



SEINÄJOEN AMMATTIKORKEAKOULU  
SEINÄJOKI UNIVERSITY OF APPLIED SCIENCES

Elina Hirviniitty & Miro Palmroth

---

# Cardiopulmonary Resuscitation for a Neonatal

Functional Thesis

Bachelor's Thesis

Spring 2024

Degree Programme in Health Care, Nursing



SEINÄJOKI UNIVERSITY OF APPLIED SCIENCES

## **Thesis abstract**

Degree Programme: Bachelor of Health Care, Nursing

Specialisation: Registered Nurse

Author: Elina Hirviniitty, Miro Palmroth

Title of thesis: Cardiopulmonary Resuscitations for a Neonatal

Supervisor: Terhi Voltti, Paula Paloniemi

Year: 2024

Number of pages: 30

---

Neonatal resuscitation is a critical procedure requiring knowledge, rapid decision-making, and effective teamwork to ensure the survival and well-being of newborns experiencing life-threatening conditions. This thesis focuses on creating an educational video that demonstrates the proper techniques for neonatal cardiopulmonary resuscitation (CPR), according to the latest guidelines established by the Finnish Käypä hoito recommendations. The project is functional in nature, aiming to address the growing need for easily accessible, standardized educational tools for healthcare professionals, particularly those involved in neonatal care.

The purpose of this thesis was to produce a high-quality instructional video that accurately reflects the current evidence-based practices for neonatal CPR, and the goal of this thesis is to support nursing students learning and skills about cardiopulmonary resuscitation of neonatal patients. Among nursing students, the video also targets healthcare providers, including nurses, midwives, and physicians, who are directly responsible for resuscitating newborns.

The content was developed based on a comprehensive review of Käypä hoito guidelines, ensuring adherence to the latest recommendations on the resuscitation process, including initial assessments, ventilation techniques and chest compressions. Particular emphasis was placed on the unique physiological characteristics of neonates, which necessitate distinct approaches compared to adult or paediatric resuscitation.

Recent guidelines are sought of neonatal resuscitation and this thesis explains how those guidelines are in practice. The main features of good educational video are looked for and utilized while creating an educational video. The final result is a practical and easy-to-use video that can be used for training, as a refresher, or as a quick reference in real-life situations.

## TABLE OF CONTENTS

|  |    |
|--|----|
| Thesis abstract .....  | 1  |
| TABLE OF CONTENTS.....   | 2  |
| Pictures, Figures and Tables .....                                   | 4  |
| Terms and Abbreviations .....  | 5  |
| 1 INTRODUCTION.....  | 6  |
| 2 DEFINITION OF NEONATAL PERIOD .....                                | 7  |
| 2.1 ASSESMENT OF NEONATAL NEWBORN'S CONDITION .....                  | 7  |
| 2.2 APGAR SCORE .....  | 8  |
| 3 NEONATAL RESUSCITATION .....                                       | 9  |
| 3.1 ABCDE-protocol in Neonatal Care .....                            | 9  |
| 3.2 Assessment of the resuscitation and preparing resuscitation..... | 11 |
| 3.3 Medications used in resuscitation.....                           | 12 |
| 3.4 Fluid resuscitation and hypovolemia .....                        | 12 |
| 3.5 After resuscitation.....   | 13 |
| 3.6 PEWS (Pediatric Early Warning Score).....                        | 13 |
| 4 BASIC NEONATAL CARE AFTER RESUSCITATION .....                      | 15 |
| 4.1 Skin to skin contact .....                                       | 15 |
| 4.2 Vitamin K.....   | 15 |
| 4.3 Assessing newborn measurements.....                              | 15 |
| 4.4 Laboratory tests.....  | 16 |
| 5 FAMILY CARE AND SUPPORT .....                                      | 18 |
| 6 DEATHN OF A NEONATAL .....   | 20 |
| 7 AIM AND PURPOSE .....  | 22 |
| 8 METHODOLOGY .....  | 23 |
| 8.1 Functional thesis .....  | 23 |
| 8.2 What is functional thesis?.....                                  | 23 |
| 8.3 Search strategy and data collection .....                        | 23 |
| 9 FEATURES OF GOOD EDUCATIONAL VIDEO .....                           | 24 |

|   |    |
|---|----|
| 10 DUAL CHANNEL THEORY AND COGNITIVE LOAD ..... | 26 |
| 10.1 Cognitive learning theory.....             | 26 |
| 11 PLANNING THE VIDEO.....                      | 28 |
| 11.1 Video storyline.....                       | 28 |
| 11.2 Video script .....                         | 28 |
| 12 VIDEO IMPLEMENTATION .....                   | 29 |
| 12.1 Video shooting.....                        | 29 |
| 12.2 Editing .....                              | 29 |
| 13 ETHICALITY AND RELIABILITY .....             | 30 |
| 14 CONCLUSION .....                             | 32 |
| 15 BIBLIOGRAPHY.....                            | 33 |

## **Pictures, Figures and Tables**

[Figure 1. Dual channel theory](#)

## **Terms and Abbreviations**

APGAR (Appearance, Pulse, Grimace, Activity, Respiration)

CPR (Cardiopulmonary Resuscitation)

ERC (European Resuscitation Council)

PEWS (Paediatric Early Warning Score)

TENK (Finnish Research Ethics Committee)

## 1 INTRODUCTION

Resuscitation situations can occur unexpectedly, and it is important to have information on the subject in the background. According to Duodecim, basic health care education does not necessarily guarantee sufficient competence, as resuscitation skills may be forgotten, and techniques may change. Repetition of fundamental skills holds considerable significance. (Mäkinen, et al., 2011, p. 473)

The authors of this thesis have asked the Finnish National Institute for Health and Welfare (THL) for statistics on newborn resuscitation and received statistics through an email. In Finland, details on postpartum care are documented in the birth registry. HUS hospitals (Helsinki University Hospital) have been providing information to THL in keeping with the current data collection since 2020, their data has not been included in the statistics. In 2017, 1466 newborns needed immediate care after birth. In 2022, the number had doubled, with 2974 newborns requiring immediate care. THL suggest that the number of neonatal resuscitations is rising, and that the role of resuscitations is also expanding. Notable is also the fact that there are more babies born also in good health than in prior years.

