Swiss Society of Neonatology

Schweizerische Gesellschaft für Neonatologie
Société Suisse de Néonatologie
Società Svizzera di Neonatologia

www.neonet.ch

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Standards for Levels of Neonatal Care in Switzerland

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1. Introduction

The Swiss Society of Neonatology (SSN) has decided to define levels of care for all neonates. It recognizes that in Switzerland:

- Wide variations exist from region to region in how the care for neonates is organized.
- Intensive care for neonates is offered in three types of units (see Table 1).
  a) Pure neonatal intensive care units (NICU) caring exclusively for newborns.
  b) Mixed neonatal and pediatric intensive care units (NICU/picu) caring for neonates (majority of patients) and children.
  c) Mixed neonatal and pediatric intensive care units (PICU/nicu) caring for children (majority of patients) and newborns, mainly providing postoperative care.

The SSN is responsible for the definition of standards and collects patient data of the NICU und mixed NICU/picu, whereas the Swiss Society for Intensive Care Medicine (SSICM) sets standards and minimum data sets for the PICU/nicu (according to an agreement between the SSN and the SSICM, August 2011).

Type of ICU	Standards defined by	Patient data sets
NICU	Swiss Society of Neonatology (SSN)	MNDS, AR
NICU/picu	Swiss Society of Neonatology (SSN) and Swiss Society of Intensive Care Medicine (SSICM)	MNDS, AR and MDSi
PICU/nicu	Swiss Society of Intensive Care Medicine (SSICM)	MDSi, AR and MNDS

MNDS: Minimal Neonatal Data Set of the SwissNeoNet; MDSi: Minimum Data Set of Intensive Care; AR: Asphyxia Registry

Table 1. Types of units that offer neonatal intensive care.

2. Why do levels of neonatal care have to be defined?

The definition of different levels of neonatal care has the following main goals:

- To improve outcome and ensure optimal patient care by setting standards for infrastructure and equipment, staffing, process data (minimum case load), as well as quality control.
- To promote intrauterine transfer to an institution that can provide appropriate neonatal care; infants should be born where they can get optimal care without separation from their mothers.
- To promote regionalization to guarantee the quality and safety of medical care for a given population including a tertiary perinatal center composed of a level III obstetrical unit and a level III neonatal intensive care unit which is associated with level II and level I neonatal units.
- To ensure optimal patient care by coordinated collaboration within a regional network.

- To provide adequate training facilities in neonatology for nurses and physicians.
- To ensure optimal use of financial and human resources.

3. Accreditation

3.1. Committee for the Accreditation of Neonatal Units (CANU)

The Board of the Swiss Society of Neonatology nominates a Committee for the Accreditation of Neonatal Units (CANU). This committee consists of 5 to 7 members with at least two members from level II and two members from level III units. At least one member is also a board member of the SSN. The members are nominated for 4 years and can be renominated twice.

The CANU defines minimum requirements for the accreditation of the various levels of neonatal units and evaluates applications (see below). Neonatal units accredited by the CANU are listed on the website of the SSN (www.neonet.ch).

3.2. Accreditation procedure

3.2.1. New accreditations

The head of the department of a neonatal unit, seeking accreditation as level IIA, IIB or III unit, has to inform the president of the CANU by e-mail or mail and submit the required data of the previous two completed calendar years online. The president of the CANU confirms the receipt within the following 20 workdays via mail or email.

Units fulfilling all criteria are accredited for a period of five years. The CANU can decide on a provisional accreditation if certain criteria are not met; reevaluation for definitive accreditation will take place two years later. All accredited units must provide annual data (by March 15 of the following year) for review by the CANU.

A unit that does not provide any data cannot enter into the accreditation process and therefore cannot be listed as a recognized unit for postgraduate education in neonatology.

3.2.2. Renewal of accreditation

After a period of five years, renewal of the accreditation will be based on review of the data of at least the preceding two years.

3.2.3. Re-accreditation

Re-accreditation is required whenever substantial changes in organization, size or structure of an accredited neonatology unit occur.

No later than three months after any of the above changes have occurred, the head of the unit must inform the president of the CANU. The previous accreditation is valid until the re-evaluation is completed by the CANU.

