward,CHUK May And June 2021

The purpose of the management of respiratory distress syndrome provides interventions to maximise survival at the same time as minimising potential adverse effects including BPD.I noticed that this case was managed by the multidisciplinary team from the maternity ward to NICU.My intervention as a master student and base on my clinical objectives,I conducted an impeccable neonatal nursing assessment during my one week schedule at the NICU under the supervision of the assigned nurse.SinceI noticed that nurses were not carrying out comprehensive neonatal assessment,as a master prepared nurse,I performed head to toe assessment on every newborn in collaboration with them.

I also employed an expanded use of the nursing process as a specialized pediatric student nurse in the care of this newborn diagnosed with RDS with the involvement of the family.I noticed that phototherapy administration initiated on the case was my very first experience ever in my nursing practice as well as the use of CPAP today.

In fact, the theoretical skill and knowledge taught on clinical grounds by our clinical supervisor on Ballard score and Silverman's score,I performed the practical skills on this newborn. It was very amazing for me with vivid understanding of the skills. I also used developmentally age appropriate intervention with the newborn's parallel with the family centered care approach in promoting the care of this premature newborn. Other objectives like administration of drugs to the newborn,oxygen therapy(mask,NGT,Ambu bag) as well as nutritional education,which I performed with the previous knowledge and skills obtained.

However,see the below case description and the following interventions and management strategy and procedures of the premature newborn diagnosed with respiratory distress syndrome(RDS).

Case description

Day of live (DOL)five(5)male infant born at 31weeks,5days old gestational age for preterm premature rupture of membrane(PPROM) admitted for Respiratory distress syndrome with the manifestations of sustained grunting,nasal flaring intermittent,severe chest in-drawing with adventitious sound of crackle transferred from the maternity ward to NICU ward on May 28,2021.He was seen to have

had normal capillary refill <3 secs,as well as normal heart sound with S1,S2 noted, the skin was warm and had a normal body temperature.He was seen to have active movement of limbs but had poor sucking ,rooting and swallowing reflexes.

During the third day of life,he developed jaundice with increased serous bilirubin level while on NICU admission.Therefore;hygienic,antibiotics,oxygen as well as phototherapy were administered with emotional and psychosocial supports provided to the mother respectively.

Health History of newborn and Mother

Baby details

Day of live (DOL)five(5)male infant born at 31weeks,5days old gestational age for preterm premature rupture of membrane(PPROM) admitted for Respiratory distress syndrome with the manifestations of sustained grunting,nasal flaring intermittent,severe chest indrawing with adventitious sound of crackle. The baby received vitamin k and tetracycline eye application but immunization was pending.

Birth weight was 1.5kg.Vital signs revealed: Body temperature at birth 36.8 degree centigrade, heart rate was 128bpm,Respiratory rate,52breath per minute as well as Oxygen saturation was at 92%respectively.

Vital Signs Framemwork of Days of Life(DOL)

