

Mestrado Integrado em Medicina

Internship in Neonatology: Challenges of the neonatal period

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Relatório de Estágio

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Porto, junho de 2025

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Resumo

A Neonatologia, uma subespecialidade de Pediatria dedicada ao cuidado do recém-nascido, particularmente do prematuro ou do doente crítico, está sub-representada no nosso currículo escolar médico. Motivado por um forte interesse por esta área, realizei um estágio no Serviço de Neonatologia do *Centro Materno-Infantil do Norte*, no âmbito da unidade curricular “Dissertação/Projeto/Estágio” do 6º ano. Esta experiência permitiu-me consolidar conhecimentos teóricos, desenvolver competências práticas e aprofundar a compreensão das vertentes humanas e organizacionais dos cuidados neonatais.

Ao longo de 86 horas, passei por vários ambientes clínicos, incluindo a Unidade de Cuidados Intensivos Neonatais, a Unidade de Cuidados Intermédios, a Unidade de Cuidados Neonatais Normais, bem como as salas de parto. Observei e auxiliei no tratamento de recém-nascidos prematuros, de infeções congénitas e de problemas respiratórios, incluindo procedimentos como a inserção de cateteres venosos centrais e a reanimação neonatal. Estas experiências práticas enriqueceram a minha compreensão dos desafios clínicos, éticos e emocionais exclusivos dos cuidados neonatais. Este relatório também examina a organização e as atividades do Serviço de Neonatologia, destacando características importantes como o sistema de monitorização centralizado utilizado na unidade de cuidados intensivos para aumentar a segurança dos doentes e a eficiência de trabalho.

Para além das tarefas clínicas, o estágio incluiu uma variedade de experiências adicionais que enriqueceram a minha aprendizagem. Participei em reuniões multidisciplinares que abordaram temas como o acompanhamento neonatal, a adoção e a coordenação de cuidados. Assisti também a uma sessão do Comité de Ética do hospital, adquirindo conhecimentos valiosos sobre os princípios éticos e os procedimentos regulamentares que orientam a investigação clínica e as decisões médicas complexas. Além disso, participei em reuniões de serviço, observei iniciativas de melhoria da qualidade e participei em sessões educativas.

De um modo geral, este estágio ofereceu-me uma perspetiva rica e imersiva dos cuidados neonatais, reforçando o meu interesse pela Pediatria e contribuindo significativamente para o meu crescimento académico e pessoal. O tempo passado no Serviço de Neonatologia foi especialmente significativo, uma vez que me permitiu trabalhar em proximidade com uma equipa multidisciplinar dedicada e num ambiente de alta intensidade. Esta experiência ajudou-me a desenvolver competências essenciais em comunicação, adaptabilidade e julgamento clínico, ao mesmo tempo que aprofundou a minha compreensão da profunda responsabilidade e compaixão necessárias para cuidar de recém-nascidos vulneráveis.

Abstract

Neonatology, a subspecialty within Pediatrics dedicated to the care of newborns, particularly preterm or critically ill infants, is underrepresented in our medical school curriculum. Motivated by a strong interest in this area, I undertook a clinical internship at the Neonatology Department of Centro Materno-Infantil do Norte, as part of the sixth-year “Dissertação/Projeto/Estágio” curricular unit. This experience allowed me to consolidate theoretical knowledge, develop practical skills, and gain a deeper understanding of the human and organizational dimensions of neonatal care.

Over the course of 86 hours, I participated in various clinical settings including the Neonatal Intensive Care Unit, Intermediate Care Unit, Normal Neonatal Care Unit, as well as delivery rooms. I observed and assisted in managing premature newborns, congenital infections, and respiratory distress, including procedures such as central venous catheter insertion and neonatal resuscitation. These hands-on experiences enriched my understanding of the clinical, ethical, and emotional challenges unique to neonatal care. This report also examines the organization and operations of the Neonatology Department, highlighting key features like the centralized monitoring system employed in the intensive care unit to enhance patient safety and workflow efficiency.

Beyond clinical duties, the internship included a variety of additional experiences that enriched my learning. I participated in multidisciplinary meetings addressing topics such as neonatal follow-up, adoption, and care coordination. I also attended a hospital Ethics Committee session, gaining valuable insight into the ethical principles and regulatory procedures that guide clinical research and complex medical decisions. Furthermore, I was involved in departmental meetings, observed quality improvement initiatives, and took part in educational sessions.

Overall, this internship offered a rich and immersive perspective on neonatal care, reinforcing my interest in Pediatrics and significantly contributing to both my academic and personal growth. Spending time in the Neonatology Department was especially meaningful, as it allowed me to engage closely with a dedicated multidisciplinary team in a high-intensity environment. This experience helped me develop essential skills in communication, adaptability, and clinical judgment, while deepening my understanding of the profound responsibility and compassion required in caring for vulnerable newborns.

List of Abbreviations

CMIN	Centro Materno Infantil do Norte
CMV	Cytomegalovirus
CPAP	Continuous Positive Airway Pressure
CVC	Central Venous Catheter
GBS	Group B Streptococcus
IUGR	Intrauterine Growth Restriction
NECU	Intermediate Neonatal Care Unit
NICU	Neonatal Intensive Care Unit
NCU	Normal Neonatal Care Unit
ONC	Outpatient Neonatal Consultation
RDS	Respiratory Distress Syndrome
WHO	World Health Organization

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Introduction

Context

Neonatology is a highly specialized and rapidly evolving field within paediatrics that focuses on the care of newborns, particularly those born prematurely, with low birth weight, with congenital anomalies or other life-threatening conditions. The neonatal period, which encompasses the first 28 days of life, represents one of the most vulnerable and critical phases in human development, where even minor physiological imbalances can have severe and lasting consequences. Advances in perinatal medicine, neonatal resuscitation, and intensive care technologies have significantly improved survival rates, but managing neonates continues to pose complex medical, ethical, and emotional challenges. As such, understanding the unique physiological, clinical, and developmental characteristics of neonates is essential for ensuring high-quality, evidence-based care.^{1,2}