3.3. Site visits

Starting in 2018, the CANU will visit units that apply for accreditation or re-accreditation. For this purpose, the CANU will designate a delegation of 3 members (including a representative of nursing). The costs of site visits (CHF 5000.–) will be charged to the unit applying for accreditation.

3.4. Exceptions

If a unit does not fulfill one or several of the minimum requirements, the CANU can make an exception and issue an accreditation when geographical or other stringent arguments support such a decision.

3.5. Withdrawal / rejection of accreditation

The CANU can downgrade or reject an application if the data set is incomplete or insufficient. In such cases, reapplication after one year is possible.

3.6. Appeal to CANU decisions

If applicants do not accept the decision of the CANU, they can appeal to the board of the SSN.

3.7. Annual fees

Each accredited unit will be charged an annual fee for data monitoring.

4. Standards for different levels of neonatal care

4.1. Level I: Basic Neonatal Care

4.1.1. Definition

A level I unit corresponds to a newborn nursery in a maternity hospital without on-site pediatric services. The responsibility for the care of the well babies stays with a pediatrician or with the head of the maternity unit. Every infant has to be examined at least once by a pediatrician before discharge.

There is no CANU accreditation of such units. Nevertheless, the CANU suggests that Level I units meet the requirements listed below.

Basic neonatal care includes:

- Provision of neonatal resuscitation at delivery whenever needed.
- Provision of postnatal care for healthy term newborn infants.
- Provision of postnatal care for preterm infants born at 35 0/7 to 36 6/7 weeks of gestation and a birth weight ≥ 2000 g who remain physiologically stable.

- Stabilization of newborn infants who are ill and those born at < 35 $^{6}/_{7}$ weeks of gestation and/or a birth weight < 2000 g until transfer to a facility that can provide the appropriate level of neonatal care by a specially equipped and trained neonatal transport team.

4.1.2. Infrastructure and equipment

In the delivery room, a heated resuscitation unit equipped with free flow oxygen attached to an oxygen blender, material to clear the airways and to perform bag and mask ventilation, drugs and additional equipment (e.g., T-piece resuscitator) according to the national guidelines for neonatal resuscitation must be available (see www.neonet.ch). Maternity wards should be equipped with phototherapy units and pulse oximeters.

Availability of a laboratory facility (24 hours/24 hours) for glucose, electrolytes (Na, K, Cl, Ca), blood gas analysis, total bilirubin and sepsis work-up (CBC, CRP).

4.1.3. Staffing (minimum requirements)

A health care professional (i.e. midwife, obstetrician or anesthesiologist) appropriately trained in neonatal resuscitation (e.g., start4neo) must attend every delivery. Availability of a pediatric backup is desirable.

There must be a sufficient number of nurses trained in basic neonatal care (one nurse cares for a maximum of 6 mother-infant pairs per shift).

All infants must be examined by a pediatrician at least once before discharge.

4.1.4. Process data (minimum case load)

At least 350 deliveries per year are recommended. Exceptions are possible for geographical reasons.

4.1.5. Quality control / outcome

Responsibilities and Standard Operating Procedures (SOPs) for emergencies in the delivery room and the nursery must be defined:

- SOPs and specific equipment for screening examinations according to the guidelines of the SSN (e.g. screening for metabolic and endocrine disorders, hearing impairment, cyanotic heart disease).
- SOPs for basic pathologies like evaluation and treatment of neonatal jaundice or detection and management of hypoglycemia.
- SOPs for postnatal care like the promotion of breast feeding, provision of prophylactic measures (e.g. vitamins, vaccines) and discharge planning.

4.2. Level IIA: Neonatal Special Care Unit

4.2.1. Definition

A level IIA unit provides care for moderately ill term and preterm infants ⩾ 34 0/7 weeks and a birth weight ⩾1500 g as well as continuous care for convalescent infants ⩾ 32 0/7 weeks.

Therefore, in addition to the functionalities of the level I units, neonatal special care includes:

- Provision of care for infants born at ⩾ 34 0/7 weeks gestation and with a birth weight ⩾ 1500 g who – due to their physiologic immaturity – may suffer from apnea of prematurity, may be unable to maintain a normal body temperature, to take oral feedings, or who are moderately ill with problems that can be expected to resolve rapidly and that are unlikely to need intensive care (level III) on an urgent basis.
- Resuscitation and stabilization preterm and/or critically ill infants before possible transfer to a facility where neonatal intensive care can be provided (level III). This may include installation of nCPAP until the transport team arrives.
- Provision of care for infants who are convalescent and stable after intensive care with a corrected gestational age (i.e. gestational age at birth + postnatal age) ⩾ 32 0/7 weeks.

