Annual report 2014

Neonatal Care

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ABBREVIATIONS:

BPD Bronchopulmonary dysplasia - a chronic lung disease of preterm infants
NEC Necrotising enterocolitis
IVH Cerebral intraventricular hemorrhage
ROP Retinopathy of prematurity
RDS Respiratory distress syndrome
VLBW Very low birth weight infant (under 1500 g)
ELBW Extremely low birth weight infant (under 1000 g)

Cover image: HUS photography
UNIT PRESENTATION

The neonatal units handle the care of sick neonates and preterm infants born at Helsinki and Uusimaa Hospital District (HUS). The unit also provides care for neonates in the HUS catchment area who require university hospital care due their prematurity or disease. Full-term neonates requiring surgical care are primarily treated at pediatric surgery wards.

At Helsinki University Hospital (HUH), neonatal care is provided at the Children's Hospital K7 Neonatal Intensive Care Unit, Women's Hospital N7 Neonatal Observation Ward, Jorvi Hospital L2 Neonatal Ward and Kätilöopisto Maternity Hospital LV37 Neonatal Ward. In addition, care for healthy neonates is provided in the Women's Hospital, Jorvi Hospital and Kätilöopisto Maternity Hospital maternity wards. Neonatal Care Unit physicians also assess all children born in these hospitals before their discharge. Outpatient care is provided at the Women's Hospital K7AVO, Kätilöopisto Maternity Hospital LV37AVO and Jorvi Hospital pediatric outpatient clinic. In 2014, there were 14,294 births at HUH and 17,975 at HUS. There were 18,234 children born at HUS, which accounts for a third of all children born in Finland in 2014.

The K7 Neonatal Intensive Care Unit provides care for the most acute and severe cases of neonatal disease and prematurity, such as all neonates born earlier than the 30th week of gestation, children requiring mechanical ventilation, therapeutic hypothermia and infants suffering from difficult infections. The N7 Neonatal Observation Ward and LV37 and L2 Neonatal Wards provide care for less acute cases of prematurity and other neonates requiring hospital care as well as convalescent care for patients coming from intensive care.

The Neonatal Unit has a staff consisting of 14 neonatologists, a specialist in pediatrics, 1-2 residents in neonatology, physicians specializing in pediatrics, over 200 nurses and other specialists, such as rehabilitation counselors, hospital pharmacists, ward secretaries, social workers, physiotherapists, hospital chaplains, supply technicians and ward domestics. All unit specialists are Medical Doctors and three are docents in neonatology. In 2014, there were 4,051 in-patient days in the Neonatal Intensive Care Unit, 12,056 in the neonatal wards and 4,934 visits in outpatient clinics.

NEONATAL INTENSIVE CARE

The Neonatal Intensive Care Unit K7 provides intensive care for preterm and full-term neonates born in the Hospital District of Helsinki and Uusimaa and its catchment area. The most common reasons for admittance to the unit are preterm birth, infections, delivery complications, birth defects, neonatal neurological disorders and problems caused by a disease in the mother. The unit has a neonatology staff on call 24 hours a day and is prepared to receive neonates requiring intensive care.

There are 15 intensive care beds in the unit. In 2014, the unit treated 437 neonates, 128 of which were under 1500 g (very low birth weight) and 42 under 1000 g (extremely low birth weight) at birth. Approximately two-thirds of the neonates treated in the unit are nearly full-term. The average length of stay in 2014 was 9.3 days, but the smallest preterm babies may need to stay in the unit for several months. The number of in-patient days totaled 4,051 and the unit case load per hospital bed was 76 %.

Neonatal intensive care is being developed continuously, with excellent treatment results in international comparisons. In addition to skilled personnel, neonatal intensive care requires advanced machinery, including ventilators, incubators, monitoring equipment and infusion (IV) machines. A large percentage of the examinations and surgical procedures required by neonates can be performed at the unit.

Encouraging early bonding with the baby and supporting parenting are essential parts of neonatal intensive care. Unit personnel provide parents with support and guidance in participating in the care of their baby right from the start. The unit organizes parent and father groups, in which parents are given information on special-needs babies as well as peer support.
NEONATAL WARDS

N7 NEONATAL OBSERVATION WARD

Because HUS has only one Neonatal Intensive Care Unit, centralizing high-risk pregnancies and deliveries into the Women’s Hospital is essential for best results. Thus children born in the Women’s Hospital have a greater, more acute need for monitoring than children born in other HUS hospitals.