As a distinct medical specialty, Neonatology emerged in the mid-20th century, with the first use of the term "neonatology" being attributed to Dr. Alexander Schaffer in the first edition of his textbook *Diseases of the Newborn* published in 1960.³ This period marked a significant leap in paediatric care, with many different advancements, such as the development of mechanical ventilation, which enabled the survival of infants with increasingly lower birth weights. Another milestone was made by Dr. Virginia Apgar in 1953, when she published the concept of the Apgar Score, which is a quick and systematic way to assess the health of newborns immediately after birth. Along with many others, these innovations laid the foundation for modern neonatal care, integrating technological advancements with clinical protocols to improve newborn outcomes.⁴

In Portugal, neonatology has followed a similar trajectory, particularly over the past few decades, during which remarkable improvements were achieved in neonatal and perinatal care. In the 1960s and 1970s, Portugal had relatively high mortality rates, reflecting the limited access to specialized neonatal care and technologies. The creation of a neonatal intensive care unit (NICUs), the development of regional perinatal care systems, and the establishment of specialized neonatal transport services played a pivotal role in laying the foundation for a steady decline in newborn deaths. Between 1980 and 2000, Portugal witnessed a remarkable improvement in outcomes, with the neonatal mortality rate dropping from approximately 15.2 to 3.4 deaths per 1,000 live births, a reduction of around 78%.⁵ This downward trend continued into the following decades, with the neonatal mortality rate reaching 1.8 per 1,000 live births in 2020 and further declining to 1.6 in 2023. These improvements position Portugal among the European countries with the lowest neonatal mortality rates, underscoring the critical importance of sustained investment in neonatal

healthcare, encompassing specialized training, ongoing research, and robust infrastructure, to maintain and further enhance outcomes for newborns.^{6, 7}

One of the key institutions in this process has been *Centro Materno Infantil do Norte (CMIN)*, which is a part of the *Centro Hospitalar Universitário do Porto* and includes *Hospital de Santo António*, one of the more significant hospitals in Portugal. Furthermore, CMIN has become a national reference center for not only neonatal care, but also maternal care, providing a highly specialized assistance for both high-risk pregnancies and critically ill neonates, while also serving as an academic training site for national and international healthcare professionals.⁸

Nevertheless, despite the importance of neonatology, exposure to this field during our medical degree is limited, with the curriculum largely focusing on general paediatrics and leaving critical aspects of neonatal intensive care underexplored. This is particularly relevant given that this field requires not only solid theoretical knowledge, but it also allows for the development of rapid clinical decision-making skills. It further encourages constructive and effective communication with both families and members of a multidisciplinary team, all of which are of vital importance in our profession. For students interested in paediatrics, or with the desire to further improve on these abilities, first-hand exposure to neonatology through an internship provides an invaluable opportunity to bridge theoretical learning with the realities of clinical practice, fostering a deeper understanding of the clinical, scientific, ethical, and human challenges inherent to this subspecialty.

For me, paediatrics has always been a field of deep interest and this passion has only grown stronger throughout my medical training. Among its many branches, neonatology has consistently stood out, both for its scientific complexity and for the unique emotional depth involved in caring for newborns and supporting their families during critical moments. This internship represented not only an opportunity to develop clinical and practical skills, but also a chance to immerse myself in the realities of neonatal care. By engaging directly in the care process, observing experienced professionals, and reflecting critically on each experience, I was able to deepen my understanding of the challenges faced by neonates and their families, while further solidifying my aspiration to pursue a career in paediatrics and potentially specialize in neonatology.

Objectives

This thesis aims to document and critically reflect on the experience acquired during a clinical internship in Neonatology, integrating both theoretical knowledge and personal development. The internship provided an immersive opportunity to observe and participate in the care of newborns, deepening my understanding of the complex interaction between scientific

awareness, clinical skills, ethical reasoning, and emotional resilience required in this highly specialized field.

A central focus of this work is to describe the organizational and professional environment of the Neonatology Department where the internship was conducted. This includes an overview of the care structure, the roles of multidisciplinary teams, including neonatologists, nurses, and other specialists, as well as the clinical protocols and technologies that guide decision-making in neonatal intensive care. Understanding how these elements interact provides valuable insight into the delivery of high-quality, evidence-based neonatal care, while also highlighting the importance of teamwork and coordinated communication.

In parallel, this thesis offers a personal reflection on the motivations behind choosing neonatology as the focus of the internship. With a longstanding interest in paediatrics, I sought to explore the clinical and human dimensions of neonatal care and assess its compatibility with my future career goals. This hands-on experience provided a clearer perspective on the realities of working in a Neonatology Department, including the emotional and ethical challenges unique to this setting. By confronting some of the most demanding aspects of neonatal medicine, such as managing extreme prematurity, I was able to deepen my understanding of the field while developing essential skills in communication, adaptability, and clinical judgment.

Physical infrastructure and human resources

The Neonatology Department at CMIN is a highly specialized entity dedicated to the care of critically ill, preterm, and high-risk newborns. Established in 2014 through the integration of pediatric and maternal healthcare services from Hospital Geral de Santo António, Hospital Maria Pia, and Maternidade Júlio Dinis, it has since evolved into a national reference in maternal and neonatal medicine, playing a central role in the management of complex perinatal cases in the north of Portugal. Today, as the second-largest perinatal unit in the country and the leading center for births in the region, it combines advanced medical technology with a multidisciplinary team to provide high-quality, structured care that is tailored to the specific needs of each newborn.⁸

The Neonatology Department is coordinated by Prof. Doutora Carmen Carvalho and is divided into several specialized sections:

- NICU – A highly specialized unit equipped with 12 intensive care stations, designed for extremely preterm and/or critically ill newborns, offering advanced ventilatory support, neuroprotection strategies, and specialized medical interventions.
- Intermediate Neonatal Care Unit (NECU) – Comprising 12 places, either incubators or open cribs, depending on the newborn's maturity and clinical stability. This unit provides care for newborns who no longer require intensive interventions but still need close

monitoring and specialized care, including non-invasive ventilation, phototherapy, infection management, and metabolic stabilization.