The authors were interested in acute nursing, resuscitation in general and related learning materials. Conclusions were made that there was enough material in English of adult resuscitation, but not enough material about neonatal resuscitation in video format. The purpose of this thesis is to create an educational video about an understanding of cardiopulmonary resuscitation (CPR) of neonatal. The aim is to support nursing students' knowledge and skills about CPR of a neonatal, including current CPR guidelines for a newborn. The video is targeted at nursing students and other healthcare professionals that are interested in this topic.

## 2 DEFINITION OF NEONATAL PERIOD

Newborn children immediately after birth are vulnerable to many changes regarding their health status. After being born they always need around the clock surveillance and care. The 28-day period after birth is called the neonatal period. According to World Health Organization Child that has born before 37<sup>th</sup> pregnancy week is called prematurely born or preterm. WHO also says that there are three sub-categories for prematurely born babies, which are moderate or late preterm (32-37 week), very preterm (28-32 week) and extremely preterm (<28 weeks).

### 2.1 ASSESMENT OF NEONATAL NEWBORN'S CONDITION

The well-being of the newborn must be assessed immediately after birth. If the baby cries and moves limbs, this indicates a healthy newborn. If the newborn does not cry and appears quiet and limb, various methods of stimulation should be tried. Stimulation can include gentle massage of the soles of the feet or the back. After stimulation, the majority of newborns begin to breathe and cry. If stimulation does not work, assisted ventilation for the newborn is initiated, along with ECG monitoring and pulse oximetry (Luukkainen, et a., 2019 p.8-9).

Continuous measurement of the heart rate and detection of potential arrhythmias are performed using an ECG with three electrodes taped on a newborn's chest. Pulse oximetry is a sensor put on the arm or leg that measures the percentage of oxygen saturation in the blood. For double saturation measurement, one sensor is on the right hand, and the other is on the lower limb (Terveyskylä, 2023).

According to The Royal Children's Hospital in Melbourne (n.d.), in both term and preterm neonates' oxygen saturation should be targeted within 91-95%. According to Chang, (2011) achieving the right balance of supplemental oxygen is important for infants, as inadequate or excessive exposure can be detrimental to their well-being. Newborn blood pressure is measured in two ways, using a cuff on the arm or leg, which is an easy and non-invasive method, or by using a thin tube placed in the artery of the arm, leg, or umbilical artery. This second method gives continuous readings. From this second method, you can



take blood samples through the same tube. (Terveyskylä, 2023). According to MedlinePlus, (2022), the average blood pressure in a newborn is 64/41.

The definition of mean arterial pressure (MAP) is the average arterial pressure throughout one cardiac cycle, systole, and diastole (DeMers & Wachs, 2023). The lowest value for 'normal' mean arterial pressure (MAP) for a newborn is the same as for a 25-week-old infant = 25 mmHg (Batton, B. et al., 2016).

## **2.2 APGAR SCORE**

In 1953 a scoring system called Apgar score for assessing the well-being of newborns was published by obstetric anesthesiologist Virginia Apgar. (Metsäranta, et al., 2021). The purpose of using Apgar score is to evaluate the hearth rate, breathing, irritability, stiffness, and skin color of a newborn child (APGAR = Appearance, Pulse, Grimace, Activity, Respiration). The goal for creating a scoring system was to pay attention to the child's health status right after birth and evaluate the need for resuscitation. Apgar scoring chart has five sections where a newborn child can get a maximum of two points in each section. The total score of the Apgar scoring system is 10 points. The prognosis according to Apgar is poor when an individual gets a total score of 0-3 points and good if the total score is 8-10 points (Metsäranta, et al., 2021).

### 3 NEONATAL RESUSCITATION

The purpose of cardiopulmonary resuscitation is to get the heart and lungs working again. The compression-blowing method involves pressing on the chest and blowing into the mouth of the person being resuscitated in a repetitive rhythm, until the resuscitated person breathes again (Cambridge Dictionary, n.d.). According to American Heart Association, (n.d.), CPR is an emergency lifesaving procedure.

Preparation for a resuscitation situation involving a newborn is well understood. Communication is important, and in the resuscitation, there should be at least three individuals trained in neonatal resuscitation and doctor. The staff must be knowledgeable about and familiar with the equipment, fluids, and medications used in resuscitation. Before starting the resuscitation, a quick pre-planned assessment is made based on preliminary information, and this is followed by assigning roles during resuscitation. The most experienced doctor leads the resuscitation of the newborn. After the resuscitation situation, an attempt is made to organize a discussion among the participants regarding the resuscitation (Luukkainen, et al., 2019 p. 8-9).

The poor condition that led to the resuscitation of the newborn always requires investigation and treatment. Possible basic reasons for resuscitation can be, for example: infection, difficulty breathing, asphyxia, heart failure, neurological disease, or other rare disease (metabolic disease) (Luukkainen, et al., 2019, p.17). During the hospital care of a newborn, it is essential for both the healthcare staff and parents to prioritize good hand hygiene. Proper handwashing involves thorough handwashing for about 30 seconds if hands are visibly dirty and using hand sanitizer for approximately 20 seconds (Stolt, et al., 2017, p.89-95).

#### 3.1 ABCDE-protocol in Neonatal Care

ABCDE-protocol (airways-breathing-circulation-disability-exposure) is a systematic tool for vital sign assessment. This protocol is used internationally in every patient examination and advanced life support. It is also applicable in all clinical emergencies for immediate assessment and treatment (Thim et al., 2012).

Thim et al., 2012, has explained the steps of ABCDE protocol as follows.

**A – Airways:** This passage discusses the assessment and management of airway obstruction in patients. It emphasizes the importance of recognizing signs of both partial and complete airway obstruction, such as changes in voice, noisy breathing, and increased breathing effort. A reduced level of consciousness is identified as a common cause, and snoring may indicate partial obstruction in an unconscious patient.

**B – Breathing:** The passage talks about checking a person's breathing in different situations. Counting breathing frequency, how the chest moves, and checking for certain signs like blueness. If a stethoscope is available, listening to the lungs and using a device called pulse-oximetry to measure oxygen levels is also helpful.