The N7 Neonatal Observation Ward is located directly adjacent to the delivery rooms and OR’s in Women’s Hospital. The ward provides care for neonates requiring postnatal treatment and observation, due to preterm birth, respiratory difficulty, infections or hypoglycemia. The ward provides acute care and short-term intensive observation for neonates. Resuscitation and ventilatory support for neonates requiring intensive care is also administered in the N7 emergency room. After initial assessment and acute treatment, these children are transferred to the Children’s Hospital K7 Neonatal Intensive Care Unit for follow-up care. If it is already known or discovered at birth that the child has, for example, a disease that requires surgical treatment, he or she can also be transferred to the Children’s Hospital K9 Intensive Care Unit, K6 Neonatal and Infant Surgery Ward or the K4 Pediatric Cardiac Ward.

The unit physicians work in close cooperation with obstetricians. The acute treatment of neonates with severe diseases is planned in cooperation with pediatric surgeons, pediatric cardiologists, anesthesiologists, radiologists and clinical geneticists. The ward nurses are trained in neonatal resuscitation and the treatment of problems arising during the early neonatal phase. If necessary, the nurses will assist labor ward midwives in caring for infants.

The N7 Ward has five patient beds and provided treatment for 980 children in 2014. There were 1,081 net in-patient days and an average length of stay was 1.1 days. Children were transferred from N7 to the Women’s Hospital Postpartum ward 52 or one of the local hospitals' neonatal wards for convalescent care. N7 handles the antibiotic treatment of children in Postpartum 52. There were approximately 150 such cases handled.

Figure 1. Women’s Hospital N7 Neonatal Observation Ward in-patient days, intensive observation and in-patient periods in 2011-14. It should be noted that, on May 6th 2013, the number of ward beds dropped from 8 to 5.
L2 NEONATAL WARD

Operational focus areas in the L2 ward:
- Convalescent care for preterm infants after intensive care.
- Diagnostics and in-patient care for neonates not requiring intensive care.
- Treatment of neonates suffering from withdrawal symptoms passed on from mothers with substance abuse.

In 2014, a total of 487 infants were treated in the 15 beds of the L2 ward. The average ward length of stay was 9.0 days, with a total of 4,096 in-patient days logged. Although the ward case load per hospital bed was 75%, the utilization rate of intensive observation beds was 188%. The ward also had 665 outpatient clinic visits.

Distribution of L2 treatment periods

![Distribution of L2 treatment periods](image)

Figure 2. Distribution of in-patient periods by major diagnostic category. The respiratory disorder category includes both transient tachypnea of the newborn (TTN) and respiratory distress syndrome (RDS), air leak and meconium aspiration syndrome (MAS). The infection category includes both confirmed and suspected infections.

A majority of the in-patient infants (262 infants, or 53%) were born in Jorvi. 182 infants (37%) were transferred from the Children’s Hospital for convalescent care. Preterm infants comprise the largest homogeneous group of patients receiving in-patient care. The ward treated 57 infants, who were born before week 32 of gestation or whose birth weight was under 1500 g (average 1362 g). Two of these children were transferred from the ward for convalescent care beyond the expected due date, while the remaining infants were discharged on average during week 36.4 of gestation with an average discharge weight of 2370 g.

The aim of convalescent care for preterm infants in the ward is to promote breastfeeding and parenthood. Of these infants born at less than 32 gestational...
weeks or with a birth weight below 1500 g, 51% were discharged with exclusive breastfeeding, 30% with partial breastfeeding and 19% with exclusive formula feeding. Wherever possible, an effort was made to allow parents to stay overnight at the ward in order to promote a family focus. Parents participated in the basic care of their child as much as possible, with kangaroo care being encouraged. Whenever possible the care of full-term infants is arranged in the maternity ward, thus avoiding the separation of mother and child. Ensuring family-centered care also supports ‘hospital at home’ arrangements, to which some preterm infants being discharged will be transferred.

