

Curricular Framework for Advanced Trainees in Neonatology

King Edward Memorial Hospital and Princess Margaret Hospital for Children.

Perth.

Neonatology curricular framework.

1.1 Overview

This curricular framework has been developed to support the national training program in Perinatal Neonatal medicine as defined by the Royal Australasian College of Physicians (RACP). It is the first documented neonatal, curricular framework at institutional level in Australia. It incorporates best evidence aspects of the process of training in Neonatology gleaned from international and national curricula, as well as state and local experiences to facilitate the high quality training program for prospective neonatologists in WA. This curricular framework describes what and how training is delivered in WA over a minimum of two years of advanced training in Neonatology.

1.2 Introduction

High-quality postgraduate training programs are essential to achieve high standard of patient care and research. Formalized curricular frameworks at institutional level are important to achieve this. The RACP has recently published a postgraduate curriculum in these College requirements. Access to College Curriculum for Perinatal Neonatal Medicine: <http://www.racp.edu.au/>. Sign in, and then click on “Advanced Training” under Education. In the left hand column, click on Advanced Training Curricula. Then click on Perinatal/Neonatal Medicine.

Neonatologists at the Neonatal Clinical Care Unit of Women's and Newborns' health Service in WA have developed a curricular framework that underpins the training philosophy of the neonatal intensive care units at King Edward Memorial Hospital and Princess Margaret Hospital for Children, and NETS WA by:

- Establishing clearly defined standards of knowledge and skills advanced trainees are expected to attain during their training
- Improving the quality of care of severely ill newborn babies
- Enhancing the contribution to national and international scientific progress in the field of Neonatology

This document defines the prerequisites of admission to the program, rotations, purpose of the curricular framework of training, contents and duration of the training program, academic program, and research expectations.

1.3 Admission to the training program

Trainees may enter the advanced training program in neonatal perinatal medicine of the RACP after completion of the paediatric examination of the College or equivalent. The duration of neonatal-perinatal training is three years. Two years of core training, and one year of non-core training. The tertiary units in WA are accredited by the College to offer the full 24 months of core and offer opportunities for 12 months of elective training.

1.4 Purpose of Training.

This curricular framework is established to incorporate the mastery of competencies that should result in a neonatal trainee being competent in all the principles of comprehensive care provision to newborn babies. This care provision may be within a specialized tertiary care unit, department or hospital at the level of a consultant neonatologist. The care includes the routine application of various specialized

diagnostic and therapeutic methods as well as an understanding of the psycho-social impact of a sick neonate on the family. To achieve these goals and objectives, rotations at the WA units have been devised to allow ample clinical, educational, administrative and research exposure.

1.5 Rotation

King Edward Memorial Hospital (KEMH) is the largest obstetric hospital in WA with more than 7000 deliveries and 1800 neonatal admissions annually. More than 90% of all high risk pregnancies in the State deliver in this unit, which allows the trainee to become involved in the diagnosis, management and counselling related to fetal and parental issues in the antenatal period.

The neonatal unit cares for the vast majority of premature babies who deliver in WA. It has a total of 100 neonatal beds. Thirty of these are level III beds, 54 level II beds as well 16 high dependency (HDU) beds. Advanced trainees will spend a total of 18 months of a two year rotation at this hospital. Trainees will regularly rotate through the level III and level II/HDU nurseries. All the ventilated neonates are cared for in the level III nursery, and the trainee will be exposed to all aspects of care of newborns as early as 23 weeks gestation.

It is in this part of the unit where trainees will have formal training in functional echocardiography, including assessment of cardiac anatomy and measurement of ductal size and shunts. Trainees will have the opportunity to complete the course and be accredited by the Australian Society of Ultrasound in Medicine (ASUM).

During the level II rotation, trainees gain experience in day to day management of respiratory care of ex-premature infants, many of whom are still on CPAP or oxygen,

as well the issues regarding feeding and other aspects of care associated with long term admissions. Level II is often where term babies with conditions other than just respiratory conditions are cared for. This includes a vast spectrum of conditions, from infections to neonatal abstinence.

During the level II rotation, trainees will cover birth suite to attend any deliveries of premature infants, infants who have antenatally diagnosed malformations or other conditions necessitating neonatal input. Surgical conditions commonly include cardiac anomalies, congenital diaphragmatic hernias, gastroschisis and many others.

Trainees are expected to attend the academic program and be actively involved in discussions at these sessions.

Princess Margaret Hospital for Children (PMH) is the paediatric hospital in WA which houses the accredited level III surgical training unit in neonatology. Facilities at PMH include the full paediatric service such as: cardiology, respiratory medicine, radiology, microbiology, haematology, surgery, anaesthesia, nephrology, ophthalmology, ENT, pathology, child development and genetic services.