**C – Circulation:** Checking a person's pulse and see how quickly their skin color changes. If their skin looks pale, they are sweaty, or they seem less awake, it could mean their blood flow is not good. You can also listen to the heart by using a stethoscope. It is also important to monitor their heart with an ECG and check their blood pressure.

**D – Disability:** You can quickly check a person's awareness using the AVPU method, grading them as alert, responsive to voice, responsive to pain, or unresponsive. Another method is the Glasgow Coma Scale (GCS). Looking at their limb movements for signs of problems on either side. Check their pupils' reaction to light and measure their blood sugar.

**E – Exposure:** External examination of the body. Check any signs of trauma, bleeding wounds, rashes, etc. Body temperature can be felt by touching the skin on various locations; you can also use a thermometer if available.

The first 30-60 seconds after birth includes prevention of heat loss. A newborn is very susceptible to getting cold, especially if the child is born prematurely or in poor condition. The ideal temperature for the newborn is between 36-37°C, and this can be sustained by using a heat radiator, ensuring thorough drying, and replacing damp cloths from the delivery process. However, using excessive amount of heat is not recommended because it may lead to brain damage (Luukkainen et al., 2019, p.9-11).

Breathing is supported with excess pressure using CPAP and ventilation. Ventilation should be corrected if the heart rate is below 100 BPM. Using pulse oximetry and monitoring ECG is also recommended (Luukkainen et al., 2019, p.9-11). If the heart rate is below 60 BPM, intubation should be considered while giving ventilation. If the heart rate remains below 60 BPM with supplemental oxygen, the child must be intubated and ventilated. If there is no response after intubation, cardiopulmonary resuscitation must be started. The correct way to give CPR to a newborn is one breath and three compressions (1:3) (Luukkainen et al., 2019, p.9-11).

Adrenaline is administered intravenously or intratracheally, if heart rate is below 60 BPM regardless of adequate ventilation and cardiopulmonary resuscitation. Rehydration with Ringer's or NaCl solution is started when hypovolemia or hemorrhagic shock is suspected (Luukkainen et al., 2019, p.9-11).

### **3.2 Assessment of the resuscitation and preparing resuscitation**

Effective communication and co-operation between health care professionals make it possible to prepare for the resuscitation situation of the newborn child in advance. During both office and on-call hours, the maternity hospital must have impeccable obstetrics, anesthesia and pediatric services which includes having enough resuscitation facilities, equipment, and plans as well as frequent resuscitation training available for neonatal resuscitation and around-the-clock readiness for emergency section as well (Duodecim, 2014, p. 1890).

Most newborn children adapt to life outside the womb right after birth, but some may require resuscitation measures. Käypä hoito has provided statistics regarding the requirements in neonatal resuscitation, which states that 85% of newborn children begin breathing on their own without aid, 10% need stimulation by drying or massaging and/or assistance in opening the airways, 5% need ventilation, 0.4–2% require intubation, less than 0.3% need CPR and only 0.05% need adrenaline (Elvytys (vastasyntynyt): Käypä hoitosuositus. 2022).

The need for resuscitation is assessed immediately after the birth of the child by using APGAR scoring system. The temperature of the newborn must be monitored because after birth the child is wet, which means that the temperature of the child's skin drops very quickly. It is also important to check the airways and the quality of breathing. Supplemental oxygen must be given if necessary. Chest compressions are initiated when a newborn's pulse rate is lower than 60 bpm. Compressions and ventilation are coordinated in a 3:1 ratio (1 ventilation + 3 compressions) in cycles of 15 in 30 seconds. The patient should be intubated if possible. Taking an ECG is also recommended (Duodecim 2014, p. 1890).

### **3.3 Medications used in resuscitation**

During neonatal resuscitation, medications are used to support the process. If the heart rate remains below 60/min despite resuscitation efforts, adrenaline is administered either intratracheally or intravenously. However, according to Käypä hoito in neonatal resuscitation medication is rarely required because there is little research available on the efficacy of any drug that is utilized. When the airway has been secured and the patient has been effectively ventilated, and pressure resuscitated for at least 30 seconds without response (heart rate remains below 60/min). The need for medication used in resuscitation and rehydration needs to be thoroughly assessed.

The adrenaline medication enhances the force of heart contractions, constricts peripheral blood vessels, and increases blood flow in coronary arteries. Typically, adrenaline is administered intravenously during resuscitation, in newborns either through the umbilical vein or a peripheral vein. The concentration of the medication used in resuscitation is 0.1mg/ml (Luukkainen et al., 2019, p.16).

### **3.4 Fluid resuscitation and hypovolemia**

The primary purpose of fluid resuscitation is to uphold organ perfusion (hemodynamics) and ensure the delivery of essential substrates, such as oxygen and electrolytes. This involves administering fluids and electrolytes through either the enteral route or, when oral intake is not feasible, intravenous (IV) administration to replace fluid losses. Maintaining homeostasis is the main goal of fluid resuscitation which involves not only delivering an

adequate volume of fluid to optimize hemodynamics and perfusion but also ensuring the maintenance of electrolyte balances (Wallace & Regunath, 2023).

Fluid resuscitation is conducted by quickly giving the safest dosage of 10 ml/kg of the prescribed solution for hypovolemia (Ringer or 0,9% NaCl) and is repeated if necessary. Fluid resuscitation is necessary when a newborn is having acute bleeding. Hemorrhagic shock is a life-threatening condition caused by hypovolemia, which is rare right after birth (Luukkainen et al., 2019, p.15).

Hypovolemia, as described by Melendez Rivera and Anjum (2023), is marked by a decreased volume of extracellular fluid, usually due to the concurrent loss of sodium and water. Terveyskirjasto (2016) adds to this definition by stating that hypovolemia can also be characterized by an abnormally low volume of blood in the body.

### **3.5 After resuscitation**

A newborn must be continuously observed after being resuscitated in order to guarantee their wellbeing and safety. Monitoring includes taking many vital signs, such as blood pressure, temperature, ECG, saturation, and diuresis, and assessing the results using the PEWS-score. If the newborn is in discomfort after the resuscitation, medication should be administered. After resuscitation, it is important to look into the causes behind the baby's disturbed condition and determine what caused the resuscitation to be necessary. Newborns, who have been resuscitated receive ongoing care in an intensive care unit, where their well-being is prioritized, and their condition is managed (Luukkainen et al., 2019, p.16).