Peer support

A group for parents and group for fathers meet weekly at the ward. The group for fathers was formed in 2014 and 70 fathers participated in the group. The group received positive feedback from the participating fathers. The group for parents is active, with group meetings addressing prescribed topics organized by specialists from different fields. Under the direction of a music therapist, the ward hosts a ‘music play-school’, where parents are taught how to sing to their newborn babies. Hospital musicians who perform at Jorvi Hospital also regularly visit the ward. The ward holds a November market each year. Preterm infants who were treated at the ward and their families are invited to the market. In 2014, the event was attended by 40 adults and 38 children.

LV37 NEONATAL WARD

The Kätilööpisto Maternity Hospital is the largest maternity hospital in Finland. In 2014, 8,078 children were born, 4.2% of which were born before 37 weeks of gestation. At the Kätilööpisto Maternity Hospital, children are born on 32 weeks of gestation or later.

Beginning on 27 May 2014, all mothers are given a quick test to screen for Group B Streptococcus (GBS). If the quick test result is positive, the mother is given an antibiotic treatment.
Neonatal Ward LV37 has 21 beds, 4 of which are intensive observation beds. 5 of the beds are in family rooms on the 9th floor. Full-term and moderate preterm neonates born in the Kätilööpisto Maternity Hospital are treated in LV37. In addition, small preterms and other neonates who received intensive care are transferred from the Children's Hospital K7 unit for convalescent care. Neonates treated in other Children's Hospital wards are also transferred to LV37 for convalescent care. In 2014, there were 1,064 in-patient periods. The corresponding figure for LV37B (family rooms) was 264. The average length of stay was 6.4 days. The hospitalization time for small preterm neonates transferred from K7 for convalescent care is several weeks. The in-patient periods for neonates suffering from withdrawal symptoms are also several weeks in duration. Although the total ward case load per hospital bed was 76 %, the utilization rate of intensive observation beds was 199 %. There were 5,742 in-patient days. Approximately half of the patients from LV37 are sent directly for care from the delivery room or C-section OR and one-fourth from the maternity wards. Respiratory distress and prematurity were the key reasons for in-patient stay.

A multidisciplinary team convenes weekly at LV37. The team consists of ward physicians and nurses as well as a social worker, rehabilitation counsellor, child psychiatric nurse and, if necessary, a hospital chaplain. A parents’ group meets at the ward on a weekly basis.

NEONATAL OUTPATIENT CARE

K7AVO

K7AVO is a follow-up clinic for monitoring growth and development for infants being cared for in the Children's Hospital Neonatal Intensive Care Unit K7 and Women’s Hospital Neonatal Observation Ward N7.

The patients being followed-up include preterm infants born before 32 weeks of gestation or very low birth weight (VLBW) infants (birth weight < 1500 g) and infants which have been in intensive care and/or have developmental risk factors, such as cerebral hemorrhage or periventricular leukomalacia, birth asphyxia, severe bronchopulmonary dysplasia (BPD), severe necrotising enterocolitis (post-NEC), severe nutritional problems (poor growth, severe vomiting, major eating problems), significant fetal growth restriction, severe/prolonged hypoglycemia during the neonatal period, severe infections and congenital defects.

K7AVO care is multidisciplinary - the team consists of a neonatologist, child neurologist, nurse, physiotherapist, rehabilitation counsellor, social worker, child psychiatric nurse and, if necessary, other experts. In addition, a pediatrician working as a resident in neonatology also works at the follow-up clinic weekly. Among others, Palivizumab injections are given at the nurse reception for at-risk infants in order to prevent serious RSV infections.

At the K7AVO most doctors’ visits are carried out by a neonatologist. A child neurologist is present in 29 % of the patient visits. A physiotherapist participates in 89 % of the physician consultations.
Infants with developmental risks are checked every 3-6 months at K7AVO follow-up clinic for the first year of life. Preterm infants are followed until the developmental age of 12 months. If there is any evidence of a major delay or abnormality in development, the child will begin a physical therapy program, which is carried out at home. In 2014, 23 children (8%) underwent physical therapy.

Figure 7. Number of visits to the K7AVO follow-up clinic in 2011-14.