4.2.2. Infrastructure and equipment

In addition to the equipment mentioned for level I units (see 4.1.2.), a level IIA unit has to fulfill all of the following additional requirements:

- Availability of bedside X-ray within 30 minutes (24 hours/24 hours).
- Daily availability of ultrasonography (head, abdomen, hip).
- Participation in a regional neonatal network for quality assurance.
- Availability of a laboratory facility (24 hours/24 hours) for glucose, electrolytes (Na, K, Cl, Ca), blood gas analysis, total and direct bilirubin and sepsis work-up (CBC, CRP).

4.2.3. Staffing (minimum requirements)

The head of the unit is a certified neonatologist or certified pediatrician with ⩾ 12 months of experience in a level III unit (⩾ 80%); his substitute is a certified pediatrician with at least 12 months of experience in a level III neonatology unit (⩾ 80%). There must be a total of at least 300% staff physicians (certified neonatologists, certified pediatricians) and fellows (pediatric residents with ⩾ 3 years of experience).

Minimum in-house physician coverage is at the resident level 24 hours/24.

A certified neonatologist / pediatrician must be available for emergency back-up within 30 minutes 24 hours/24 hours for emergencies.

There must be an appropriate number and mix of nurses with neonatal experience for patient days and weighted shifts. In general, one nurse with neonatal experience (at least 6 months) provides care for a maximum of 4 special care patients per shift.

Lactation consultants and social workers must also be available. In addition, it would be desirable to have spiritual advisors, psychologists, physiotherapists and an ethics committee.

4.2.4. Process data (minimum case load)

At least 600 deliveries and 50 patient admissions to the neonatal unit per year or at least 500 patient days per year are required.

4.2.5. Quality control / outcome

In addition to the SOPs for level I (see 4.1.5.), SOPs for evaluation and treatment of respiratory distress, monitoring and treatment of apnea of prematurity, and to rule out sepsis must exist. The unit must have the ability to administer intravenous glucose solutions and antibiotics.

A critical incident reporting system (CIRS) must exist and reports must be evaluated on a regular basis (at least 2×/year).

4.3. Level IIB: Neonatal Intermediate Care Unit

4.3.1. Definition

A level IIB unit cares for moderately ill term and preterm infants ⩾ 32 0/7 weeks and a birth weight ⩾ 1250 g as well as continuous care for convalescent infants ⩾ 30 0/7 weeks. Therefore, in addition to the functionalities of the level IIA units, neonatal intermediate care includes:

- Provision of care for infants born at ⩾ 32 0/7 weeks gestation and a birth weight ⩾ 1250 g who are unlikely to need intensive care (level III) on an urgent basis.
- Provision of parenteral nutrition and nCPAP.
- Provision of care for infants who are convalescent and stable after intensive care with a postmenstrual age (i.e. gestational age at birth + postnatal age) ⩾ 30 0/7 weeks.

4.3.2. Infrastructure and equipment

In addition to the equipment mentioned for level I (see 4.1.2.) and level IIA (see 4.2.2) units, a level IIB unit has to fulfill the following additional requirements:

- Availability of appropriate equipment for nCPAP (including CPAP drivers, humidifiers, and oxygen blenders).
- Availability of continuous monitoring for transcutaneous pO_2 (or SpO_2 by pulse oximetry) and transcutaneous pCO_2.
- Availability of bedside X-ray within 15 minutes (24 hour/24 hours).
- Availability of a laboratory facility (24 hours/24 hours) **adapted to the needs of neonatal patients (analyses from small sample aliquots).**

4.3.3. Staffing (minimum requirements)

The head of the unit is a certified neonatologist (⩾ 80%); his substitute is a certified pediatrician with at least 12 months of experience in a level III neonatology unit (⩾ 80%). There must be a total of at least 300% staff physicians (certified neonatologists, certified pediatricians) and fellows (pediatric residents with ⩾ 3 years of experience).