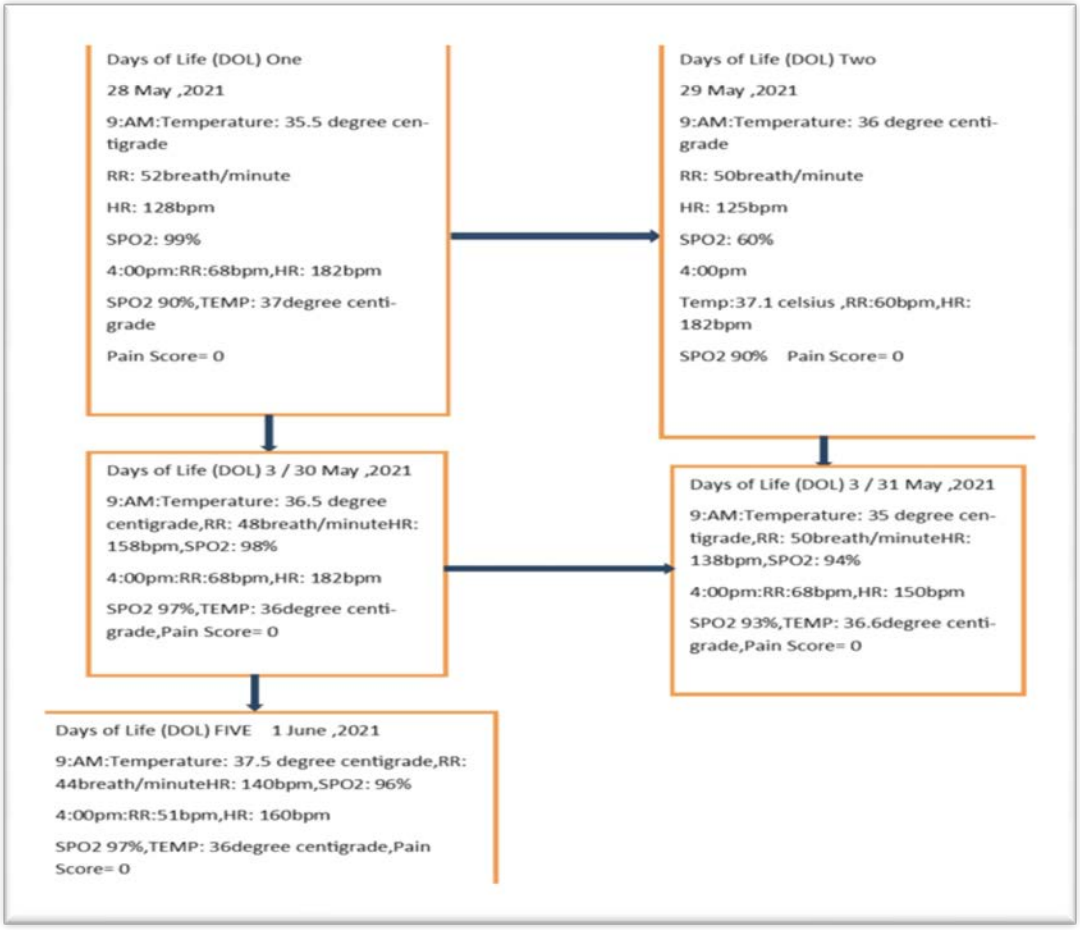

Figure 1:Vital Signs Framework of DOL

The above figure details the daily vital signs conducted by the health providers for the newborn close monitoring.

Note: NICU ward , new born vital signs are taken twice daily as well as the weights are also taken twice weekly as per protocol.

Maternal Details , Family Centered Care and /Education

This 35 year old female with G1 P1 alleged that during her first and late second trimesters,experienced spotting with small bleeding up to 28weeks gestation.During that period, a proportion of amniotic fluid was seen daily as she mentioned. She consulted the emergency department at her work place,where she served as medical laboratory officer. While on admission at the hospital, the doctor advised her to stay up to 34weeks of gestation.But due to the reduction of the amniotic fluid,she was served dexamethasone to keep the fetus lung maturity as well as antibiotic for secondary bacteria infection.

After spending one week at the hospital,the doctor advised her to be transferred from Muhma District Hospital to CHUK teaching hospital for further consultation. During the two weeks stay at CHUK hospital,she did not reach the 34 weeks gestation,thus giving birth at 31weeks gestation five days old and the delivery was spontaneous with cephalic presentation. She was diagnosed as having preterm premature rupture of membrane(PPROM) during the three weeks period.I actually obtained this information directly from the newborn's mother and she was able to explain to me vividly in English. She consented and signed the information that she provided.All information gathered from the neonate's mother were documented on the education and communication form of the hospital attached to the baby's file.

I had a nice family centered-care approach during the period,and also considered childhood developmental theory.I realized that the health status of the child,nutrition,breastfeeding as well as treatment,patient rights, culture,patient safety were respected and discussed with the child's mother on admission as noticed from the new born file.I noticed that the nutritional status of expressed breast milk(EBM) started at 6ml/kg/day to 25ml/kg/day at first day of life to fifth day of life and birth weight from 1.5kg to 1.9kg from first day of life to fifth day of life respectively.

Past Medical/Pregnancy Details

According to the mother,she has not experienced any major health problem until when she began pregnant,she has been well with no other health issues.She completed four Antenatal care visits as well took two TT vaccines as scheduled and expecting to take the third in July 2021.The major problem or issue faced during the first and late second trimesters were where she observed spotting that led her to deliver prematurely.

Nutritional Details

Received adequate nutritional food requirements,prenatal,antenatal care, drugs and education during pregnancy as well as receiving postnatal nutritional food requirements and education currently by NICU staff,CHUK. Postnatal care is currently adequate. Mother health is good and expressed breast milk EBM) to feed her baby according to Rwanda neonatal protocol as the baby is on tube feeding as well as parenteral feedings.

Surgical Details

There was no known history of surgery.She mentioned that she has not experienced any surgical condition or even began pregnancy and this was her first pregnancy at the age of 35.

Birth and Labor Details

The mode of delivery was spontaneous with cephalic presentation. The baby was born at 31weeks five days of gestation.Gestational rupture of membrane was greater than 18hours.