- Normal Neonatal Care Unit (NCU) – Located on the fourth floor, this unit can accommodate up to 34 newborns. It focuses on the care of healthy term infants, with an emphasis on promoting bonding and early discharge. The rooms are primarily individual, allowing for joint accommodation of mother and baby, which is prioritized whenever possible to support breastfeeding and parental involvement.
- Outpatient Neonatal Consultation (ONC) and Follow-up – Located on the ground floor, this area ensures long-term monitoring of preterm infants, newborns at risk of developmental delays, and those requiring specialized follow-up for conditions such as neonatal jaundice, feeding difficulties, or congenital anomalies.

In line with its commitment to family-centered care, the unit also features dedicated parental support spaces, including areas for breast milk extraction, changing rooms, and private rooms for more sensitive or emotionally demanding situations.

Description of Key Activities

Throughout the 86-hour internship, which took place between 12/01/2025 and 14/02/2025, I was able to rotate through several areas of neonatal care, gaining exposure to both routine and critical aspects of the specialty. My schedule included 12-hour shifts with the on-call emergency team, time in the NCU, and days spent in outpatient follow-up consultations. I also had the opportunity to witness childbirths in both the delivery and operating rooms, gaining first hand insight into the immediate care and stabilization of newborns. These rotations allowed me to observe emergency interventions, routine newborn care, and the long-term monitoring of preterm and at-risk infants. In addition to clinical practice, I participated in daily rounds, case discussions, and teaching sessions, which provided valuable exposure to the decision-making processes, ethical challenges, and multidisciplinary coordination that define neonatal care.

Emergency shifts

At CMIN, the Neonatology emergency team consists of two pediatricians/neonatologists who share responsibilities across various critical areas. Their duties include overseeing and monitoring newborns in the NICU and NECU. In addition, they are involved in managing the ONC and provide assistance in the delivery and operating rooms for all complicated births, ensuring comprehensive care for the newborn during high-risk deliveries.

During these emergency shifts, I was able to observe and assist in various critical procedures, particularly in the delivery and operating rooms. The dynamic of a delivery room in CMIN involves close coordination between a fixed team of healthcare professionals, including neonatologists, obstetricians, anesthesiologists, and nurses. This team works together during shifts, which are structured to ensure the best possible care for both the mother and newborn. The delivery area is equipped with 7 delivery rooms and 2 operating theaters, each equipped with neonatal resuscitation tables and necessary equipment.

When a pregnant woman arrives at the hospital, she is first assessed by the obstetric team and is then referred to the delivery area for continuous monitoring of fetal well-being and labor progression. A schematic board is used to track key information about each patient, allowing healthcare professionals from various specialties to quickly understand the stage of labor and anticipate necessary interventions. The information displayed includes the phase of labor, risk factors, and the expected timeline for delivery, helping to determine when the neonatologist's presence is required.

The presence of a neonatologist is mandatory during high-risk deliveries, such as those involving preterm births, fetal anomalies, suspected infections, multiple births (in cases of twins, triplets, or other multiple births), fetal growth restriction, or maternal complications. Additionally, a neonatologist must be present at all cesarean sections, regardless of complications, to ensure the immediate care and stabilization of the newborn. In these high-risk cases, the neonatologist is immediately involved to assist with the newborn's care, including resuscitation if necessary. For deliveries without these complications, the neonatologist's role involves a timely assessment of the newborn, typically within the first hour of life, to ensure normal adaptation and stability.

Before each delivery, the neonatologist must thoroughly review key aspects of the pregnancy and ensure that all necessary tools and equipment for neonatal resuscitation and stabilization are prepared. This preparation is particularly crucial for preterm births or deliveries involving fetal distress. Furthermore, the neonatologist is responsible for documenting the newborn's admission note, which includes the initial assessment and a detailed medical history from the mother. This involves reviewing the "Processo Clínico Eletrônico" and the "Boletim de Saúde da Grávida", which provide essential information about the pregnancy, family history, prenatal screenings, and any tests, such as ultrasounds, blood work, or genetic screenings. This comprehensive review enables the neonatologist to anticipate potential risks and plan for appropriate interventions.

Key components the neonatologist evaluates before each delivery include:

- **Gestational Age:** Understanding the gestational age of the newborn is essential for determining the level of care required. Preterm infants (born before 37 weeks) are at

higher risk for respiratory distress, infections, and other complications, necessitating more intensive monitoring and potential interventions.¹