The neonatal unit has a total of 25 beds, 10 of which have ventilator capabilities and admit close to 700 newborn babies annually. The New Children's Hospital due for completion in 2014 will have a 30-bed NICU. Neonates born at peripheral hospitals and with a wide spectrum of problems including congenital heart disease and other surgical conditions are cared for by the neonatal team. Neonates born at KEMH often with antenatally diagnosed congenital problems and anomalies are transferred to the NICU at PMH for surgery or ongoing subspecialist care. Trainees will spend about six months in the PMH unit.

The Neonatal Emergency Transport Service (NETS) is based at PMH and KEMH and trainees will rotate through this service gaining valuable experience in road and fixed wing aircraft retrieval of sick neonates in WA.

Although these units are on different sites, they have the same director and many of the medical and nursing staff work on both sites.

1.6 Teaching and Learning Philosophies

The WA neonatal units follow Evidence-based guidelines (EBG) for management of neonates. Trainees are encouraged to use Evidence-based individual decision (EBID) making in their day to day practice. Trainees are viewed as adult learners whereby self directed study and lifelong learning form the core of acquisition of knowledge. Educational resources available to trainees include access to a computer with internet and intranet connections. Both hospitals have libraries which keep hard copies of journals, but free online access to a vast number of journals and databases is available. As teacher, trainees must become familiar with different learning styles and apply this knowledge to maximize learning opportunities and teaching activities.

1.7 Personal and professional development

Trainees will have the opportunity to gain the **qualities and attributes** as expected by a consultant neonatologist. This includes aspects such as: medical expert, communicator, manager, collaborator, health advocate, scholar and professional.

1.8 Content

The training provided should equip the trainee with the necessary knowledge, skills and attributes required to practice high quality neonatal medicine. The complete

syllabus can be accessed at the RACP website under “Neonatal-Perinatal Curriculum”, summarized below.

Trainee Neonatologists have ample opportunity to acquire detailed **knowledge** of:

Pathophysiology of the foetus: Foetal growth, development and means of assessment.

Detection of foetal anomalies, the impact on families and collaborative prenatal counselling. The impact of maternal disease on the foetus.

Epidemiology: Morbidity factors and mortality rates in the perinatal period. Methods of data collection such as birth and death notifications as well as audits aimed at quality assessment.

Pathophysiology of prematurity: Respiratory development, pathology of the respiratory system including surfactant deficiency and its sequelae and persistent pulmonary hypertension. Cardiovascular adaptation and problems, including patent ductus arteriosus and its impact on the preterm newborn. Fluid balance, renal maturation, gastro-intestinal development and feeding. Neurological problems, including the pathogenesis of periventricular haemorrhage and periventricular leucomalacia.

Physiology of postnatal adaptation: Respiratory, cardiovascular and other physiological changes at birth. Physiology of breast feeding. Organ system development and changes in physiology after birth.

Pathophysiology of conditions of all gestational ages: Metabolic adaptation to postnatal life. Hypoxic ischaemic insults and its consequences. Newborn screening for

metabolic and other congenital conditions. Neonatal immunity and pathogenesis of perinatal/neonatal infection. Congenital abnormalities and their management.

Principles of Neonatal care: Neonatal resuscitation theory and organization. Endotracheal intubation, mechanical ventilation and delivery of respiratory support. Prevention and management of long term sequelae of prolonged neonatal ventilation. Cardiovascular assessment, support and management of the patent ductus. Parenteral nutrition indications, composition and administration. Neonatal skin and thermal requirements. Diagnosis, assessment and management of enteral diseases. Assessment and management of fluid balance and nutritional requirements. Prevention and management of bone disease of prematurity. Postnatal growth, breastfeeding, composition and use of formula and supplements. Clinical, radiological and special investigations of structural integrity of the brain. Prognosis of neuropathology in the newborn. Screening of neonates at risk for retinopathy and loss of hearing. Diagnosis, assessment and investigation of congenital abnormalities and dysmorphism including genetic testing. Investigation of suspected inborn errors of metabolism. Routine care and investigation of the neonate with jaundice. Assessment, diagnosis and investigation of the neonate with suspected infection. Early, medium and late sequelae of conditions and events requiring ethical consideration and discussion.

Pharmacology in the neonatal/perinatal period: Pharmacokinetics in the preterm and term neonate. Drug interactions toxicity. Maternal medication and the influence on the foetus/newborn. Maternal drug use and the influence on the foetus and transmission of drugs via breast milk.