### **3.6 PEWS (Pediatric Early Warning Score)**

The Pediatric Early Warning Score (PEWS) is a scoring system used globally to detect early disturbances in critical processes in children during medical treatment. It can be used to evaluate heart rate, blood pressure, and breathing rate. But it cannot evaluate treatment or illness severity. PEWS systems are now widely used in pediatric hospitals worldwide.

The Finnish Resuscitation Guidelines emphasize identifying changes in a patient's bodily functions and health deterioration before cardiac arrest (Sairaanhoitajat, 2019).

## **4 BASIC NEONATAL CARE AFTER RESUSCITATION**

### **4.1 Skin to skin contact**

After a successful resuscitation of the newborn and when the newborn's condition allows, it is important for the newborn to have skin-to-skin contact with the mother or father. There are multiple benefits of skin-to-skin contact for both the mother and the newborn. For example, increased breastfeeding self-efficacy, lowered maternal and newborn stress levels, bonding between mother and the baby, and thermoregulation. In skin-to-skin contact, a newborn baby goes through 9 instinctive stages: birth cry, relaxation, awakening, activity, rest, crawling, familiarization, suckling, and then sleeping. Staff should ensure that this first skin-to-skin contact succeeds, as it is important for the baby's development and for the mother and parents to bond with the baby (Widström, et al., 2019).

### **4.2 Vitamin K**

After birth, the newborn receives a vitamin K injection. Vitamin K is injected into the muscle and thigh. The functions of vitamin K are related to blood clotting, bone formation, and immune defense. Vitamin K deficiency in newborns is serious because the newborn's vitamin K status in the body is weak. The vitamin received from the mother's breast milk is low, and vitamin intake through the placenta is inefficient, which is why the injection is given in the thigh (Schwab, 2024).

### **4.3 Assessing newborn measurements**

According to the birth weight of a newborn is important for determining medication dosage as well as ensuring proper nutrition. The average weight of a full-term baby is around 3.2 kg. In resuscitation, the most important information is the newborn's weight. Other measurements are taken once the condition has stabilized. The circumference of the newborn's head is measured above the ears. The head circumference is usually 35 cm. The next measurement taken is the length. The length of the newborn is measured from head to toe, and it is typically around 50 cm (University of Rochester Medical Center, n.d.).



#### 4.4 Laboratory tests

A screening blood sample is taken from the heel of the newborn. This screening blood sample is used to screen for congenital metabolic and immunodeficiency disorders. These conditions are rare but hereditary. Untreated disease can lead to severe disabilities or even the death of the newborn, so it is important to initiate the correct treatment as soon as possible. This screening sample can detect metabolic and immunodeficiency disorders. In Finland, this screening is conducted for all newborns. Without this sample, identifying these diseases would be challenging (Terveyskylä, 2020). Blood sugar is taken from the soft fatty tissue of the newborn's heel, usually 3–4 times a day, with the first blood sugar measurement done at 3–4 hours. If the blood sugar is below 2.6 mmol/l, additional feeding is initiated (Terveyskylä, n.d).

Newborns also undergo a TSH (thyroid-stimulating hormone) test, which is taken from cord blood. The TSH sample reflects the function of the thyroid gland and can rule out hypothyroidism. Untreated hypothyroidism can lead to permanent intellectual disability and severe growth disorders (Terveyskylä, 2020).

Blood salt concentrations are also checked in the laboratory tests of a newborn. Sodium and potassium are the most important blood salts, essential for normal metabolic function. Disturbances in salt concentrations can lead to various symptoms (Pelttari, 2023).

This laboratory exam helps assess respiratory function and how efficiently a neonate's body is exchanging oxygen and carbon dioxide, as well as the acid status of the blood (pH). It can also identify renal or metabolic disorders. Typically conducted in the Neonatal Intensive Care Unit, capillary blood gas is taken from the newborn's heel as it is less painful than obtaining a sample from an arterial line.

From the blood gas, the following parameters are measured:

PH: Indicates how acidic or basic the blood is

PO<sub>2</sub>: Dissolved oxygen in the blood

PCO<sub>2</sub>: The dissolved carbon dioxide in the blood

HCO<sub>3</sub>: Bicarbonate bases in the blood

These laboratory tests are essential as they can detect illnesses and abnormalities in the body if the values are not within the normal range. For example, respiratory acidosis may occur if the pH is low and PCO<sub>2</sub> is too high, while metabolic acidosis might occur with low pH and low HCO<sub>3</sub> (Agrawal, 2012).

Bilirubin is a byproduct of the breakdown of red blood cells, studied in the liver and bile ducts. The lifespan of red blood cells in the blood is 120 days, and when these cells age, they break down in the body, resulting in the formation of bilirubin (SYNLAB, n.d).

Bilirubin is yellow, which is why its accumulation in the body shows yellowing. The newborn's bilirubin levels can be monitored with a blood sample from the heel or a skin meter. As the bilirubin level rises sufficiently high, it is treated with blue light therapy and adequate hydration. In severe cases of jaundice, immunotherapy may be used, and in critical situations, blood exchange may be necessary. The newborn's liver is immature and poorly breaks down bilirubin. Prematurity in a newborn is a significant predisposing factor for jaundice, and other contributing factors include infections, bruises, and the birthing process. A yellowish baby easily becomes tired and quiet, and inadequate milk intake and weight loss increase the risk (Terveyskylä, n.d).

## 5 FAMILY CARE AND SUPPORT

The parenthood and forming of a family start right when the pregnancy begins. Both parents start to plan how their family is going to be and what roles they will have. Self-images, perceptions, and expectations are formed about the unborn child. Usually, parents expect that everything will go well during the delivery. When the process of parenthood is disrupted by difficulties in delivery, such as the need for CPR for the neonatal, it affects parents. Especially mothers might feel that they did something wrong or it's their fault. For parents, the resuscitation scenario is usually unexpected, and they require proper assistance. While it is the right of parents to be present during resuscitation, nurses must ensure that parents do not interfere with the process. Parents should be informed about what occurred during resuscitation and be given the opportunity to discuss the scenario. Additionally, parents can seek crisis help (Storvik-Sydänmaa, et al. 2019, p.132).