- **Pregnancy complications:** Information regarding conditions such as maternal infections, diabetes, hypertension, or pre-eclampsia. These conditions can increase the risk of neonatal complications such as low birth weight, prematurity, and congenital infections.^{1,9}
- **Obstetric History:** Any relevant obstetric history must be considered, including previous pregnancies, complications, or surgeries that might influence the delivery or the health of the newborn. For instance, a history of preterm births, intrauterine growth restriction (IUGR), placental abnormalities, or cesarean deliveries can inform the neonatologist about the level of risk and the likelihood of needing interventions during or after birth.^{1,9}
- **Blood group (ABO and Rh) and indirect Coombs test:** Identifying blood group incompatibility between the mother and newborn, such as Rh incompatibility, which can lead to hemolytic disease of the newborn. The Coombs test helps detect antibodies that may cause this condition.⁹
- **Adequate prenatal care:** The neonatologist verifies that the pregnant woman has had at least six prenatal consultations. The provider of care (whether a public health center or a private practice or hospital) is important in assessing the continuity and quality of the pregnancy's monitoring.¹
- **Immunological status (serologies):** Includes mandatory testing for syphilis, toxoplasmosis, rubella, hepatitis B, and HIV. These screenings help assess potential risks to the fetus and guide preventive measures.^{1, 9, 10} If the mother lacks these serological results in the third trimester, they are collected upon admission to the labor ward.
- **Ultrasounds (at least one per trimester):** These are essential for monitoring fetal growth, detecting anomalies, and assessing fetal well-being. If an echocardiogram is performed, it is also reviewed for congenital heart defects.¹
- **Group B Streptococcus (GBS) screening:** Performed between 35-37 weeks gestation, GBS can cause severe infections in newborns. A positive result, history of a previous GBS-infected newborn or if the status of infection is unknown, appropriate antibiotic prophylaxis during labor is required to reduce transmission risk (Penicillin G 4/4 hours).^{1,11}
- **Infectious risk assessment:** The neonatologist evaluates the timing of membrane rupture (spontaneous or artificial) and the duration of the antepartum period, as prolonged ruptured membranes can increase the risk of infection (>18 hours).¹²
- **Labor characteristics:** Whether labor is spontaneous or induced can provide clues regarding potential complications, such as the need for monitoring or immediate intervention during delivery.

- **Fetal Monitoring:** Continuous fetal monitoring is crucial for detecting any signs of fetal distress. Monitoring involves tracking fetal heart rate and uterine contractions to identify abnormalities or complications. Abnormal fetal heart rate patterns may signal hypoxia or other complications, requiring immediate attention and, potentially, neonatal resuscitation.¹³

Once the newborn has been delivered, the neonatologist plays a critical role in the immediate postnatal period. The first assessment takes place at the neonatal resuscitation table, where key parameters such as breathing, circulation, and Apgar scores are evaluated. This initial evaluation ensures a smooth transition to extrauterine life. If complications arise, such as respiratory distress or signs of infection, the neonatologist leads the intervention, performing resuscitation or initiating treatment as needed.

Key Components of Immediate Post-Delivery Evaluation:

1. **Type of Birth:** The type of delivery, whether spontaneous vaginal, instrumental (e.g., forceps or vacuum-assisted), or cesarean section is documented, along with the gestational age at birth. This information provides critical context for the newborn's condition and guides postnatal care. If any instruments were required during delivery, their use is noted, as they may be associated with specific risks, such as trauma or the need for more immediate intervention.¹²
2. **Apgar Scoring (Table I):** The neonatologist will perform an Apgar score assessment at 1 minute, 5 minutes, and at 10 minutes of life. The Apgar score evaluates the newborn's heart rate, respiratory effort, muscle tone, reflex irritability, and skin color. This helps determine whether the newborn requires immediate intervention and guides the care team in managing their stabilization process. If resuscitation is needed, a detailed description of the procedures is recorded, which includes:
 - Aspiration of secretions, if necessary;
 - Ventilation assistance;
 - Chest compressions, if the heart rate is below 60 beats per minute;
 - Administration of medications, such as epinephrine, if needed to stabilize the newborn's condition.
3. **Physical Examination:** A thorough physical examination of the newborn is performed. The neonatologist carefully looks for alarm signs, such as:
 - Respiratory distress, including difficulty breathing, cyanosis, or labored breathing;
 - Heart rate irregularities, such as a heart rate below 100 bpm or above 160 bpm;

- Capillary refill time (a delay of more than 3 seconds may indicate circulatory issues);
 - Response to stimuli: Ensuring that the newborn reacts appropriately to light, sound, and touch;
 - Congenital anomalies, such as neural tube defects, coarctation of the aorta (absence of palpation of femoral pulses), imperforate anus, choanal atresia (absence of permeability of the tracheal aspiration tube), cryptorchidism, or other visible malformations;
 - Umbilical cord inspection: Confirming the presence of two arteries and one vein, which is the normal anatomical pattern;
 - Assessment of the hips for signs of hip dysplasia using the Ortolani and Barlow maneuvers, particularly in cases where the newborn is breech or has other risk factors;
 - Traumatic birth injuries: Assessing for any birth-related trauma, such as brachial plexus injury or fractures.
4. **Somatometrics:** Weight, length, and head circumference are measured, as these parameters help determine the newborn's overall size and growth. These parameters give an indication of whether the newborn is within the expected growth range for their gestational age. These measurements are compared against standard growth curves, such as:
- Fenton curves for preterm newborns.¹⁴
 - World Health Organization curves for full-term newborns.¹⁵
 - Some organizations might prefer to use only the Fenton curves for both preterm and full-term newborns, which is the case at CMIN.
5. **Neonatal Admission:** Based on the physical exam and Apgar score, the neonatologist decides where the newborn will be admitted:
- NCU for stable, term infants who are ready to be with the mother.
 - NICU or NECU for high-risk infants who require intensive monitoring or interventions.
6. **Documentation and Medication:** Once the newborn has been stabilized and admitted, the neonatologist completes the “Boletim de Saúde Infantil e Juvenil”, which includes detailed documentation in the “Processo Clínico Eletrônico”. This includes missing basic admission data, birth details, and the clinical evaluation of the newborn. The neonatologist then prescribes Vitamin K via intramuscular injection to prevent hemorrhagic disease of the

newborn, and Oxytetra ointment for neonatal conjunctivitis.¹ These medications are administered by nursing staff once the newborn is stabilized.

