Women's & Newborns' Health Network

Framework for the care of neonates in Western Australia

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Executive Summary

In Western Australia (WA), the Women's and Newborns' Health Network (WNHN) was tasked with the development of a statewide service plan for neonates in order to address all aspects of care for a neonate including service redesign in the primary, secondary and tertiary setting, workforce training and education, prevention and treatment. The complexity of caring for neonates in collaboration with the increasing number of births in WA has led to the development of a statewide services framework and best practice patient pathway for babies.

Key Recommendations

Primary

- Support initiatives to improve antenatal care and both access and attendance for Aboriginal women and medium to high risk women.
- Support public health programs for pregnant women that promote healthy diet and avoidance of harmful substance use to reduce and prevent the incidence of congenital abnormalities.
- Ensure that all health professionals/health care workers, who are in attendance at births and specifically have a responsibility for caring for the newborn, are trained and accredited in neonatal resuscitation.
- Support and ensure that health professionals and health care workers to have an adequate understanding of the mental health issues affecting parents which may impact on neonatal outcomes.
- Support and develop the neonatal hearing screening for all babies in WA using the automated auditory brain stem response.
- Strengthen pathways to care for women identified 'at risk' of mental health concerns in the perinatal period.
- Facilitate better integration with community services to improve the support provided to women and their families' pre and post discharge through improved communication protocols, case and data management protocols, access to allied and mental health services and co-location of clinical and community services.
- Support and develop a statewide midwifery and nursing home visiting program and associated promotion of the service to decrease a newborns length of stay and improve the provision of care and support for women and their families in the community following discharge.
- Improve integration between child health nurses, community health nurses, home visiting midwives, mental health services, lactation consultants, neonatal nurses and maternity services, providing antenatal and postnatal care to women and their families in the community through improved communication protocols, care coordination process and data and caseload management.
- Strengthen and promote pathways to care for women identified 'at risk' of mental health concerns in the perinatal period.
- Support and establish appropriate communication and case management protocols for child health nurses, community health nurses, mental health services, lactation consultants, neonatal nurses, midwives and General

Practitioners to provide care to parents and babies in both the clinical and community setting.

- Support General Practitioners maintenance of knowledge and skills in providing care to healthy newborns and recognising early signs of disease.

Secondary

- Increase secondary neonatal capacity in metropolitan and rural areas outside the tertiary catchment.
- Support and develop level 5 (otherwise known as a level 2b) neonatal nurseries at Joondalup Health Campus (JHC) and Fiona Stanley Hospital (FSH).
- Progress the development of unit upgrades to Kalgoorlie, Broome, Bunbury and Albany hospital based on CSF service modelling and role delineation definitions.
- Establish a statewide coordinated neonatal bed management and transport service such that babies can stay closer to their home for secondary care.
- Support and facilitate the expansion of Baby Friendly Health Initiative (BFHI) accreditation for all maternity hospitals in WA.
- Increase accommodation that is culturally appropriate and safe for all women and families (including Culturally and Linguistically Diverse, Aboriginal and disabled) at secondary neonatal units for pre and post birth.
- Improve the integration of General Practitioners, midwives and child health nurses in the clinical and community setting to provide appropriate continuity of care for parents and their babies.
- Support ongoing training and maintenance of clinical neonatal skills of paediatricians in WA.

Tertiary

- Continue to support and develop integrated statewide neonatal services and facilitate greater responsiveness to the needs of sick babies and their parents.
- Authorise Women's and Newborns' Health Service (WNHS) as the centre of excellence that provides a statewide service, including policy advice, clinical guidelines and service coordination.
- Support the statewide directorate of neonatology to provide a centralised and coordinated leadership role and improve the collaboration with primary, secondary and tertiary neonatal services and care in WA.
- Support the establishment of a statewide neonatal committee to provide coordination of neonatal beds and care across WA and support the directorate of neonatology implement the Framework for Neonates.
- WNHN and the WNHS to develop statewide policies and clinical guidelines for babies in collaboration and consultation with key stakeholders and organisations. Guidelines should be sourced by other neonatal centres, viewed as guiding principles and may be adapted (as appropriate) for their hospital.
- Support the completion of the KEMH neonatal unit refurbishment by 2010/11.
- WNHS in consultation with CAHS to consider an increase in the number of beds at the new Children's Hospital.
- Support and increase culturally appropriate and safe accommodation available to women and their families near tertiary neonatal units for pre and post birth.