After succeeded resuscitation, the neonatal child needs hospitalization in the neonatal intensive care unit. This might evoke feelings of powerlessness, fear, and stress in parents, delaying their transition to secure roles as parents. Parents often experience symptoms of anxiety and depression when their child is in the neonatal intensive care unit. The bonding between the child and parents is delayed due to medical reasons, and this can affect future relationships and the well-being of the family. In summary, there are usually difficulties for parents in assuming the role of a mother or father when their child is in the neonatal intensive care unit. Nowadays, hospitals try to support this bonding by prohibiting the use of mobile phones and allowing parents to take on most of the basic care tasks, such as changing diapers and breastfeeding. Allowing parents to perform these basic care activities for their baby helps strengthen the bond. Nursing staff should encourage parents to be with the child, even when the child is connected to medical IVs and tubes (Peterson, et al., 2023).

In the article written by Peterson, et al. (2023), it is well noted that parents have different needs over time. It can be challenging for parents to express these needs. Both non-verbal communication and verbal communication are important. Nonverbal communication could include information leaflets or websites, for example. Nursing staff shouldn't assume that if there are already multiple children in the family and the parents have enough experience,

they may not need guidance, as sometimes parents could forget some aspects of basic care.

Premature and full-term babies have an equal right to the presence of their parents, regardless of intensive care. In Article 9 of the UN Convention on the Rights of the Child, it is stated that a child should not be separated from their parents unless there is a very compelling reason, such as abuse. Space should be provided for parents and the baby to develop in the hospital setting (Stolt, et. al., 2017, p.128).

## 6 DEATHN OF A NEONATAL

In some cases, despite intensive resuscitation efforts, a newborn may not survive. Healthcare providers must offer support to parents during such challenging times. (Storvik-Sydänmaa, et al. 2019, p. 132). Parents have the right to get to know their child, even if resuscitation or intensive care is unsuccessful. It is beneficial to provide parents with a private room where they can say their goodbyes to their child. Memories of the child, such as photos or footprints, serve as important mementos for parents. A hospital chaplain can be summoned, and parents can invite close relatives or other support persons to be present. Emergency baptism can also be performed. When parents are ready, the baby is disconnected from the ventilator, and they can hold the newborn in their arms. After the baby's passing, parents can, together with a nurse, swaddle the baby (Stolt., et. al., 2017, p.28).

According to October, et al., (2018), Child deaths in industrialized countries are relatively exceptional compared to worldwide. Because of this, parents and the rest of the support network are not prepared for the death of the newborn. A lack of support network and social assistance can lead to a deterioration in the parents' health, as well as psychological and physical. The expectation is usually that newborns will develop and live a long life, but when this idea is dashed, so to speak, parents' despair about the future. The death of a child is always a shock, and parents may not understand what has happened. Parents should always have contact after the child's death, if they have questions or other concerns. This will help parents deal with grief. Even small gestures and attention from the nursing staff help to support parents. Medical staff must be open, trustworthy and respectful of the deceased child.

Parents decide on behalf of the newborn child what is morally right for the child. The decision includes evaluating the proposed treatments together with healthcare professionals. For example, unnecessary treatments can be ruled out if they impair the child's quality of life. Pain is avoided. (Ong, 2013, p. 100–101).

Resuscitation of the newborn may be withheld if early death or suffering from treatment is likely. Structural abnormalities can also complicate resuscitation, for example, anencephaly. The decision on the child's resuscitation is made only after the child is born. It is important to communicate with the parents during this time (Luukkainen, et al, 2019 p. 8–9).

## **7 AIM AND PURPOSE**

The purpose of this thesis is to create an educational video about understanding cardiopulmonary resuscitation (CPR) of newborns. The aim is to support nursing students' knowledge and skills about CPR of a newborns, including current CPR guidelines for a newborn. The video is targeted at nursing students and other healthcare professionals that are interested in this topic. The audience for this thesis is nursing students and other healthcare professionals.

Research questions

What are the current guidelines of neonatal resuscitation?

What is a good educational video?

## **8 METHODOLOGY**

### **8.1 Functional thesis**

The thesis is a functional thesis, creating an educational video which is constructed based on the care protocol and recent guidelines of cardiopulmonary resuscitation for neonates. The functional thesis will follow the rules and guidelines set by Seinäjoki University of Applied Sciences (Seinäjoki University of Applied Sciences, 2023).

### **8.2 What is functional thesis?**

The functional thesis work is one of the ways of research and development. Functional thesis work is developmental work where the authors position themselves as experts in their subject and prepare a product for their chosen target group using reliable materials and sources to gain accurate information. The process of functional thesis starts with the idea and planning, where the topic, objectives, target groups, methods, and theoretical basis of the thesis are decided. From the planning phase, it moves to the commitment phase, where activities are planned for the benefit of the thesis. The next phase is development, where materials are acquired, and comparisons are made between them. At this stage, the preparation of the product begins, with interim evaluations in between. The final phase is completion and drafting the report (Airaksinen, et al., 2022, p. 11-13).

### **8.3 Search strategy and data collection**

In order to gather information for this thesis, reliable academic databases, and sources such as Duodecim, Terveyskirjasto, SeAMK Finna, Pub-Med, Google Scholar, and Medic were used. The period of the information-gathering procedure will be 2008–2023, with a focus on the most recent years. Both Finnish and English are used in the search process. Neonatal resuscitation, the European Resuscitation Council (ERC), and cardiopulmonary resuscitation are the search terms used for information.



## 9 FEATURES OF GOOD EDUCATIONAL VIDEO

Oulu University of Applied Sciences has published the article written by Heikkilä, et al., *Video to help with learning – producing an orientation video for biomedical science students*, (2021). The article goes through the features of a good tutorial video. Video material is increasingly used in teaching to support learning. Instructional videos can be used to tell concrete things that are difficult to tell with pictures or text. Instructional videos also promote the student, as the student can have background knowledge of the topic and combine it with practice by watching the video. The videos are also practical and suitable for the student, as the video can always be stopped and returned to the desired point to re-view.