Minimum in-house physician coverage is at the resident (preferably pediatric resident) level 24 hours/24.

A certified neonatologist / pediatrician must be available for emergency back-up within 15 minutes 24 hours/24 hours for emergencies.

There must be an appropriate number and mix of nurses with neonatal experience for patient days and weighted shifts. In general, one nurse with neonatal experience (at least 6 months) provides care for a maximum of 3 IMC or 4 special care patients per shift.

Lactation consultants and social workers must also be available. In addition, it would be desirable to have spiritual advisors, psychologists, physiotherapists and an ethics committee.

4.3.4. Process data (minimum case load)

At least 1'000 deliveries in the hospital and/or 2'000 deliveries in the catchment area, 100 patient admissions (gestational age > 32 0/7 weeks and/or birth weight > 1250 g) to the neonatal unit per year or at least 1250 patient days per year are required.

In addition, a minimum of 20 patients is treated with nCPAP per year (at least 4 hours; non-invasive respiratory support during postnatal stabilization not included).

4.3.5. Quality control / outcome

In addition to the SOPs for level I (see 4.1.5.) and level IIA (see 4.2.5.), SOPs for indication and application of nCPAP, emergencies such as pneumothorax, as well as use of central venous catheters and parenteral nutrition must be available.

Participation in national neonatal registries as defined by the SSN and SwissNeoNet is mandatory; a minimum of 90% of all eligible patients must be entered into the data bases.

A critical incident reporting system (CIRS) must exist and reports must be evaluated on a regular basis (at least 2x/year).

4.4. Level III: Neonatal Intensive Care Unit

4.4.1. Definition

Perinatal care for a given population is organized around a tertiary perinatal center composed of a level III obstetrical unit and a level III neonatal unit, located on the same campus, preferably in the same building. The minimum critical mass of births/year per region (perinatal network) is 5'000 births which corresponds to the

requirement for a minimum of 5 neonatal intensive care beds (UK recommendations: 1 ICU bed for 1'000 births, USA recommendations: 1.5 beds for 1'000 births).

A level III neonatal unit refers to a neonatal intensive care unit (NICU) in a tertiary perinatal center, where - in addition to the functionalities of level I and II - all critically ill newborn infants are being referred to, preferably before birth if the problem can be anticipated.

The NICU takes care of all neonatal pathologies from birth on and at least until the end of the neonatal period (28 days after birth or completed 44 postmenstrual weeks for preterm infants).

The spectrum of pathologies managed encompasses all neonatal disease entities, including most pre- and post-operative care (possible exception: care after surgery for congenital heart disease, which is provided in only a few centers).

Some level III units not only care for sick newborn infants, but also for pediatric intensive care patients. These mixed units have to fulfill the same criteria as the pure NICUs of tertiary perinatal centers and must also fulfill the requirements for pediatric intensive care (according to the agreement between SSN and SSICM, August 2011).

A regional neonatal network covers a regionally defined birth population and consists of a level III and possibly several level II and I neonatal units. Typically, the perinatal network is managed by the heads of obstetrics and neonatology of the tertiary perinatal center with frequent meetings with the network partners.

4.4.2. Infrastructure and equipment

In addition to the equipment mentioned for level I (see 4.1.2.), level IIA (see 4.2.2), a and level IIB (see 4.3.2.), a level III unit has to fulfill the following additional requirements listed below in detail.

4.4.2.1. Delivery room

A separate room heated to a minimum of 25°C equipped with all the necessary resuscitation and monitoring equipment and infrastructure to perform neonatal resuscitation (for details see care and resuscitation of the newborn – 2017 revision of the Swiss recommendations, available on www.neonet.ch).

4.4.2.2. Neonatal intensive care (NICU) and intermediate care (IMC) units

Each NICU/IMC cot should have equipment available to perform intensive or intermediate care, respectively, (incubator or unit with radiant heating, respirator with high frequency modality, nitric oxide if needed) under full monitoring of the patient's vital signs.

There must be access 24 hours/24 hours to resuscitation equipment, blood gas analysis performed by neonatal staff within the neonatal unit, cold light source for transillumination, mobile X-ray equipment, mobile ultrasound machine, as well as laboratory services adapted to neonatal patients' needs (small aliquots).