JORVI HOSPITAL NEONATAL OUTPATIENT CLINIC

The Jorvi Hospital Neonatal outpatient clinic focuses on the following:
- Developmental follow-up and ophthalmologist control of preterm neonates (birth weight over 1500 g)
- Developmental follow-up of at-risk children (major neonatal growth restriction, hypoglycemia, sepsis, post-intensive care monitoring, asphyxia or neurological abnormalities)
- Follow-up of children from at-risk families (parental substance abuse, mental disorders or interactivity problems)
- Nursing neonates referred from at-risk families (parental substance abuse, mental disorders or interactivity problems)
- Nursing neonates referred from a public health service for specialist medical treatment, with the exception of allergy diagnostics on its own.

In 2014, the pediatric outpatient clinic logged 941 physician consultations. The nurse outpatient clinic also works in close cooperation with the physician reception, which logged 352 visits.

LV37AVO

LV37AVO, neonatal follow-up clinic in Kätilöopisto Maternity Hospital, had 2560 visits in 2014. Of these, 1100 infants visited neonatal nurse and 1437 neonatologist or pediatrician. The team of LV37AVO consists of 2 nurses, 1 neonatologist, 1 social worker and 1 physiotherapist. In addition a child neurologist and a resident in child neurology make weekly consultation visits.

Figure 8. Visits are divided into short consultations for patients being discharged from the children's ward and consultations following treatment in the children's ward. In the follow-up program, infants with low or moderate developmental risks are evaluated.
TREATMENT OUTCOMES

VERMONT - OXFORD NETWORK

The treatment of small neonates is monitored using the Vermont Oxford Network. The network is an international comparative database, which includes nearly 1,000 hospitals all over the world that provide care for small neonates. A majority of the hospitals are located in the United States. All five of Finland’s university central hospitals are part of the network. Data on all preterm neonates with a birth weight of less than 1500 g or born before the 32nd week of gestation is collected for the database. In 2013, data on over 60,000 preterm neonates was entered into the database. The comparative database makes it possible to monitor diseases and complications affecting the mortality and morbidity among small neonates, and it allows organizations to compare their own results with those of the network.

The results for K7 are of a high international standard. In comparison for 2008-2010, K7 placed in the top 6% in terms of the survival of small neonates and discharging without any disease presenting in the patient. Comparative data for 2014 is not yet available; K7 data in the table below covers until November 2014.

PERINATAL MORTALITY

In 2014, there were 14,532 children born in the HUH area, 44 of which were stillborn and 21 expiring during the first week. The perinatal mortality rate is thus 4.5 deaths per 1,000 births. In 2013, the perinatal mortality rate at HUH was 4.3 deaths per 1,000 births. The perinatal mortality rate for all of Finland was 3.5 deaths. When considering perinatal mortality, it should be noted that known congenital heart defects and some severe congenital anomalies, such as diaphragmatic hernia, are concentrated within the HUS area out of Finland as a whole.

Table 1. K7 Unit and Vermont-Oxford Network comparative data for 2011-14.

<table>
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<th>2011</th>
<th>2012</th>
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<td>K7</td>
<td>Network</td>
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<td>Network</td>
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<td>Preterm neonates with a low birth weight</td>
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<td>56212</td>
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<td>Deaths</td>
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<td>8</td>
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<td>Deaths (%)</td>
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<td>Death or serious disease (%)</td>
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<td>In-hospital sepsis (%)</td>
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<tr>
<td>BPD &lt; 33 weeks (%)</td>
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<td>25.4</td>
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<tr>
<td>Pneumothorax</td>
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<td>Severe IVH (%)</td>
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<tr>
<td>Cystic PVL (%)</td>
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<td>Severe ROP (%)</td>
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<td>5.7</td>
<td>6.1</td>
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</table>
TREATMENT-RELATED INFECTIONS

In 2014, 37 treatment-related infections were observed in K7, 1 in N7, 8 in LV37 and 2 in L2. In 2014, no cases of multiresistant MRSA, VRE or CPE strains were encountered in the Neonatal Care Unit. ESBL E. coli was found in two children in K7 and in one child in N7. Both cases involved a carrier state - no sepsis was discovered.