Labor duration was about five hours.Labor complication associated was preterm premature rupture of membrane(PPROM)for 18days.The APGAR score was at 6 which means the newborn was moderately depressed.The baby was stimulated and later began to cry vigorously.

Psychosocial Details

The neonate mother is married with the first pregnancy ever experienced.Level of health insurance in Rwanda is category III.No association with any substance,drug and alcohol respectively.She is currently in good health condition and providing express breast milk for her newborn on admission. I had the opportunity to have provided psychosocial counseling for the mother because she was able to fluently explain to me about her pregnancy history and her health status.She was trying to develop some psychological problems,as I observed,She explained to me that as her 35years giving birth to a child that did not reach term with this kind of complication worried her a lot.I was able to provide psychosocial and emotional supports to her and she gained hope about her child health condition.

Table 2: Framework of management provided

Days of life and Date	**Management**
DOL one : May 28,2021	1. At birth, initial management wereVit. K and eye prophylaxis applied. 2. The child was on a radiant warmer. 3. Oxygen was initiated and CPAP QD 3 hrs 4. NG Tube inserted 5. Body Heat and skin care were taken care of. 6. EBM 6ml Q 3hourlhy through tube feeding and on NPO 7. D10 1/4RL-80ml/kg/day(120ml/24hours,5ml/hour) 8. Caffeine 20 mg/kg/day 9. Ampicillin 150mg/kg bid +gentamicin 3mg/kg QD
DOL two :May 29,2021	1. Continue EBM 6ml/ 2. Continue ampicillin and gentamicin 3. Started CPAP and Oxygen 4. Continue feeding according to national protocol
DOL three: May 30,2021	1. Due to the increase serous bilirubin- phototherapy Nursing management I noticed on the administration of the phototherapy,the child face was covered to protect from the light and it was measured as the level of 45 degree distance 2. Continue caffeine 20 mg/kg /day 3. Continue EBM according to the protocol 4. Continue Oxygen therapy 5. D101/4RL
DOL four: May 31,2021	1. Continue phototherapy

	2. Continue EBM according to the protocol 3. Continue ampicillin and gentamicin 4. Continue Oxygen therapy 5. Continue caffeine 20 mg/kg /day
DOL five :Jine 1,2021	1. Stop ampicillin and gentamicin 2. Start meropenem and Vancomycin 3. EBM 25ml QD3hrs 4. Continue Oxygen therapy 5. Continue caffeine 20 mg/kg /day

Findings/observation of the Management of the Case

Days of life five male premature infant born by normal vaginal delivery with cephalic presentation who was diagnosed with respiratory distress syndrome.Due to the child's condition,he was transferred from the maternal ward to the NICU,CHUK for admission.With immediate effect, IV line,NG tube were established. I realized that there multidisciplinary team approaches initiated during the time admission.

Due to the prematurity and with the preterm premature rupture of membrane,he was noted to be an increased risk of infection as well as prematurity of apnea, ,malnutrition,hypoglycemia and hypothermia respectively.

Therefore;he was been managed with the administration of antibiotics, caffeine, Expressed breast milk(EBM)and parenteral IV fluid and nutrition.In another instance, his serous bilirubin level was high, as the result of neonatal jaundice and in that case,phototherapy was ordered and administered according to his condition.Oxygen therapy and CPAP were been initiated immediately.

I realized that the neonate IV fluid and parenteral nutrition protocols,that is the SOPs were displaced on the wall and followed.The nurses used that as reference in managing the child's condition. As for the antibiotic,I did not see the SOPs for antibiotics during the child's care,but from the protocol I observed that it was inline and followed. I realized that the administration of surfactant was not initiated in the national guideline for the management of RDS,but it was noted in the international guideline and standard.

In analyzing and evaluating theories,protocols and the current practice of the management of a newborn with respiratory distress syndrome at NICU, I noticed that growth and monitoring of the neonate was not adequately done and documented by care providers.I realized that growth and monitoring charts were not in the patient file. Although patient weights were taken twice weekly,but other parameters such as height,head circumference including the weight of the newborn are important to be plotted on the growth chart in the patient file.I also observed that,holistic nursing assessment were not done by nurses,the documentations are done but from my observation while on my clinical placement.I was able to inquire from one of the nurses who I was assigned with,and later made me to understand that due to work overload,it is difficult to spend much time to do head to toe assessment of the neonates..Lastly,I also noticed that the results of laboratory were not available in time,but requests are made to the laboratory by the attending physician.The gaps I noticed on the side of the family members not this identical case, but others were delay in the payment of laboratory fees,by some family member as I noted from the patient file.