- Expand the Hospital in the Home (HITH) program to reduce length of stay and provide support and care to the family in the community setting.

Transport and Accommodation

- Develop a statewide criteria for transfers between levels of neonatal care and discharge to home.
- Strengthen the development the Neonatal Emergency Transport Service (NETS) for all areas of Western Australia (previously known as WANTS) to reach an equal and consistent standard to the Eastern states.
- Establish a centralised neonatal bed management system (that coincides with maternity bed management system) coordinated by NETS WA to ensure timely transfer of all infants who require tertiary care to the tertiary centre while facilitating appropriate referral to secondary centres.
- Develop culturally appropriate and safe transport and accommodation for parents of babies transferred, to maximise the utilisation of beds in secondary units and minimise inconvience to families.

Workforce Development and Training

- Expand Neonatal Outreach education and training to all health care personnel and workers who attend births and provide care to sick babies in WA.
- Support and provide access to training, skill maintenance and improvement programs (i.e. clinical rotations, distance learning and telehealth) to all health professionals providing care to sick babies in the health service and hospital settings.
- Support the training of health professional and expansion of programs for home visiting midwives and nurses during both pre and postnatal period.
- Strengthen the workforce and support the retention and reduce the turnover of health professionals providing care to sick babies in the health service and hospital settings, especially in the rural and remote setting.
- Improve health professional's communication with Aboriginal families requiring special care through ongoing and continual culturally sensitive education packages for doctors, nurses and midwives caring for neonates.

Quality of Care

- Develop a data collection for all peripheral neonatal units to enable the monitoring of quality and safety of neonatal care.
- Develop neonatal and obstetric clinical indicators for all public hospitals delivering maternity care in WA.

1. Introduction

The development of a framework for the care of neonates is timely and essential to coordinate the activities, improve services and ensure highest quality and safety for the care of neonates across WA. The framework for the care of neonates transcribes how, why and what services need to be provided to neonates in WA to ensure high quality and safe care for babies.

1.1 Key Objective and Outcomes

Key objectives and outcomes from the framework include:

- Improve neonatal outcomes statewide;
- Support the development of a sustainable workforce;
- Advocate for the rights of neonates in conjunction with but not withstanding those of the parents
- Improve collaboration and support with obstetric services and between all neonatal services.
- Inform and influence the planning of neonatal services statewide (including the primary, secondary and tertiary setting).

1.2 Methodology

The Women's and Newborns' Health Network Executive Advisory Group (WNHNEAG) (refer to Appendix 1) and the Neonatal Working Group (NWG) (refer to Appendix 2) are comprised of a range of multidisciplinary health professionals, non-government organisations, consumers and Aboriginal stakeholders. The NWG was established following the Neonatal Network Major Stakeholders Workshop in September 2007. The workshop highlighted priorities for neonatal care and discussed what is working well, what are the barriers and what are the priorities in neonatal care in WA. Priorities identified at the workshop included:

- Conduct a statewide service mapping and inventory exercise.
- Explore opportunities for alternative models of care.
- Establish and gain endorsement from the Director General for a state-wide neonatal service.
- Establish a statewide neonatal website.
- Improve and expand the Western Australian Neonatal Transport System now known as NETS WA.
- Collaborate with the Child and Youth Health Network to work with other government agencies to improve accommodation, transport and other support services for families at risk, with a specific focus on rural and remote, Aboriginal and Cultural and Linguistically Diverse (CaLD) groups.
- Reduce the incidence of non elective caesarean sections.
- Increase and improve staff attraction and retention.