As previously mentioned, this post-delivery evaluation is crucial to ensure that the newborn is properly assessed, stabilized, and monitored for any signs of distress or abnormality. The neonatologist's role is essential in documenting these initial evaluations and ensuring the newborn receives the appropriate care based on their condition and gestational age. During my time in the delivery room, I had the opportunity to take on many of the responsibilities typically carried out by the neonatologist, always under appropriate supervision. I participated in multiple births, where I assessed the newborn's Apgar score, measured weight, length, and head circumference, and performed complete physical examinations after the initial adaptation period. In addition to the clinical aspects, I was also involved in the documentation process, including drafting the newborn's admission note, filling out the "Boletim de Saúde Infantil e Juvenil" and conducting maternal history interviews, which I was trusted to carry out independently in several cases.

One particularly memorable case during my emergency shifts involved a full-term newborn from a healthy pregnancy, with no documented prenatal complications. Labor, however, became prolonged and difficult during the expulsive phase. Initially, the obstetric team attempted vacuum-assisted delivery, but this method was unsuccessful. An episiotomy was then performed, and forceps were ultimately required to complete the delivery. Due to the extended duration of labor and the mechanical assistance needed, the newborn was born in poor condition, with an Apgar score of 3, scoring 2 for Heart rate and 1 for Appearance

Immediately after birth, two pediatricians worked together at the resuscitation table to stabilize the newborn. The baby was unresponsive and hypotonic, requiring prompt stimulation and positive pressure ventilation via T-piece resuscitator, which allows for more controlled delivery of pressure (both Peak Inspiratory Pressure and Positive End-Expiratory Pressure) and reduces the risk of barotrauma. These interventions gradually led to improved tone and respiratory effort. The neonatologists continuously reassessed the newborn, following neonatal resuscitation guidelines, and closely monitored oxygen saturation, heart rate, and perfusion. Over the following minutes, the newborn's condition improved steadily, and further intensive measures were not required. The successful outcome of this case emphasized the critical importance of teamwork, rapid decision-making, and strict adherence to neonatal resuscitation protocols.^{16, 17}

These experiences deepened my understanding of normal neonatal adaptation and the need to be prepared for situations where that adaptation may be compromised. Despite careful monitoring, some newborns may face challenges such as respiratory distress, prematurity,

hypoglycemia, neonatal infections, or congenital anomalies, requiring rapid intervention. In these cases, the neonatologist plays a crucial role in ensuring swift action based on clinical guidelines. While many newborns transition smoothly, others may require specialized care and admission to the NICU or NECU. My time in these settings enhanced my understanding of managing such cases, from stabilization to ongoing treatment.

Neonatal Intensive Care Unit

The NICU is designed to support critically ill newborns through a combination of advanced clinical care and specialized infrastructure. A key feature of this environment is the centralized monitoring system, which enables real-time observation of each infant's vital signs from a central station, allowing for swift intervention when necessary. Additionally, acoustic surveillance systems, commonly referred to as the "orelhão", are installed throughout the unit to amplify alarm sounds, ensuring that clinical staff are immediately alerted to any changes in a newborn's condition. These technological tools are essential in maintaining high standards of vigilance and safety.¹⁸

Newborns requiring intensive care often present with conditions that compromise their ability to adapt to extrauterine life. The most common reasons for NICU admission include prematurity, respiratory distress, infections, and congenital anomalies. Each of these conditions demands prompt evaluation and individualized management to optimize outcomes.¹⁹

1. **Prematurity:** Premature infants (<37 weeks), particularly those born before 32 weeks of gestation, often require NICU care due to their underdeveloped organs, especially the lungs, and difficulty in regulating body temperature and blood glucose levels. Management in the NICU focuses on providing respiratory support. Additionally, premature infants are closely monitored for signs of infection, temperature regulation, and adequate nutrition.^{1, 19}
2. **Respiratory Distress Syndrome (RDS):** This condition, commonly seen in preterm infants, occurs when the newborn's lungs lack sufficient surfactant, a substance that helps the lungs stay inflated. Management includes the administration of surfactant and respiratory support through Continuous Positive Airway Pressure (CPAP) or mechanical ventilation. Newborns with RDS are also monitored for potential complications such as pneumothorax, which may require further interventions.²⁰
3. **Neonatal Infections:** Infections, such as pneumonia, or congenital infections (e.g., Cytomegalovirus (CMV), toxoplasmosis, or rubella) are common in the NICU. Newborns with signs of infection require prompt administration of antibiotics, antivirals, or antifungals, depending on the type of infection. Blood cultures and other diagnostic tests

are performed to identify the pathogens, and treatment is tailored based on the results. Monitoring for sepsis is crucial, as it can progress rapidly in newborns.^{1, 21}

4. **Congenital Anomalies:** Some newborns are born with congenital conditions that require surgical interventions or specialized care. These may include structural anomalies such as congenital heart defects, gastrointestinal malformations, or neural tube defects. These newborns are managed with immediate stabilization and may require surgery or other interventions in the neonatal period.^{1, 22}
5. **Hypoglycemia:** Low blood glucose levels are commonly observed in newborns who are premature, growth-restricted, or born to diabetic mothers. While many cases can be managed with early and frequent enteral feeding, more severe or persistent hypoglycemia may require intravenous glucose administration. In such cases, particularly when prolonged parenteral nutrition is anticipated or higher glucose concentrations are needed, a central venous catheter (CVC) may be inserted to ensure safe and effective delivery.²³

CVCs are critical tools in neonatal care, particularly for infants requiring long-term intravenous access. They provide a reliable route for administering medications, fluids, parenteral nutrition, and blood products, especially in critically ill or preterm newborns. There are several types of CVCs used in neonatology, including peripherally inserted central catheters, umbilical venous catheters, and tunneled central venous catheters. The choice of catheter depends on the infant's clinical condition, gestational age, and the anticipated duration of therapy. CVCs are often necessary when peripheral veins are not accessible, or when prolonged access for intravenous medication or nutrition is required. They are particularly essential for preterm infants or those with low birth weight, who are at higher risk for complications such as hypoglycemia. While essential, CVCs are associated with risks such as infection and thrombosis, necessitating strict protocols for insertion, care, and monitoring to ensure their safe and effective use. The decision to place a CVC is carefully considered, weighing the benefits against the risks, and reflects the complexity of managing metabolic instability in the NICU.²⁴

During my time in the NICU, I had the opportunity to observe and assist in managing cases involving premature infants and congenital infections, including the insertion of a CVC. One notable case involved preterm twins born at 28 weeks' gestation. Both infants required immediate respiratory support, with one infant receiving CPAP and the other being intubated due to more severe respiratory distress. Both were closely monitored for temperature regulation and received intravenous nutrition to support their growth and development. The neonatology team promptly administered surfactant therapy to improve lung function and adjusted the respiratory settings as needed. Over the following days, the twins' conditions were carefully monitored, and they

received specialized care tailored to their individual needs, including close monitoring of their vital signs, nutrition, and ongoing respiratory support.