4.4.2.3. Neonatal emergency transport

At least one neonatal transport incubator must be available. The incubator has to be equipped with a monitoring system, a device for invasive and non-invasive respiratory support, heating system for thermoregulation, and syringe pumps. It must carry a battery and compressed gas/oxygen for independent operation to allow the provision of the full range of neonatal intensive care required stabilize and securely transport all kinds of neonatal intensive care patients.

4.4.2.4. Additional facilities

The following additional facilities are required:

- Sufficient storage room
- Office space
- Rest rooms for staff
- Rooms for discussions with parents
- Parent – infant rooms (pre-discharge)

4.4.3. Staffing (minimum requirements)

4.4.3.1. Physician staff

The head of the unit and his substitute are certified neonatologists (200%). In addition, there must be at least another 200% of certified neonatologists and at least 200% neonatologists in training (i.e., neonatology fellows). Therefore, a total of at least 600% staff physicians (certified neonatologists) and fellows (neonatologists in training) is required.

Minimum in-house physician coverage is at the certified neonatologist or fellow level 24 hours/24.

A certified neonatologist must be available for emergency back-up within 15 minutes 24 hours/24 hours for emergencies.

The services of the following pediatric (sub-)specialists are available:

- 24 hours/24 hours: cardiology, surgery, anesthesiology, radiology.
- Within 24 hours: other pediatric (sub-)specialists from infectious diseases, neurology, nephrology, ophthalmology, metabolic diseases, perinatal pathology, genetics, endocrinology and surgical subspecialties (such as neurosurgery, ENT, orthopedics, etc.).

4.4.3.2. Nursing staff

Each level III unit requires a head nurse with neonatal experience and management responsibility.

A sufficient number of nurses trained in neonatal intensive and neonatal special care must be available:

- In intensive care: one nurse cares for a maximum of 2 NICU patients per shift

- In intermediate care: one nurse cares for a maximum of 3 IMC patients per shift
- In special neonatal care: one nurse cares for a maximum of 4 SC patients per shift

In addition, there should be one extra nurse available per shift. Note that at least 500% by position are required.

Nurses in training work under the supervision of an experienced nurse. One experienced nurse can supervise only one nurse in training.

There must be at least one designated nurse for continuing education and training.

4.4.3.3. Transport staff

A transport team must be available 24 hours/24 hours for all emergency transports of neonates. The team consists of a fellow (experienced in emergency procedures such as endotracheal intubation, insertion of peripheral venous lines, placement of umbilical catheters, drainage of pneumothoraces, etc.) or a board-certified neonatologist and a specially trained neonatology nurse.

4.4.3.4. Additional staff

The following additional personnel must be available:

- Lactation consultant
- Social worker
- Spiritual advisor
- Psychologist
- Physiotherapist
- Members of an ethical committee

4.4.4. Process data (minimum case load)

At least 1'500 deliveries in the hospital and/or 5'000 deliveries in the catchment area, 300 patient admissions to the neonatal unit or at least 5'000 patient days per year are required.

At least 50 preterm infants with a gestational age < 32 0/7 weeks and/or birth weight < 1500 g should be admitted annually.

At least 50 patients undergoing invasive (conventional or high frequency ventilation) and 50 patients undergoing with non-invasive mechanical ventilation (CPAP) should be cared for every year, resulting in a minimum of 300 and 700 invasive and non-invasive ventilation days, respectively.

4.4.5. Quality control / outcome

4.4.5.1. Protocols and SOPs

Clinical protocols: each unit has agreed upon evidence-based written protocols for medical and nursing staff. These protocols must be reviewed regularly.

In addition to SOPs for level I (see 4.1.5.), IIA (see 4.2.5.), and IIB (see 4.3.5.), a level III

unit should define SOPs for the monitoring and treatment of neonatal intensive care patients. Furthermore, SOPs explaining the collaboration with obstetricians, other specialties and pediatric sub-specialties involved in the care of the patient before, during and after hospitalization in the neonatal unit must be available.

4.4.5.2. Internal quality control

A critical incident reporting system (CIRS) must exist and reports must be evaluated on a regular basis (at least 4x/year).