In order for a video tutorial to fulfill its mission, the qualitative characteristics of the video tutorial must be right. The first essential thing when making a video tutorial is to choose the target group and the main point video. Perhaps the most important feature of a video is the length of the video. A video that is too long distracts the viewer and the lesson does not get through. If the topic of the instructional video is extensive, it's a good idea to break the video into parts. The video should have a plot that keeps the viewer interested. (Kuokkanen, 2019).

According to Farr & Roth (2021), the educator is making a schema of the presentation. Making a schema is important since it helps viewer progress and remember lots of information. Finally comes the presentation and narration of the video. How the video is presented affects directly to viewers' learning. Speaking rate should be quick but clear and the narrator should be enthusiastic. Conversational way of speaking is preferred by the students.

In a good video tutorial, the sound and image quality must be good. Poor audio and video quality can ruin even a good video. In the video tutorial, the storyline is logical, and the shot points do not change too quickly. It is also a good idea to have subtitles in the video tutorial to make it more accessible. Also, one of the most important things to consider in the video tutorial is the script. The script is an outline of the events and storyline in the

video. In the script, it is decided whether you want to use other things in the video, such as pictures or quiz passages (Heikkilä, et al., 2021).

## 10 DUAL CHANNEL THEORY AND COGNITIVE LOAD

According to Krumm et., al., 2021, There are two theories that affect the way of learning from the educational video. The first theory is that humans can progress written and auditory information at the same time. This theory is called Dual Channel theory. It conflicts with Cognitive load theory, according to cognitive load theory, humans only have limited capacity in each channel. Good educational videos should be high quality, avoiding any mistakes or interruptions. Audio and the visual matter. Background noises, poor sound quality and unnecessary imagines and information, all contributes to the extraneous cognitive load that is created which requires lot of thinking but is not the point of the video

Whilst making the educational video, the authors took these theories into account. There are no separate distractions in the video, the image quality is stable and clear. The sound quality on the video is good.

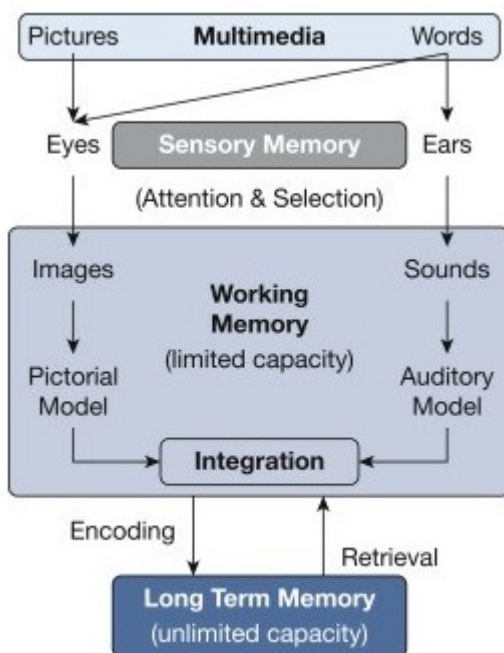


Figure 1 Dual channel theory, MAYER AND THOMPSON ET AL (KRUMM. ET AL., 2022)

### 10.1 Cognitive learning theory

According to Farr & Roth, 2021, Cognitive learning theory means the video has an evidence-based approach and helps describe how external and internal factors affect the

viewer's ability to process the information. The video should be designed to manage cognitive load, maintain attention, facilitate schema construction, and promote engagement.

Cognitive load means how the information is processed through the working memory. There are three types of cognitive load. The first type is the extraneous load. Extraneous load means disruptions from the environment like busy, loud or poorly designed lectures. The second type of cognitive load is the intrinsic load. Intrinsic load is the procession of information. This could be reduced by simplifying created schemas or decreasing the amount of information. Lastly, there is Germane load mean procession required to manage new information and adding it to long-term memory. Germane load can be achieved by minimizing the other two types mentioned above (Farr & Roth, 2021).

## 11 PLANNING THE VIDEO

### 11.1 Video storyline

Resuscitation status: The neonatal is born and is fully grown. The nurse assesses the newborn's condition, and, despite the stimulation, the baby is subdued, does not cry or move the limbs. The baby is unwell. Breathing is insufficient and heart rate below 100<min.

The baby's condition does not improve, a doctor and a resuscitation team are called to the scene. Before they arrive, nurses start CPR. The neonatal is attached to the monitor, ECG and saturation monitoring. The saturation meter is placed in the right hand. The video goes through the attachment of monitors, the resuscitation itself and the use of a NeoPuff in ventilation. Lastly, the condition of the newborn returns to normal.

### 11.2 Video script

The video starts with a text image, including the subject and creators of the video. The video continues with a narration of the situation, using a made-up story mentioned above. Monitors are put on the newborn: a saturation meter in the right hand and 3 ECG flaps on the newborn's chest. The video shows a picture of a monitor in which the condition of the newborn is poor, the following resuscitation actions are started. In the next shot, opening the airways. A ventilation mask is placed on the face of the newborn. The airways are opened with 5 ventilations. The video continues with another 5 ventilations. Oxygen is administered to 100% and CPR is started. During compression, the presser changes. The condition of the newborn improves. The last picture is of a monitor with good values. Lastly, NeoPuff ventilation machine shows how all devices should be checked for functionality. A short text imagines are included in the middle about the resuscitation progress is going to be written.

## 12 VIDEO IMPLEMENTATION

### 12.1 Video shooting

Authors shot a video of neonatal resuscitation on Thursday 15.2.2024 in simulation class D2070 at Seinäjoki University of Applied Sciences. The description was addressed by a few classmates and teachers, who assembled the necessary equipment for the class. The video was shot on the newest iPhone with good quality.

Before the shooting, authors went through together the plan. The pictures and videos were taken in clips. First, authors described putting an ECG, saturation meter and blood pressure monitor on a newborn. Then filmed ventilation. After ventilation, the CPR was filmed CPR. Lastly, pictures were taken of the monitor with different values on it, neo puff-ventilation machine and oxygen regulation.

The video was shot by hand with the latest Apple iPhone 15 smartphone with 4K resolution and 30 FPS.

### 12.2 Editing

The video was edited with DaVinci Resolve editing software, which can be downloaded online. At first, the videos were edited and clipped to fit and the original audio from the videos was removed and replaced with voiceover. The material, such as images, videos and text sections, was arranged according to the script. The text portions of the video were made using Microsoft's PowerPoint program. The PowerPoint template was a template created by Seinäjoki University of Applied Sciences. The voice in the video was made by machine, using copyright free website called TTSMaker.