Another case involved a newborn diagnosed with a congenital CMV infection. The baby was admitted to the NICU for close monitoring and antiviral treatment. CMV was suspected due to abnormal ultrasound findings and confirmed by PCR testing. The multidisciplinary team initiated antiviral therapy and closely monitored the newborn for any signs of organ involvement, including neurological complications and sensorineural hearing loss.

Intermediate Care Unit

Following the more critical and intensive cases managed in the NICU, I also had the opportunity to spend time in the NECU. This unit plays a vital role in the continuum of neonatal care, focusing on ongoing monitoring, which also includes the acoustic surveillance system “orelhão”, and support for infants who no longer require intensive interventions, but are not yet ready for discharge. The clinical priorities here shift from acute stabilization to the gradual progression of feeding, respiratory independence, and overall growth and development.^{1,9}

The NECU typically accommodates a diverse range of patients, including premature infants gaining weight and learning to feed orally, as well as term infants recovering from early complications such as transient respiratory distress, jaundice requiring phototherapy, or suspected infections undergoing antibiotic therapy.^{1,3} It also serves as a transitional space for neonates with congenital anomalies or those recovering from surgical procedures, providing close monitoring and specialized care adjusted to their evolving needs.²⁵ A particularly relevant aspect of care in this unit and the whole Department is the autonomy of clinicians in performing bedside ultrasounds, such as functional echocardiography or cerebral, pulmonary and renal-pelvic ultrasounds, available around the clock. These point-of-care imaging tools are fundamental for a timely diagnosis and therapeutic decision-making.

An essential component of neonatal care, both in the NICU and the NECU, is the active involvement of the newborn’s family. Even in more critical settings, such as the NICU, parents are encouraged to be present, participate in skin-to-skin contact (kangaroo care) when possible, and engage with the care team. This involvement not only promotes bonding and emotional support for both the baby and the family but also contributes to better outcomes. In the NECU, where babies are typically more stable, families are often more hands-on when feeding, changing, and comforting their infants as they prepare for discharge.^{1,25} Throughout my time in both units, I observed how empowering parents with knowledge and confidence in caring for their baby made a profound difference in the transition from hospital to home, particularly for those whose infants required prolonged hospitalization or had complex needs.

During my rotation in this setting, I was actively involved in the daily assessment and follow-up of several newborns. I assisted in evaluating feeding tolerance, weight progression, respiratory parameters, and readiness for weaning from supplemental oxygen. Additionally, I participated in discussions regarding discharge planning and the transition to rooming-in with parents. This experience gave me a valuable perspective on the importance of continuity of care, reinforcing how attentive monitoring and individualized care plans can make a meaningful difference in each newborn's recovery and outcome.

Normal Neonatal Care Unit

Following more complex or high-risk scenarios, I also had the opportunity to work in the NCU, where care is centered around healthy term newborns and their families. Although these infants are generally stable and require no specialized interventions, the early hours and days of life remain a critical window for observation, guidance, and screening. The focus in this setting is not only on ensuring the newborn's smooth physiological transition, but also on equipping parents with the confidence and tools needed to care for their child.^{1, 9, 25}

In the NCU, a strict infectious risk protocol is followed to protect newborns from potential hospital-acquired infections. Despite being healthy term neonates, they remain vulnerable due to their developing immune systems. Key measures include hand hygiene, sterilization of medical equipment, antibiotic stewardship, early detection of infection and isolation of newborns if any signs of infection are found.

During my time in this unit, I was involved in the daily follow-up of newborns, with particular attention to physical examination findings and overall progression. Key aspects included the evaluation of skin color and perfusion, respiratory effort, cardiac auscultation, femoral pulses, abdominal palpation, and neurological tone and reflexes. Special focus was placed on the eyes (red reflex), genitalia, hips (Barlow and Ortolani maneuvers), umbilical stump, and identification of any dysmorphic features or congenital anomalies that may have gone unnoticed initially.^{1, 26}

In the first 24 to 48 hours, it is essential to monitor for milestones such as passage of meconium and urine, effective feeding, weight stability, and jaundice. I learned to assess feeding techniques and latch quality, support mothers experiencing difficulties, and recognize early signs of dehydration or insufficient intake. Screening procedures, including the metabolic heel prick test ("Teste do Pezinho"), pulse oximetry for critical congenital heart defects, hearing test ("Rastreio Auditivo Neonatal Universal"), and red eye reflex exam, were all coordinated before discharge, as well as the Hepatitis B vaccine.^{1, 10, 26}

Beyond the clinical aspects, much of the work involved addressing the natural concerns of new parents. I frequently participated in conversations about feeding frequency, interpreting

normal newborn behaviors (such as hiccups, sneezing, or irregular breathing), umbilical care, skin rashes, and sleeping patterns. These moments were not only valuable learning experiences, but also deeply rewarding, as they underscored the importance of communication, empathy, and reassurance in pediatric care.