Figure 9. Treatment-related infections in K7 in 2007-2014.

RESEARCH PROJECTS

Clinical research plays a major role in neonatal care unit operations. In 2014, there were 10 research projects underway.

**Anxiety in children and their guardians**
This research project expands upon the "Lifequality measurements in the evaluation of the cost effectiveness of specialized medical care" research project and attempts to determine the impact that treatment factors have on the effectiveness and cost-effectiveness of treatment. The research examines the incidence of anxiety in children and their guardians when a child falls ill with a chronic or serious disease.

**CMV**
Randomized study of congenital cytomegalovirus infection. Even though CMV infection is the most common congenital infection encountered in developing countries, very little is known about its natural progression. This study examines the burden of disease caused by the virus in Finland.

**GENBPD**
This study examines genetic predisposition to bronchopulmonary dysplasia (BPD).

**Big data – small preterm neonates**
This study seeks to find factors predicting prognoses and complications of small neonates by data mining the data in K7's Clinisoft information system.

**Kangaroo families- the impact of sound environment on the development of preterm neonates**
This study examines the impact of music on the development of preterm neonates provided with 'kangaroo care'.

**Caffeine study**
This study examines the impact that caffeine and supplemental oxygen have on the sleep and breathing of preterm neonates.

**NEO-Opioid**
This study examines the use of opiates in managing chronic pain and procedural pain.

**NEUROSIS**
An international multicenter trial which examines whether early inhaled budesonide reduces the incidence of BPD in extremely preterm neonates born before week 28 of gestation.
PiMiKo – microbial colonization of the small preterm neonates
This study examines changes in microbial colonization on the skin and in the gut during the first weeks of intensive care as well as the impact that microbes have on the risk of infection for preterm neonates.

PLUS
This study examines the protein intake and growth of preterm neonates with an extremely low birth weight.

REDEXAM
This study examines the use of urinary NTproBNP concentration in identifying mild cases of retinopathy of prematurity (ROP).

In 2014, physicians published a total of 20 papers and 2 thesis dissertations.

NEW IN 2014
In the summer of 2014, we introduced a new method for the acute care of preterm neonates with a low birth weight: LISA (Less Invasive Surfactant Administration). Instead of using intubation, surfactant is delivered to the lungs via a thin intratracheal catheter. This allows the child to breathe spontaneously by maintaining positive airway pressure. The aim of the method is to protect the lungs of neonates and reduce the incidence of bronchiopulmonary diseases (BPD) in small neonates or at least alleviate the severity of the disease.

An expanded screening of neonates for congenital metabolic disorders was begun at the end of 2014. The screening is used to detect congenital adrenal hyperplasia (CAH), fatty acid oxidation disorders (MCAD and LCHAD), glutaric acidemia type I (GA 1) and phenylketonuria (PKU). It is estimated that some 10-20 children with these disorders are born in Finland each year. Approximately one out of every four of these children are born in the HUH area. The screening was begun at the Women's Hospital in October and the Kätilöopisto Maternity Hospital and Jorvi Hospital in November. By the end of 2014, 1,876 children had been screened and not one child was diagnosed with a metabolic disorder.

In the autumn of 2014, a two-year neonatology education program was launched in three hospitals. A total of 16 nurses from K7, N7, L2 and LV37 are participating in the program.

SUMMARY
With regard to the incidence of disease, disability and death, the neonatal phase is the most high-risk stage of life. Expert, focused neonatal care makes it possible to diagnose children in need of treatment as early as possible and is cost-effective. The HUH Neonatal Care Unit cares for one out of every four neonates born in Finland and is the largest unit of its kind in the country. The size of the unit allows for continuous neonatal care and the development of specialized expertise by dividing areas of responsibility.

The unit is divided among four hospitals, which have a total of 15 intensive care beds and 41 beds in neonatal wards. The unit logged more than 16,000 in-patient days and nearly 5,000 outpatient visits. The outcome of small neonates was of a high international standard and the perinatal mortality rate is low. Neonatal care is being developed by both conducting extensive research and actively adopting new forms of treatment. In 2014, a new neonatal metabolic screening program and Less Invasive Surfactant Administration (LISA) via a thin intratracheal catheter were introduced.
Neonatology

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