The NWG formally established in February 2008. The working group's key priority has been to develop a framework for the care of neonates to assist and strengthen the tertiary service, expand secondary capacity and improve primary services for neonates in WA.

The development of the framework for the care of neonates has included the provision of expert advice and research from health professionals following preliminary consultation with the NWG, the WNHNEAG, the Office of Aboriginal Health (OAH), Child and Adolescent Health Service (CAHS), North Metropolitan Area Health Service (NMAHS) Obstetric and Neonates working group, South Metropolitan Area Health Service (SMAHS) Maternity Services Planning group, West Australian Country Health Service (WACHS) and the analysis and integration of various Commonwealth and state key publications and policies including:

- Improving Maternity Services: Working Together Across Western Australia. A Policy Framework 2008.
- Maternity and Newborn Services Map Report 2008.
- South Metropolitan Health Service Obstetric Services Review 2008.
- Our Children Our Future: A Framework for Child and Youth Health Services in Western Australia 2008-2012.
- Neonatal Network Major Stakeholders Workshop Report, September 2007.
- WA Health Clinical Services Framework (CSF) 2005-2015.
- A Healthy Future for Western Australians. Report of the Health Reform Committee. March 2004.
- Western Australian Statewide Obstetric Services Review. Discussion Paper April 2003.

2. The Current State of Play

2.1 Definitions

The following definitions have been modified from the Neonate Program Operational Directive from the Department of Health (DoH), WA[1].

2.1.1 Neonate

A **neonate** is any infant aged less than 28 completed days. Neonatal units may provide care for infants up to 6 months postnatally or two months of age corrected for prematurity.

2.1.2 Newborn

All babies in hospitals are admitted patients and are defined as either qualified or unqualified.

2.1.3 Qualified newborn

A **qualified newborn** is any newly born baby greater than 20 gestational weeks and less than 10 days old and who meets one of the following criteria:

- is accommodated in a special care nursery in a hospital approved by the Commonwealth Minister under section 3(2) of the Health Insurance Act 1973 for the purpose of the provision of special care. This related to a Level 2 Special Care Nursery (SCN) and Level 3 Neonatal Intensive Care Unit (NICU);
- remains in hospital without its mother;
- is admitted to hospital without its mother, or
- is the second or subsequent liveborn infant of a multiple birth, whose mother is currently admitted patient.

Note: In some other states with different funding models (i.e. Resource Allocation Model), some babies receive special care at the mother's bedside and may be classified as special care nursery outliers).

2.1.4 Unqualified newborn

An **unqualified newborn** is a baby under 10 days old who does not meet the criteria to be classed as a qualified newborn:

- is the first born of a multiple birth or is a single baby who stays in hospital with its mother for less than 10 days; and
- it is not admitted to a SCN in an approved hospital

2.2 Levels of neonatal nurseries/unit

WA Health has developed a WA Health CSF 2005-2015 which provides a strategic map for the DoH and Area Health Services and acts as a foundation for future development of a health care system. The CSF classifies the clinical services role delineations for neonatology between levels 1 to 6 which is consistent with the Eastern states. The CSF classification also integrates obstetric levels of care with the neonatology levels of care.[2]

The WNHN has collaborated with the Health Reform Implementation Taskforce and the WACHS for the revision of the CSF. Below are the revised role delineation

definitions for neonatology. Please refer to Appendix 3 for the matrix of the revised role delineation definitions for obstetrics and neonatology.

Traditionally neonatal nurseries have been classified as either level 1, 2a, 2b or 3. Level 1 (CSF level 1, 2 and 3) refers to routine care of babies in postnatal wards. Level 2 nurseries are located in secondary units with 2a (CSF level 4) providing low dependency care and 2b (CSF level 5) providing high dependency care. Level 3 (CSF level 6), otherwise known as a NICU is located in a tertiary centre.