In healthy term infants with no complications, discharge typically occurs after 48 hours, once the newborn has demonstrated clinical stability, effective feeding, and adequate weight progression. Before leaving the hospital, several conditions must be met: routine screenings must be completed, the baby should have passed urine and stool, and a thorough physical examination should confirm normal adaptation. Parents also receive counseling on key areas of neonatal care, including feeding techniques, safe sleep practices and general newborn care.^{1, 2, 9} This holistic approach ensures that families are well-prepared to continue care at home and can recognize early warning signs should complications arise.

Outpatient Consultations and Follow-up

After discharge, neonatal care continues through outpatient consultations and structured follow-up, ensuring that newborns, particularly those with a history of prematurity, complications, or risk factors, receive appropriate support in the weeks and months that follow.¹ During my rotation, I was able to observe and participate in several of these consultations, gaining insight into the long-term management of neonatal health and development.

These visits often include the routine postnatal consultation and the first-week follow-up, which is frequently conducted by the nursing team. These early appointments are essential for assessing weight evolution, feeding adequacy, jaundice, and early signs of potential complications. In situations where concerns arise, the nursing team refers the case for a more detailed medical evaluation. I had the opportunity to observe several of these cases, including infants with poor weight progression, jaundice and suspected hip clicks during physical examination.^{1, 2, 9} These findings required prompt pediatric follow-up and, in some cases, further diagnostic testing or specialist referral.

Beyond the more routine cases, I also participated in follow-up consultations for high-risk infants, who had previously been admitted to the NICU or NICU. These visits focused on monitoring growth parameters, addressing feeding challenges, and evaluating neurodevelopmental progress. A significant part of these consultations involved detailed neurological assessments, observing posture, tone, primitive reflexes (such as Moro, grasp, and tonic neck reflexes), and spontaneous movements, to detect any early signs of delay or abnormality. Special attention was given to assessing early psychomotor development milestones, for instance visual tracking, social smiling, and head control by one month of age, as well as the

beginning of vocalizations and increased motor activity by two months. These follow-ups were essential for identifying warning signs such as persistent hypotonia or hypertonia, asymmetrical movements, lack of eye contact, or feeding and weight gain difficulties. Early detection of such signs ensured timely referral to developmental support services, physiotherapy, or further diagnostic evaluation when needed.⁹

In every setting, these consultations revealed the importance of continuity of care, not just for identifying medical concerns early, but also for building a relationship of trust with families. Many parents came with questions or concerns related to their infant's behavior, feeding patterns, or physical signs, such as a Mongolian Spot, which is completely benign. I observed how neonatologists and nurses addressed these with both clinical precision and empathy, offering reassurance while also educating families about what to expect. These moments underscored for me how essential outpatient care is, not only for monitoring neonatal health, but also for empowering parents during a period often marked by uncertainty.¹

Other Activities

In addition to clinical work, I was actively involved in several educational and multidisciplinary activities that enriched my understanding of neonatal care from both a practical and organizational perspective. Each morning, I attended the Neonatology Department's daily handover meetings, where the team reviewed and discussed the clinical progress of all infants admitted to the NICU and NECU. These sessions, held Monday through Friday at 8:30 a.m., involved thorough case discussions, including updates on diagnostic results, treatment plans, procedures under consideration, and discharge planning. Attention was also given to bed availability, new admissions, and occasionally, newborns in the NCU who presented specific concerns or relevant risk factors. Pregnancies with maternal or fetal complications were likewise reviewed, especially when preterm delivery was a possibility. These discussions ensured that the pediatric and obstetric teams could coordinate and plan ahead, particularly for high-risk births.

Later in the day, around 12:30 p.m., I also took part in the midday briefing, which focused on the transition of care between teams. This meeting allowed the on-call staff to receive a comprehensive overview of each patient's status and the care plan for the upcoming shift. These structured discussions were instrumental in illustrating how collaborative and anticipatory thinking plays a key role in neonatal medicine.

Outside of the clinical routine, I attended several educational sessions that broadened my understanding of key neonatal topics. One such session focused on congenital CMV infection, addressing updated screening strategies, diagnostic approaches, and available treatments. The presentation included recent developments in the field and sparked a lively and enriching debate

among the attending physicians, offering valuable insights into differing clinical perspectives and decision-making processes. Another presentation was dedicated to neonatal nutrition, emphasizing the specific needs of preterm infants and the careful planning required to support their growth and development.

In addition to these educational moments, I also participated in a multidisciplinary meeting held in the CMIN auditorium, which brought together professionals from pediatrics, obstetrics, and social services. The session focused specifically on adoption cases, exploring the medical, legal, and psychosocial aspects involved. It included open discussions on how to proceed in specific, real-life scenarios, using case examples to highlight the complexities of each situation. This experience reinforced the importance of interprofessional collaboration in delivering thoughtful and comprehensive perinatal care.

I was also privileged to observe a session of the hospital's Ethics Committee. Although the cases discussed extended beyond the field of neonatology, this experience was highly enriching, offering a broader understanding of how ethical deliberation supports clinical decision-making across specialties. The meeting addressed complex issues such as informed consent in vulnerable populations, the ethical considerations surrounding off-label medication use, and the evaluation of clinical research proposals. It was interesting to see the multidisciplinary dialogue, regulatory frameworks and structured processes that ensure ethical integrity in clinical research.

Last but not least, I benefited from a dedicated educational session with Dr. Miguel Fonte, who gave an insightful presentation on neonatal emergencies. This included a detailed review of neonatal resuscitation algorithms and a practical demonstration of the resuscitation equipment available in the unit.^{16, 17} His clear and structured approach was particularly helpful in reinforcing key priorities during critical situations and improving my familiarity with the tools used in real-life scenarios.