Regular clinical meetings including nursing and medical staff and interdisciplinary meetings with midwives, obstetricians and pathologists to monitor mortality and morbidity are required.

4.4.5.3. Regional quality control

The level III neonatal unit takes the lead for quality control measures in its regional perinatal network. Quality assessments together with the regional level II neonatal units have to be performed on a regular basis, at least once a year.

Referred patients (both antenatally and postnatally) who cannot be accepted must be recorded.

4.4.5.4. Neonatal quality control

Participation in national neonatal registries as defined by the SSN and SwissNeoNet is mandatory; a minimum of 90% of all eligible patients must be entered into the data bases.

Each level III unit participates in regular audits (benchmarking) of the SwissNeoNet.

Developmental follow-up: each level III neonatal unit guarantees follow-up in collaboration with a specialized developmental unit for all patients with gestational age < 32 0/7 weeks and/or birth weight of <1500 g (follow-up rate ⩾ 90%).

5. Document validity

The revised version of the Standards for Levels of Neonatal Care in Switzerland (including Appendix I and II) were developed by the members of the CANU in 2017/8 (in alphabetical order: Prof. Dirk Bassler, Prof. Thomas M. Berger, Dr. Bernd Erkert, Dr. Juan Llor, Dr. Marion Moenkhoff, Prof. Matthias Roth-Kleiner) in order to consolidate the information from previous documents and eliminate discrepancies.

The revised version of the Standards for Levels of Neonatal Care in Switzerland (including Appendix I and II) replace all previous documents:

1. Standards for Levels of Neonatal care in Switzerland (E)
   5.12.2012
2. Minimum Requirements for Swiss Neonatal Units (E)
   28.8.2013
3. Einteilungskriterien für Neonatologieabteilungen in der Schweiz (D)
   4.11.2014
4. Critères de classement applicables aux unités de néonatologie en Suisse (F)
   4.11.2014

Following consultation among all members of the SNN, the revised version was endorsed by the Board of the SSN on December 20, 2018.

Lausanne, 14.3.2019

Prof. Matthias Roth-Kleiner
President of the SSN

Luzern, 14.3.2019

Prof. Thomas M. Berger
President of the CANU

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Appendix I – Minimum requirements

Infrastructure

Minimum requirements	Level III	Level IIB	Level IIA
Perinatal center			
Obstetrical unit on same campus	yes	yes	yes
Common weekly meetings between neonatologists and obstetricians about ongoing high risk pregnancies	yes	desirable	desirable
Common teaching meetings and/or mortality-morbidity conferences (⩾ 1x/month)	yes	desirable	desirable
Operative beds			
NICU beds (1 – 2 beds/nurse & shift) [a)]	⩾ 5	n/a	n/a
IMC beds (2 – 3 beds/nurse & shift) [a)]	⩾ 5	⩾ 2	n/a
SC beds (3 – 4 beds/nurse & shift)	⩾ 10	⩾ 3	⩾ 2
Respiratory support			
Respirators for invasive respiratory support, total	⩾ 5	n/a	n/a
Ventilators with high frequency ventilation modality	⩾ 2	n/a	n/a
NO delivery systems	⩾ 2	n/a	n/a
CPAP devices	⩾ 10	⩾ 2	n/a
Monitoring			
Patient monitoring available for all hospitalized patients	yes	yes	yes
Other infrastructure			
Laboratory services adapted to neonatal patients available 24/24 hours	yes	yes	yes
Ultrasound examination	available in unit	available in unit	available in hospital
X-ray	available in unit	available in unit	available in unit
Echocardiography	available in unit	optional	optional
MRI	available in hospital	optional	optional