2.2.1 Level 1 neonatal unit (CSF level 1, 2 and 3)

- Onsite Level 1 neonatal facilities
- Normal low-risk pregnancies and births and management of babies ≥ 37+0 weeks gestation with minimal complications (i.e. hypoglycaemia, infection screening etc)
- 24 hour onsite access to a health professional skilled in initiating neonatal resuscitation and accredited in neonatal resuscitation
- Phototherapy for physiological jaundice
- Telephone access to emergency care and transport for neonates

2.2.2 Level 2a neonatal unit (CSF level 4)

As above, and in addition:

- Onsite Level 2a neonatal facilities with low dependency patients and apnoea monitoring, low-level oxygen therapy (including monitoring) and nasal/oral-gastric feeding
- Paediatricians on-call 24 hours
- Low to moderate risk pregnancies and births and management of babies ≥ 34+0 weeks gestation with minimal neonatal complications
- Short term intravenous therapy available
- All patients are referred for management by attending paediatrician

2.2.3 Level 2b neonatal unit (CSF level 5)

As above, and in addition:

- Onsite Level 2b neonatal facilities with high dependency patients and provision of short-term mechanical ventilation (< 6 hours) pending transfer, nasal Continuous Positive Airway Pressure (CPAP) with facilities for arterial blood gas monitoring
- Non invasive blood pressure monitoring
- Access to clinical and diagnostic paediatric subspecialties
- Service led by neonatal paediatricians
- Paediatricians on-call 24 hours
- Paediatric registrar or above on site 24 hours
- Moderate to high-risk pregnancies and births and management of babies ≥ 32+0 weeks gestation with minimal complications
- Access to specialist Senior Registered Nurse (SRN)
- Role in post graduate medical and nursing education
- Access to clinical and diagnostic paediatric subspecialties
- May receive baby retrieval by NETS WA from Level 1 neonatal facilities (Level 2 or Level 3 hospital)

2.2.4 Level 3 neonatal unit (Neonatal Intensive Care Unit) (CSF level 6)

As above, and in addition:

- Onsite Level 3 Neonatal Intensive Care Unit (NICU) with high dependency patients and provision of medium-long term mechanical ventilation and full life-support
- Neonatal paediatricians on-call 24 hours
- High-risk, high dependency pregnancies and births
- Management of babies < 32+0 weeks gestation
- Undertakes neonatal surgery and care for complex congenital and metabolic diseases of the baby
- Coordinates statewide retrieval service
- Coordinates post graduate medical and nursing neonatal education
- Conducts neonatal research

2.3 Classification of maternity patients

Maternity patients are classified as normal risk (sometimes referred to as low risk), moderate risk and high risk. The following classifications are defined below [3]

- **Normal risk** implies the absence of any risk factors that may lead to a pregnancy complication(s) which would require the services of a specialist obstetrician. Most women are in this category and are appropriate to birth in a unit of any level, and could receive care from practitioners of any description including midwives, general practitioners or specialists. In general this category implies the birth at full term of a healthy neonate who does not require a paediatrician. These patients may deliver in CSF level 2 or 3 maternity units. In certain circumstances an operative birth by non-specialists may be appropriate e.g. the need for caesarean section does not always necessitate a move to moderate risk if appropriately-trained procedurals are available.
- **Moderate Risk** implies the presence of fetal or maternal risk factors which may adversely impact on a pregnancy outcome. Management by, or at least consultation with a specialist obstetrician is compulsory. The birth will usually be in maternity units of a least CSF level 4. Preterm birth may be anticipated but this should not be less than 32 weeks. Paediatric involvement is likely and should be available.
- **High Risk** patients have major fetal or maternal risk factors which will always require management by a specialist obstetrician, and frequently management by, or at least consultation with a subspecialist in maternal fetal medicine. A birth in a CSF level 6 unit will be indicated due to the potential need for neonatal intensive care facilities. In some cases a birth in CSF level 5 unit may be appropriate, depending on the availability of appropriate subspecialists for consultation, and if the birth at greater than 32 weeks is anticipated.