I also found that the vital signs monitors in the NICU were inadequate.

Effects of the Gaps on the baby

It is obvious that babies born preterm are at increased risk of a range of poor outcomes including respiratory distress syndrome, necrotising enterocolitis,neonatal sepsis, as well as malnutrition.Therefore,in the long term,they are more likely to experience motor and sensory impairment ,delay in cognitive development and behavioural problems than babies at term. I believe that effective growth mentoring and plotting on the neonate file will determine the growth and developmental status as well as nutrition.Therefore,ensuring that postnatal growth is as healthy as possible is critical to improving survival and long term outcomes of preterm infants.

In this case, it requires having vigorous standards to monitor their growth and development on the growth chart. If nurses are not fully assessing all neonates holistically,when complication arises,the greatest effects will go to the child and the family and will also become excruciating for them.The shortage of vital signs monitors may expose the newborn to other infection,because using one or two monitors on each newborn may have effect as well.

Strengths and weaknesses noticed in managing the case

One of the strengths that I noticed at the NICU ward was that the pediatric and neonatal protocols are actually followed by care providers,family centered care approaches are effective that is, the family involvement and education in the care of their newborns are adhered.I also noticed that infection prevention and control is one of the priorities for every patient care in the hospital.From the theory as mentioned in the reduction of neonatal mortality in Rwanda according to the RDHS 2019-2020 report,I realized that it is actually proven in practice,because from my observation, I did not see any neonatal death during the period under review of my clinical placement.Although this report is done only in one hospital in Rwanda and one of teaching hospitals where most of the complicated cases are referred or transferred across the country.I realized that neonatal resuscitation materials are available and used by the care providers. I noticed that the nurses have the potential in teaching the assigned students who are on their clinical placement at the various pediatric and neonatal units.

On the other hand, the weaknesses I observed were the following: inadvertent use of the growth and monitoring chart by care providers,limited staff assigned at the unit thus leading to work overload,ineffective communication between ordering physician and laboratory unit which led to delay in providing patient results. Other factors associated in providing laboratory results or delay are not yet clear and finally, lack of staff capacity to master level at the NICU. Furthermore, as I was told by the unit manager,only one neonatologist is currently assigned at the unit but five years ago,the unit was having five neonatologists.

Lesson learnt

I strongly believe that my preferment to come in Rwanda to obtain master in pediatric nursing, it was essential for the Liberian Government to provide me this opportunity so that knowledge and skills gained from this program to share among other healthcare professionals and the pediatric population across the country.I'm actually getting the best theoretical and practical skills and knowledge through the supervision and mentorship of our supervisors of the pediatric track, university of Rwanda,college of nursing and midwifery.I have realized that writing concept for analysis on our clinical placement or practice indicates an evidenced based nursing practice today. I noticed that since my clinical experience as a nurse in practice, I was somehow limited in dealing with the neonates and the entire pediatric populations in term of assessment and management of their health issues,but now this clinical rotation, I am confident and knowledgeable in applying my skills in practice according to my clinical objectives today and the future.

For now,this clinical placement,I am now knowledgeable of the pediatric and neonatal protocols of Rwanda, international standard and guideline and other empirical literatures of the management of newborn with respiratory distress syndrome.I have realized that

my undergraduate studies in nursing practice I had limited experience,but the master program has actually made me to critically analyze theory and practice of the nursing profession here in Rwanda today.

Furthermore,phototherapy in the management of neonatal jaundice and CPAP administration were my first time to observe during this clinical placement. It is a new experience and knowledge that I have gained today in my clinical practice.

From the theoretical standpoint and practice,I have seen that the master of nursing and midwifery program at the university of Rwanda is based on evidence and standard of nursing practice.

All of the theoretical sections taught by our lecturers are vividly seen in my clinical practice today.

I also noticed that Rwanda has many neonatal,pediatric specialists/nurses,as compared to Liberia.I realized that pediatric,neonatal resuscitation equipments,laboratory materials and other services are available here in Rwanda,CHUK.

Conclusion

The day of birth and the first 28-days of life - the neonatal period – are the most susceptible periods for a child's survival and health. It is obvious that everybody can be a champion for newborns who are a group without a voice that is governed by others to champion their cause. Newborn health champions have been at the forefront of advocating for robust policies and programmes to mitigate global neonatal mortality.

Healthcare professionals such as Clinicians (midwives, paediatricians, obstetricians), as well as members of parliament, ministers of health and finance, parents, journalists, celebrities, donors and many other champions have to work together to increase the availability of and access to routine and emergency newborn care services and supplies, improve the quality of newborn care services and supplies, and increase knowledge of and demand for newborn care.