a) Downward adjustment may be considered for geographical reasons

Staffing

Minimum requirements	Level III	Level IIB	Level IIA
Physician staffing			
Head of the unit	certified neonatologist	certified neonatologist	certified neonatologist or certified pediatrician with ⩾ 12 months of experience in a level III unit
	100%	⩾ 80%	⩾ 80%
Substitute of the head of the unit	certified neonatologist	certified pediatrician with ⩾ 12 months of experience in a level III unit	certified pediatrician with ⩾ 12 months of experience in a level III unit
	100%	⩾ 80%	⩾ 80%
Additional consultants/attendings	certified neonatologists	certified pediatricians	certified pediatricians
	⩾ 200%	see total physician staff	see total physician staff
Fellows	neonatologists in training	experienced pediatric residents (⩾ 3 years of experience)	experienced pediatric residents (⩾ 3 years of experience)
	⩾ 200%	see total physician staff	see total physician staff
Total staff physicians and fellows	⩾ 600%	⩾ 300%	⩾ 300%
In house physician coverage 24/7	certified neonatologist or neonatology fellow	resident (preferably pediatric resident)	resident
Emergency physician back-up	certified neonatologist within 15 min	certified neonatologist / pediatrician within 15 min	certified neonatologist / pediatrician within 30 min
Nurse staffing			
Appropriate number for patient days and weighted shifts	500% per 2 NICU beds 500% per 3 IMC beds 500% per 4 SC beds	500% per 3 IMC beds 500% per 4 SC beds	500% per 4 SC beds
Certified nurses with postgraduate diploma in intensive care	not specified in detail	not specified in detail	not specified in detail
Certified nurses with CAS or equivalent formation in neonatology	not specified in detail	not specified in detail	not specified in detail
Certified nurses with basic diploma only	not specified in detail	not specified in detail	not specified in detail
Additional staffing			
Lactation consultant	yes	yes	yes
Social worker	yes	yes	yes
Spiritual advisor	yes	desired	desired
Psychologist	yes	desired	desired
Physiotherapist	yes	desired	desired
Ethics committee	yes	desired	desired

Process

Minimum requirements	Level III	Level IIB	Level IIA
Patients			
Live births in obstetrical service [a)]	⩾ 1500	⩾ 1000	⩾ 600
Live births in catchment area [a), b)]	⩾ 5000	⩾ 2000	n/a
Total admissions to neonatal unit [c)]	⩾ 300	⩾ 100	⩾ 50
Admissions: by body weight (BW)			
Admission BW ⩽ 1250 g	⩾ 50	n/a	n/a
Admission BW 1251 – 1500 g		⩾ 100	⩾ 50
Admission BW 1501 – 2000 g	⩾ 250		
Admission BW > 2000 g			
Admissions: by gestational age (GA)			
Admissions with (corrected) GA < 28 0/7 weeks	⩾ 50	n/a	n/a
Admissions with (corrected) GA 28 0/7 – 31 6/7 weeks		retrotransfers (PMA ⩾ 30 0/7 weeks) only	
Admissions with (corrected) GA 32 – 33 6/7 weeks	⩾ 250	⩾ 100	retrotransfers (PMA ⩾ 32 0/7 weeks) only
Admissions with (corrected) GA 34 0/7 – 36 6/7 weeks			⩾ 50
Admissions (corrected) GA ⩾ 37 0/7 weeks			
Hospitalisation days			
Total for all neonatal patients [c), d)]	⩾ 5000	⩾ 1250	⩾ 500
Respiratory support			
Patients with invasive ventilation (ETT) [e)]	⩾ 50	n/a	n/n
Total days of invasive ventilation (via ETT) [e)]	⩾ 300	n/a	n/a
Patients with non-invasive ventilation (CPAP, NIPPV) only (at least 4 hours, DR excluded) [f)]	⩾ 50	⩾ 20	n/a
Total days of non-invasive ventilation (CPAP, NIPPV) [f)]	⩾ 700	⩾ 75	n/a

a) at least one of the two live births criteria must be fulfilled

b) main responsible unit only

c) one of the two criteria (number of admissions, number of hospitalisation days) must be fulfilled

d) day of discharge excluded (in analogy to Swiss DRG)

e) one of the two invasive ventilation criteria must be fulfilled

f) one of the two non-invasive ventilation criteria must be fulfilled

Quality and Outcome

Minimum requirements	Level III	Level IIB	Level IIA
Clinical standards			
Written standard operating procedures (SOPs)	yes	yes	yes
Critical incident reporting system (CIRS)	yes	yes	yes
Participation in neonatal registries			
Annual unit survey completed by March 15 of the following year	yes	yes	yes
Annual data monitoring fee paid (invoice by SSN)	yes	yes	n/a
Data entry into SSN/SNN registries (% of eligible patients)	⩾ 90%	⩾ 90%	n/a
Follow-up rate at 18 – 24 months (for SwissNeoNet population)	⩾ 85%	n/a	n/a
Audit			
Participation in quality circle at least once per year	yes (nationwide)	yes (nationwide)	yes (regional)