Discussion

This internship provided me with a wide-ranging and immersive experience in neonatology. By rotating through different settings, such as the delivery room, the normal neonatal care unit, and outpatient follow-up consultations, I was able to gain a broader understanding of neonatal care across different phases. Each environment presented unique learning opportunities, from the urgency and coordination required during deliveries to the careful, longitudinal monitoring of preterm infants or those at risk of developmental complications. These varied experiences helped me understand not only the clinical aspects of neonatology but also the importance of adaptability, communication, and structured workflows in this field.

One of the most enriching aspects of the internship was the opportunity to apply theoretical knowledge in real-life clinical situations. From practicing neonatal assessments to assisting in the immediate postnatal adaptation of newborns, I was able to consolidate and deepen my understanding of the fundamental principles of neonatal care. Being actively involved in tasks such as initial evaluations, observing feeding patterns, interpreting vital signs, and understanding decision-making around neonatal resuscitation allowed me to gradually build confidence and clinical reasoning. These hands-on experiences complimented my academic training and helped bridge the gap between theory and practice. I am especially grateful for this opportunity, as I recognize that not all medical students have access to such close and continuous contact with neonates during their studies.

Another key takeaway from this internship was the realization of how essential neonatal care is within the broader field of pediatrics and perinatal medicine. The first days of life are marked by rapid physiological transitions and a high level of vulnerability, making it crucial to have well-coordinated, timely, and skilled interventions. I came to deeply appreciate the role of multidisciplinary teamwork in ensuring the best outcomes for newborns, whether through collaborative decision-making in daily clinical rounds, joint planning with obstetric teams before high-risk deliveries, or the support provided by nursing staff during outpatient follow-ups. Each professional's contribution, from nurses to neonatologists, was not only respected but actively integrated into the care process, reinforcing the value of communication, shared responsibility, and mutual trust in this high-stakes environment.

On the other hand, while the Neonatology Service generally functions with remarkable efficiency and coordination, one area that stood out as potentially improvable was the documentation process. Currently, the admission details of newborns must be recorded both on paper and digitally in the clinical system. Although this double entry ensures completeness, it can be time-consuming, especially during high-pressure moments in the emergency setting. Optimizing this workflow could help reduce administrative load and allow healthcare professionals to dedicate more of their time and attention to direct patient care.

Another potential area for improvement involves the promotion of immediate skin-to-skin contact following cesarean deliveries. While this practice is well integrated into standard care after vaginal births, I did not observe it being implemented in cesarean sections during my internship at CMIN. Skin-to-skin contact is known to play a critical role in neonatal adaptation, thermoregulation, and the initiation of breastfeeding. Recognizing the challenges specific to surgical births, such as limited maternal mobility and sterility concerns, some hospitals have begun exploring innovative solutions. For instance, a midwife in Scotland developed "Cozy Cuddle Scrubs," which feature a built-in kangaroo-style pouch worn by the birth partner, allowing them to

provide immediate skin-to-skin contact with the newborn while the mother is in recovery.²⁷ This approach ensures that the physiological and emotional benefits of early contact are not lost due to the delivery method and could be considered a valuable enhancement to perinatal care practices at CMIN.

Nevertheless, I truly felt that my contribution to the Neonatology Department mattered, particularly when I was entrusted with tasks such as helping document the initial admission records of newborns, which helped alleviate the workload of the on-call pediatricians. I felt welcomed, supported, and integrated into the team.

Conclusion

This internship was an incredible opportunity and a truly enriching experience, one that I will carry with me throughout my future career. I am deeply grateful for the chance to immerse myself in the field of neonatology, a subspecialty that has always fascinated me, and to do so within such a welcoming and high-level clinical environment. The moments I witnessed, the knowledge I gained, and the connections I made have all contributed to making this stage one of the most memorable parts of my medical education so far.

Academically, this internship served as a valuable complement to the theoretical training I received during my studies. It offered a unique chance to reinforce and expand on what I had learned in the classroom by allowing me to observe and participate in real clinical scenarios. It was through repeated exposure and hands-on experiences that I was able to solidify concepts, understand their practical implications, and begin to develop my own clinical reasoning.

It also became increasingly clear to me how essential neonatology is, not just in the immediate stabilization and care of newborns, but in laying the foundations for their future health. The intricate and coordinated work between pediatricians, nurses, obstetricians, and other healthcare professionals demonstrated the true value of multidisciplinary teamwork. Every decision, every intervention was a product of collaboration, mutual respect, and shared expertise. Observing this in action emphasized how vital communication and teamwork are in delivering the best outcomes for these vulnerable patients and their families.

What made this experience especially meaningful was the atmosphere within the team. I felt truly integrated into the service, not just as an observer, but as a valued participant. The professionals I worked with consistently took the time to explain, involve me in clinical reasoning, and encouraged me to contribute where appropriate. I never felt out of place, even in the more fast-paced or high-pressure situations. That sense of support and inclusion created the ideal environment for growth, allowing me to feel both challenged and safe as I learned.

On a personal level, this internship marked a period of significant growth. It pushed me to grow in confidence, sharpen my clinical instincts, and approach each situation with greater empathy and thoughtfulness. Being present in such a delicate and specialized area of medicine allowed me to discover new strengths and deepen my passion for neonatal care. I now feel even more drawn to a career in pediatrics, with a special place in my heart for neonatology. The lessons I've learned and the inspiration I've gained here will undoubtedly stay with me and continue to guide my path forward.

Appendix

Tables

Table I: Apgar score, adapted from Apgar, V. "A proposal for a new method of evaluation of the newborn infant", 1953 (3)

Indicator	Score		
	0	1	2
Appearance (Skin colour)	Blue (cyanotic) or pale	Pink trunk, blue extremities	Pink body and extremities
Pulse (Heart rate)	Absent	<100 bpm	>100 bpm
Grimace (Reflex irritability)	Absent	Grimace	Cry or active withdrawal
Activity (Tone)	No movement, limp body	Some flexion	Active motion, flexion
Respiration	Absent	Weak cry, irregular/slow/weak breathing or gasping	Regular breathing, strong cry

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