In this light,developing and supporting champions that advocate for newborn health is a core component of shifting social norms so that it is no longer acceptable for babies to die unnecessarily, just as it has become unacceptable for women to die while giving birth..Therefore; include communities, civil society and other stakeholders to increase demand and ensure access and coverage of essential maternal and newborn care.

Recommendations

Based on my observation from the management of the newborn diagnosed with RDS,I would like to come out with the following recommendations for a newborn with respiratory distress syndrome admitted at NICU ward,CHUK:

- That growth and monitoring chart to be properly filled and documented in patient file
- That strong collaboration between the laboratory and the neonatal team for timely lab.results
- Nurses to be upgraded to master level in pediatric and neonatology nursing
- That nurses to ensure impeccable nursing assessment routinely
- To include ballard score and silverman's score to be included in the nursing assessment form
- Nurse –newborn ratio to be 1:3 to reduce work overload
- Surfactant administration to be added in the Rwandan neonatal/pediatric national protocol in accordance with international standard and guideline
- Make available vital signs monitors for each newborn

References

[1] Jobe AH. Fetal and Neonatal Physiology. Fifth. 2017.
[2] Chanie ES, Alemu AY, Mekonen DK, Melese BD, Birhan BM, Hailemeskel HS, et al. Impact of Respiratory Distress Syndrome and Birth Asphyxia Exposure on the Survival of Preterm Neonates in East Africa continent: Systematic Review and Meta-analysis. Heliyon. 2021;7(April):e07256.
[3] Gaertner VD, Bassler D, Rüegger CM. Does surfactant nebulization prevent early intubation in preterm infants? A protocol for a systematic review and meta-analysis. Syst Rev. 2021;10(1):4–9.
[4] Banerjee S, Fernandez R, Fox GF, Goss KCW, Mactier H, Reynolds P, et al. Surfactant replacement therapy for respiratory distress syndrome in preterm infants: United Kingdom national consensus. Pediatr Res [Internet]. 2019;86(1):12–4. Available from: http://dx.doi.org/10.1038/s41390-019-0344-5
[5] Verma RP. Respiratory distress syndrome of the newborn infant. Obstet Gynecol Surv. 1995;50(7):542–55.
[6] Sweet DG, Carnielli V, Greisen G, Hallman M, Ozek E, Te Pas A, et al. European Consensus Guidelines on the Management of Respiratory Distress Syndrome - 2019 Update. Neonatology. 2019;115(4):432–50.
[7] National Institute of Statistics of Rwanda M of H and TDPI. Rwanda Demographic and Health Survey 2019-2020: key indicators report. Vol. 53, Demographic and Health Surveys. 2020. 1689–1699 p.
[8] Betts KS, Kisely S, Alati R. Predicting neonatal respiratory distress syndrome and hypoglycaemia prior to discharge: Leveraging health administrative data and machine learning. J Biomed Inform [Internet]. 2020; Available from: https://doi.org/10.1016/j.jbi.2020.103651
[9] Stanley CA, Rozance PJ, Thornton PS, De Leon DD, Harris D, Haymond MW et al. R "transitional. Reevaluating "transitional neonatal hypoglycemia": mechanism and implications for management. J Pediatr. 2015;1689–99.
[10] TS J. Hypoglycemia and the Full-Term Newborn: How Well Does Birth Weight for Gestational Age Predict Risk? J Obstet Gynecol Neonatal Nurs. 2003;(0):48–57.
[11] Gien J. Respiratory distress syndrome. Fith. Berman's Pediatric Decision Making. 2011.
[12] Donn SM, Sinha SK. Respiratory Distress Syndrome. Second. Manual of Neonatal Respiratory Care. 2006.
[13] NATIONAL HEART, LUNG ABI. Respiratory Distress Syndrome [Internet]. 2019. Available from: https://www.nhlbi.nih.gov/health-topics/respiratory-distress-syndrome
[14] WHO. Recommendations on newborn health: approved by the WHO Guidelines Review Committee. Who [Internet]. 2017;(May):1–28. Available from:https://www.who.int/maternal_child_adolescent/documents/newborn-health-recommendations/en/%0Ahttp://apps.who.int/iris/bitstream/handle/10665/259269/WHO-MCA-17.07-eng.pdf?sequence=1%0Ahttp://apps.who.int/iris/bitstream/handle/10665/259269/WHO-MCA-17.07-eng
[15] Relats JL. Basic Pediatric protocol. J Lang Relatsh. 2019;vii–viii. J Lang Relatsh. 2020;vii–viii.