### 13 ETHICALITY AND RELIABILITY

According to the TENK (Aittasalo, M., 2013, p. 11-12) research ethics principles are divided into four parts. These parts are honesty, respect, reliability and sense of responsibility. Honesty in research ethics means that scientific research of the thesis is planned, implemented and evaluated openly and impartially, without concealing details. Respect in research ethics means respecting colleagues, society and parties involved in scientific activity. Reliability in research ethics means ensuring the quality of sources, using scientific sources in design, writing and analysis. The last part, responsibility means that authors take responsibility for the thesis starting from the idea, thesis making, publication and impact on society after publishing. When authoring the thesis, the authors have taken into account the theory mentioned above and utilized it. The sources of information used were from reliable sources and they were open access. The authors have respected each other and the process of the thesis.

All European Academies, ALLEA, have published The Code of Conduct for Research Integrity (2023, p. 6-9). According to ALLEA, there are good research practices that should be used to insure research ethical principles. These practices are research environments, training supervision and mentoring, research procedures, data practices, collaborations, publication and lastly reviewing and assessment. The first two mentions are about institution activities, the others are more about authoring a thesis.

The research procedure in the thesis means that the researchers plan, implement and document the process they carry out and talk about them openly and honestly. If artificial intelligence or other external services have been used, they must be reported. Security measures in the thesis means that researchers must follow the rules, guidelines and regulations that are part of authoring their thesis. Security measures in the thesis mean identifying and preventing potential risks and harms. Researchers must consider the health, well-being and safety of all participants. Research subjects and other related information must be respected in accordance with ethical principles. Researchers store the collected data appropriately and for a clearly stated period of time. The data used must be open and the sources must be verifiable. The data used in the thesis does not violate copyright, and

researchers have permission to do so. Data must be legal; researchers and research institutes must recognize the data. Thesis authors recognize authorship, thesis design, proper and reliable data collection and its interpretation. The authors undertake to be responsible for the content of the publication and take responsibility. The authors are honest and attentive in communication to society as a whole. Finally, a review and evaluation in which researchers, research institutes and organizations review the thesis and the possible use of artificial intelligence and automated tools openly and justifiably. Check the quality and sources used and whether the instructions and regulations that are part of the thesis preparation have been followed. The authors have followed the instructions of the thesis thoroughly. Artificial intelligence has not been used in the thesis. The authors are aware of the risks of the thesis. The material used in the thesis is legal and transparent. Copyright is not infringed.



## 14 CONCLUSION

The authors agreed that both the design and making of the video were successful. There were small challenges in making the video, with the authors in different places. Shooting the video went smoothly due to good teamwork and planning in advance. The video goes through the latest resuscitation instructions and the sources used were reliable. The authors think that the requirements for the video were met because of the presence of a teacher with proper knowledge and expertise about the topic.

The video shows how important nurses are in helping newborns who need urgent care. Nurses need to quickly assess and start chest compressions and breathing support. To be good at this, they should practice a lot and do training exercises. Furthermore, it is crucial for them to always watch for signs that a newborn is having trouble breathing so they can act fast and help them. Nursing students should focus on developing their clinical skills related to neonatal resuscitation and simulation training.

The authors agree that for the future, there is also need for educational videos including premature-babies and newborns, especially in English for international nursing students.

## 15 BIBLIOGRAPHY

Aittasalo, M. (2023). Hyvä tieteellinen käytäntö ja sen loukkausepäilyjen käsitteleminen

Suomessa. Tutkimuseettisen neuvottelukunnan julkaisuja (1. painos, Vol. 2/2023). Tut-

kimuseettinen neuvottelukunta [https://tenk.fi/sites/default/files/2023-03/HTK-ohje\\_2023.pdf](https://tenk.fi/sites/default/files/2023-03/HTK-ohje_2023.pdf)

Airaksinen T., Kostamo P., Vilkkä H., (2022). Kirjoita itsesi asiantuntijaksi: Opas toiminnalliseen opinnäytetyöhön. Art House

ALLEA. (2023). The European Code of Conduct for Research Integrity – Revised Edition 2023. Berlin. DOI 10.26356/ECOC <https://allea.org/wp-content/uploads/2023/06/European-Code-of-Conduct-Revised-Edition-2023.pdf>

American Heart Association. (n.d). CPR & First Aid Emergency Cardiovascular Care. What is CPR? <https://cpr.heart.org/en/resources/what-is-cpr>

Batton, B., Dempsey, EM, Durrmeyer, X., Rios, DR, Moffet, BS, Kaiser, JR, Watterberg,

KL, & The PROPHET Study Group. (2016). Newborn Critical Care Center (NCCC) Clinical

Guidelines: Treatment of hypotension for extremely low birth weight infants. In Arch Dis

Child Fetal Neonatal Ed (Vol. 3, p. 101) <https://www.mombaby.org/wp-content/uploads/2020/02/Hypotension-Management-in-the-ELBW-Newborn-2018.pdf>

Chang M. (2011). Optimal oxygen saturation in premature infants. Korean journal of pediatrics, 54(9), 359–362. <https://doi.org/10.3345/kjp.2011.54.9.359>  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3250600/>

CPR. (2024). In English Meaning - Cambridge Dictionary. <https://dictionary.cambridge.org/dictionary/english/cpr>

DeMers, D., & Wachs, D. (2023). Physiology mean arterial pressure. StatPearls - NCBI Bookshelf. <https://www.ncbi.nlm.nih.gov/books/NBK538226/>

Elvytys (vastasyntynyt). (2022). Suomalaisen Lääkäriseuran Duodecimin, Suomen Perinatologisen seuran Suomen Neonatologit -alajaoksen ja Suomen Elvytysneuvoston asettama työryhmä. (Referenced 10.9.2023) Accessible in Elvytys (vastasyntynyt) (kaypa-hoito.fi)

Farr, E., & Roth, E. (2021). Virtual Learning in Graduate Medical Education: Applying Learning Theory for Effective Educational Videos. *Journal of graduate medical education*, 13(6), 757–760. <https://doi.org/10.4300/JGME-D-21-00245.1>

Heikkilä, M., Luo, X., Holappa-Girginkaya, J., Kuure, M. & Nummilinna, K. (2021). Video apuna oppimisessa – perehdytysvideon tuottaminen bioanalytiikan opiskelijoille. ePooki. Oulun ammattikorkeakoulun tutkimus- ja kehitystyön julkaisut 31. <http://urn.fi/urn:nbn:fi-fe202103197864>.