Follow-up of the high risk neonate: Diagnosis and counselling associated with outcomes of perinatal high risk groups such as prematurity, fetal growth restriction

and intrapartum hypoxia. Understanding of problems such as chronic respiratory problems, visual and hearing defects associated with these high risk infants and possible long term neurocognitive outcomes.

Ethical issues and end of life discussions.

Trainees will have the opportunity to acquire extensive **skills** in the following domains

Practical procedures:

- Resuscitation of the newborn.
- Tracheal intubation and techniques of artificial ventilation.
- Insertion of arterial and venous lines, central and peripheral.
- Blood transfusion and exchange transfusion.
- Drainage of pneumothorax and insertion of intercostal catheters.
- Suprapubic aspiration of urine.
- Lumbar puncture

Clinical practice:

- Clinical examination of the sick and healthy neonate.
- Recognition of common patterns of malformation/genetic syndromes.
- Assessment of gestational age.
- Assessment of disability, including neurologic and developmental assessment of the older infant.

Diagnosis:

- Interpretation of X-rays commonly performed in the newborn period such as chest and abdominal films.

- Indications and interpretation of contrast studies commonly performed in neonates.
- Performing an echocardiogram to assess basic cardiac anatomy, function and ductal shunt.
- Interpreting Electrocardiograms.
- Experience in interpreting results of ultrasound examination of the nervous system, abdominal organs and hips.
- Role of specialized investigations such as MRI and CT.
- Ordering and interpreting common laboratory and micro-biological investigations.
- Use and interpretation of the BRAINZ monitor and EEG results.
- Indications and interpretation of specialized neuromuscular electro-physiological tests.

Technology:

- Understand the basic mechanical and electrical function of ventilators, monitoring equipment, incubators, phototherapy units and radiant heaters.

Communication:

- Acknowledging staff support and dynamics, including co-operation and consultation with other specialists, nursing staff and allied health personnel.

- Counselling skills, including appropriate approach to distressed and bereaved parents, disclosure of “bad news”, end-of-life care issues and follow-up counselling after the loss of a neonate.

Teaching:

- Training and involvement in teaching activities to medical staff, nursing staff, allied health professional staff as well as outreach teaching.

Training program

Key competencies

Resuscitation: The trainee must be able to institute and lead neonatal resuscitation of both the preterm and term neonate. The trainee must demonstrate a full understanding of the physiology and treatments involved.

Cardiorespiratory intensive care: The trainee must develop a full, working knowledge of principles and application of a range of ventilatory strategies. This will enable the trainee to institute, maintain and manage complications of full cardiorespiratory care for preterm and sick, term neonates. Additionally, trainees must be able to plan the care for babies with chronic lung disease and be aware of the long term complications.

Fluid balance and thermoregulation: The trainee must understand the thermal environment of neonates of all gestation. The trainee must understand and demonstrate a full understanding of the physiology, especially the rapid postnatal changes in body water distribution and transepidermal water loss. The trainee must initiate and manage these issues as well as the fluid balance.

Immunity and infection: The trainee must understand the development of immunity in the fetus, vulnerability of the newborn and risk factors for infection, including bacteria and viruses commonly involved. The trainee must implement appropriate antimicrobial/antiviral agents in a timely fashion to prevent morbidity and mortality as a consequence of infections.

Neurology: The trainee must demonstrate proficiency in aetiology, clinical assessment, investigations and management of a range of neurological disorders. This includes injury of the term and preterm brain, infections, congenital malformations, intracranial trauma and seizures.

Nutrition, feeding, gastro-intestinal and hepatic disease: The trainee must have in-depth knowledge of the indications, principles and composition of enteral and parenteral feeding in the healthy and sick neonate and the associated complications. The trainee must be able to recognize common hepatic and gastro-intestinal anomalies and initiate appropriate investigation and management.

Haematology and transfusion: the trainee must be able to diagnose, investigate and manage the range of haematological disorders found in neonates. The trainee must know the full range of blood products available for transfusion in the neonate and the appropriate use of each.

Metabolic and endocrine disorders: Trainees must demonstrate proficiency in the presentation, assessment, investigation and management of the more common and important metabolic and endocrine disorders.

Congenital anomalies and genetic disease: Trainees must be able to recognize common congenital anomalies, investigate such babies and communicate such information to the parents.

Transport of the newborn baby: Trainees must be competent at retrieving newborn babies by road and air and be able to teach others to carry out retrievals.

Family care and care of the well newborn baby: Trainees must have a wide knowledge of normal development, common minor problems, and importance of communication and follow up with other health care professionals and the parents.

Communication skills and counselling: Trainees must demonstrate increasing skills in communication with parents and staff during their training. This includes breaking bad news, discussing prognosis and handling perinatal/neonatal death.