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Appendix II – Absolute requirements

Level IIA

	Absolute requirements
Perinatal center	
Obstetrical unit on same campus	yes
Operative beds	
IMC beds (2-3 beds/nurse & shift)	⩾ 2
Physician staff	
Total staff physicians	⩾ 300%
In house physician coverage 24/7	resident
Emergency physician back-up	certified neonatologist or certified pediatrician within 30 min
Patients	
Live births in obstetrical service	⩾ 600
Number of admissions [a)]	⩾ 50
Hospitalisation days	
Total for all neonatal patients [a)]	⩾ 500
Participation in neonatal registries	
Annual unit survey completed by March 15 of the following year	yes

a) at least one of the two criteria must be fulfilled

Level IIB

	Absolute requirements
Perinatal center	
Obstetrical unit on same campus	yes
Operative beds	
IMC beds (2 – 3 beds/nurse & shift)	⩾ 2
SC beds (3 – 4 beds/nurse & shift)	⩾ 3
CPAP devices	corresponds to number of IMC beds (minimum 2)
Physician staff	
Total staff physicians	⩾ 300%
In house physician coverage 24/7	resident (preferably pediatric resident)
Emergency physician back-up	certified neonatologist or certified pediatrician within 15 min
Patients	
Live births in obstetrical service [a)]	⩾ 1000
Live births in catchment area [a), b)]	⩾ 2000
Number of admissions [c)]	⩾ 100
Hospitalisation days	
Total for all neonatal patients [c), d)]	⩾ 1250
Respiratory support	
Patients with non-invasive ventilation (CPAP, NIPPV) only (at least 4 hours, DR excluded) [e)]	⩾ 20
Total days of non-invasive ventilation (CPAP, NIPPV) [e)]	⩾ 75
Participation in neonatal registries	
Annual unit survey completed by March 15 of the following year	yes
Annual data monitoring fee paid (invoice by SSN)	yes

a) at least one of the two live births criteria must be fulfilled

b) main responsible unit only

c) one of the two criteris (number of admisions, number of hospitalisation days) must be fulfilled

d) day of discharge excluded (in analogy to Swiss DRG)

e) one of the two non-invasive ventilation criteria must be fulfilled

Level III

	Absolute requirements
Perinatal center	
Obstetrical unit on same campus	yes
Physician staff	
Total number of certified neonatologists	⩾ 400%
In house physician coverage	certified neonatologist or neonatology fellow
Emergency physician back-up	certified neonatologist within 15 min
Nurse staff	
NICU beds	500% per 2 NICU beds
IMC beds	500% per 3 IMC beds
SC beds	500% per 4 SC beds
Patients	
Live births in obstetrical service [a)]	⩾ 1500
Live births in catchment area [a), b)]	⩾ 5000
Number of admissions [c)]	⩾ 300
Number of patients with a GA < 32 0/7 weeks [d)]	⩾ 50
Number of patients with a BW < 1500 g [d)]	⩾ 50
Hospitalisation days	
Number of hospitalisation days [c), e)]	⩾ 5000
Respiratory support	
Patients with invasive ventilation (ETT) [f)]	⩾ 50
Total days of invasive ventilation (via ETT) [f)]	⩾ 300
Patients with non-invasive ventilation (CPAP, NIPPV) only (at least 4 hours, DR excluded) [g)]	⩾ 50
Total days of non-invasive ventilation (CPAP, NIPPV) [g)]	⩾ 700
Participation in neonatal registries	
Annual unit survey completed by March 15 of the following year	yes
Annual data monitoring fee paid (invoice by SSN)	yes

a) at least one of the two live births criteria must be fulfilled

b) main responsible unit only

c) one of the two criteris (number of admisions, number of hospitalisation days) must be fulfilled

d) at least one of the two criteria (GA or BW) must be fulfilled

e) day of discharge excluded (in analogy to Swiss DRG)

f) one of the two invasive ventilation criteria must be fulfilled

g) one of the two non-invasive ventilation criteria must be fulfilled