Kuokkanen A. (2019). Vaikuttava opetusvideo: tee se näin. Mediamasteri Oy <https://www.mediamasteri.com/blog/kuinka-tehda-vaikuttavia-opetusvideoita>

Krumm, I. R., Miles, M. C., Clay, A., Carlos li, W. G., & Adamson, R. (2022). Making Effective Educational Videos for Clinical Teaching. *Chest*, 161(3), 764–772. <https://doi.org/10.1016/j.chest.2021.09.015>

Luukkainen P, Metsäranta M & Sankilampi U. (2019). Vastasyntyneiden akuuttihoito. *Duodecim*

Mäkinen, M., Saari, L., & Niemi-Murola, L. (2011). Kohti tehokasta elvytyskoulutusta.

Aikakauskirja Duodecim. <https://www.duodecimlehti.fi/duo99383>

National Library of Medicine. (2022). High blood pressure in infants: MedlinePlus Medical Encyclopedia. <https://medlineplus.gov/ency/article/007329.htm>

October, T. W., Dryden-Palmer, K., Copnell, B., & Meert, K. L. (2018). Caring for parents after the death of a child. *Pediatric Critical Care Medicine*, 19(8S), S61-S68.

<https://doi.org/10.1097/pcc.0000000000001466>

Ong, S. Y. (2013). The Ethics of neonatal resuscitation. *Proceedings of Singapore* [The-Ethics-of-Neonatal-Resuscitation.pdf \(researchgate.net\)](#)

*Healthcare*, 22(2), 99–102. <https://doi.org/10.1177/201010581302200203>

Pelttari H., Duodecim Terveyskirjasto. (2023). Veren suolapitoisuuksien muutoksia Veren suolapitoisuuksien muutoksia – Terveyskirjasto [Veren suolapitoisuuksien muutoksia - Terveyskirjasto](#)

Petersson, M. Å., Benzein, E., Massoudi, P., Wåhlin, I., & Persson, C. (2023). Parents' experiences of the significance of interpersonal interactions for becoming parents and a family during neonatal intensive care. *Journal of pediatric nursing*, 69, e1–e6.

<https://doi.org/10.1016/j.pedn.2022.11.021>

Rivera, J. G. M., & Anjum, F. (2023). Hypovolemia. *StatPearls - NCBI Bookshelf*.

<https://www.ncbi.nlm.nih.gov/books/NBK565845/>

Sairaanhoitajat. (2019). Sairaanhoitajan ammatilliset työkalut. PEWS – lasten aikaisen varoituksen pisteytysjärjestelmä. <https://sairaanhoitajat.fi/ammatti-ja-osaaminen/ammattilliset-tyokalut/>

Schwab U, Vitamiinit, (2024). Terveyskirjasto. <https://www.terveyskirjasto.fi/dlk01300/vitamiinit?q=vastasyntynyt#s4>

Storvik-Sydänmaa S., et al. (2019). *Lapsen ja perheen hoitotyö*, Sanoma Pro Oy, 1 Painos

Stolt S., Yliherva A., Parikka V., Haataja L., Lehtonen L. (2017). *Keskosen hoito ja kehitys*, Printon, 1 Painos

Susan Agrawal. (2012). Complex Child; All about Blood Gases [All About Blood Gases - Complex Child](#)

SYNLAB. (n.d) Bilirubiini aiheuttaa ihon kellastumisen (S-Bil )Bilirubiini aiheuttaa ihon kellastumisen (S-Bil) – SYNLAB [Bilirubiini aiheuttaa ihon kellastumisen - SYNLAB Suomi](#)

Terveyskirjasto. (2016). Hypovolemia <https://www.terveyskirjasto.fi/ltt01258/hypovolemia?q=hypovolemia>

Terveyskylä. (n.d.), Matala verensokeri eli hypoglykemia vastasyntyneellä Matala verensokeri eli hypoglykemia vastasyntyneellä | Naistalo | Terveyskylä.fi (terveyskyla.fi)

Terveyskylä. (2020). Vastasyntyneen seulonta <https://www.terveyskyla.fi/naistalo/synnytyksen-j%C3%A4lkeen/vastasyntynyt/vastasyntyneen-seulonta>

Terveyskylä. (n.d.). Vastasyntyneen kellastuminen ja sinivalohoito Vastasyntyneen kellastuminen ja sinivalohoito | Naistalo | Terveyskylä.fi (terveyskyla.fi)

The Royal Children's Hospital Melbourne. 2023. Oxygen saturation SpO2 level targeting in neonates. [https://www.rch.org.au/rchcpq/hospital\\_clinical\\_guideline\\_index/oxygen\\_saturation\\_spo2\\_level\\_targeting\\_premature\\_neonates/](https://www.rch.org.au/rchcpq/hospital_clinical_guideline_index/oxygen_saturation_spo2_level_targeting_premature_neonates/)

Thim, T., Krarup, N. H., Grove, E. L., Rohde, C. V., & Løfgren, B. (2012). Initial assessment and treatment with the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach. *International journal of general medicine*, 5, 117–121.

<https://doi.org/10.2147/IJGM.S28478>

University of Rochester Medical Center, (n.d.) Newborn Measurements. Health Encyclopedia. <https://www.urmc.rochester.edu/encyclopedia/content.aspx?contenttypeid=90&contentid=P02673>

World Health Organization. (2023). Preterm birth. <https://www.who.int/news-room/factsheets/detail/preterm-birth>

Widström, A. M., Brimdyr, K., Svensson, K., Cadwell, K., & Nissen, E. (2019). Skin-to-skin contact the first hour after birth, underlying implications, and clinical practice. *Acta paediatrica* (Oslo, Norway: 1992), 108(7), 1192–1204. <https://doi.org/10.1111/apa.14754>