1.9 Experience in other areas

In addition to the key competencies in neonatal practice, trainees are encouraged to develop expertise in more detail in one of the areas discussed above. Trainees would often choose to develop expertise in a field after completion of their 24 months of core training. The third year of training may be used as 12 months of elective training to combine research with aspects of neonatology such as: transport, developmental, cardiology, neurology or other areas of interest. Trainees commonly enrol in a Master's degree at the University of WA during their rotation.

Research

Advanced trainees have to complete three scholarly research projects during their Advanced Training as part of the mandatory College requirements. Projects are done in collaboration with a senior staff member/s. Trainees will become familiar with

research steps such as: grant application, writing a research proposal, study design, critical literature review, data collection, analysis and final manuscript preparation. Trainees may choose to present research at international conferences and publication in peer review journals.

1.10 Monitoring of progress

Trainees have to keep their professional learning portfolio, supplied by the College, up to date. The portfolio contains evidence of completion of key parts of College requirements such as neonatal retrievals, developmental assessments and supervisor meetings/reports. It also contains documentation of personal goals, strengths and weaknesses which the trainee can focus on to improve his/her own knowledge and abilities. It is a record of continuing professional educational activities and a mandatory requirement to ensure trainees have achieved College requirements to become a consultant.

Each trainee will receive a “Framework of Assessment”. This is a useful document in addition to the College Portfolio, to document progress of knowledge and skills. The Sheffield Assessment Instrument for Letters (SAIL) is currently trialled in WA as an assessment tool.

Each trainee will be allocated a supervisor at the commencement of training. The supervisor is responsible for feedback, assessment, completing the College required supervisor’s reports and to document competency. Supervisors would only sign off a report, once the trainee has met the mandatory requirements. Trainees are encouraged to identify a mentor who may or may not be the same person as their supervisor. Some Advanced Trainees may seek a clinical or academical mentor. The mentee must

write a diary on professional development and ethical issues which the mentor will assess and discuss with the mentee.

Trainees will undergo a performance appraisal. This gives the Advanced Trainee the opportunity to discuss objectives achieved, as well as discussing objectives for the future. This includes aspects such as which professional organizations to belong to, continuing education, including enrolment in a Masters, or PhD, and the opportunity to suggest how the faculty could improve aspects such as conditions of work, efficiency and teaching.

1.11 Neonatal medical staff

All senior medical staff are trained neonatologists with a vast spectrum of interest and expertise. They have many internationally acclaimed publications, and trainees will have the opportunity to complete research papers and college projects under supervision of highly motivated and experienced consultants. Clinical protocols and practice standards are continuously updated and monitored by senior staff, creating the chance for trainees to become involved in audits and clinical governance issues. The neonatologists are rostered on call after hours.

Registrars are basic trainees who are rotating through neonatology. They staff the different units 24 hours a day on a shift basis. Advanced trainees are in-house, 24 hours a day at KEMH with a consultant on call as back up. At PMH, advanced trainees do some after hours on-call from home, with a consultant as back-up.

1.12 Quality assurance

Both King Edward Memorial Hospital and Princess Margaret Hospital for Children have written protocols for medical and nursing staff, including drug protocols which

are available on the intranet. These protocols are continuously reviewed through discussion and audit to reflect current best evidence based practice.

Monitoring is in place to review morbidity among survivors of prematurity, such as cerebral ultrasound of neonates <32 weeks gestation, screening and treatment of retinopathy of prematurity and screening of high risk survivors for hearing loss. Data are collected on birth weight and gestational age, the number and duration of admissions and classified according to international guidelines. Data of the unit form part of regular reporting to the Australian and New Zealand Neonatal Network (ANZNN). The ANZNN is a collaborative network that monitors the care of high-risk newborn infants by pooling the data to provide quality assurance for the resource consuming care.

	Activity	Time
Monday	Lunch time meeting Neonatology	13:00-14:00
Tuesday	Grand Round Neonatology	9:30-12:00
Wednesday	Fetal Medicine Meeting	12:45-14:00
	Registrar Teaching	14:00-16:00
Thursday	Senior Registrar Teaching	8:00-9:00
Friday	Obstetric study afternoon	13:00-15:00

Table 8. Academic Program at Princess Margaret Hospital for Children

	Activity	Time
Monday	Grand Round Neonatology	9:30-11:30
	Radiology	12:00-13:00
Tuesday	Family focus	11:00-12:00
Wednesday	Registrar teaching	14:00-16:00
Thursday	Senior Registrar teaching	8:00-9:00
Friday	Pathology meeting	Once a quarter, 11am
		TBA