2.4 Burden of disease in WA

The WNHN collaborated with the Statewide Obstetric Support Unit (SOSU) in February 2008 to commence the Maternity and Newborn service map (MANSmap) project. The MANSmap project was initiated as a key priority for the implementation of maternity policy framework and aimed to identify the needs and improve the current understanding of the existing maternal and newborn services in WA. Of

importance, the MANSmap identified some problems with levels of neonatal care particularly the mismatch between levels of obstetric risk and the level of nursery facility. The following section includes statistics from the MANSmap, Perinatal Statistic Report 2006 and other WA Health sources.[4]

- **Rising birth rate:** Preliminary figures identified that in 2008 there were approximately 32,000 births in Western Australia. Overall there has been approximately a 19 percent rise in births since 2002 (24,782 babies) in comparison to 29,420 births in 2007.[5]
- **Increased birth rate for Aboriginal women:** In 2006 Aboriginal mothers represented 6.3% of women who gave birth and Aboriginal women had birth rates on average almost twice as high as non-Aboriginal women. Of births to teenage mothers, the proportion to Aboriginal mothers was six times greater than for non-Aboriginal mothers. These figures highlight major issues due to the association of the increased risk of premature birth and low birth weights to adolescent mothers[5].
- **Low birthweight:** Birthweight is an important factor affecting the survival of the baby. Two fifths of the perinatal deaths in 2006 were in babies with a birthweight less than 500 grams and more than three quarters were in the low birthweight category of less than 2,500 grams. There were 388 babies born as low pre-term (23-31 weeks gestation) in 2006. Of these, the majority were born in tertiary centre, reflecting high referral rates to King Edward Memorial Hospital (KEMH).[6]

Table 1. Birthweight distribution and Aboriginality of mother for births in WA, 2005

	Aboriginality of Mother				TOTAL	
	Aboriginal		Non-Aboriginal			
Birthweight (grams)	No.	%	No.	%	No.	%
<500	11	0.6	103	0.4	114	0.4
500-999	22	1.3	110	0.4	132	0.5
1000-1499	31	1.8	144	0.6	175	0.6
1500-1999	50	2.9	312	1.2	362	1.3
2000-2499	170	9.9	962	3.8	1132	4.2
< 2500	**284**	**16.5**	**1631**	**6.5**	**1915**	**7.1**
2500-2999	424	24.6	3987	15.8	4411	16.3
3000-3499	563	32.7	9223	36.5	9786	36.3
3500-3999	325	18.9	7694	30.4	8019	29.7
4000-4499	110	6.4	2367	9.4	2477	9.2
≥ 4500	16	0.9	368	1.5	384	1.4
TOTAL	**1722**	**100.0**	**25270**	**100.0**	**26992**	**100.0**

- **Place of birth:** Three-quarters (75.1%) of women who gave birth in 2006 provided their usual residential address as being within a metropolitan health region, while 24.8% reported their usual place of residence as within one of the seven non-metropolitan health regions, and 32 (0.1%) women were non-residents of WA. The majority (98.9%) of women gave birth in hospital and 194 (0.7%) women gave birth at home as planned. The remainder (0.4%) were unplanned births outside hospital. In total, 20.5% births were at KEMH, 39.5% in

other public hospitals and 38.5% were in private hospitals. Currently in WA, there are 30 hospitals providing public maternity beds. [5]

- **Neonatal units in WA:** The MANsmap highlighted that various hospitals have a poor knowledge of the definition of "level of nursery", inadequate neonatal unit facilities and equipment, and problems with doctors working on an availability basis rather than a dedicated on-call roster.[4]
- **Level 1 neonatal units:** Examples of Level 1 nurseries include: Busselton District Hospital, Carnarvon Regional Hospital, Denmark District Hospital, Esperance District Hospital, Kununurra District Hospital, Narrogin Regional Hospital and Warren River District Hospital.[4]
- **Activity of level 2 neonatal units:** Reporting of special care for newborn babies relates only to those who received care in Level 2 and/or Level 3 special care nurseries. The proportion of livebirths who received Level 2 and/or Level 3 nursery care in WA was 8.8%. The information regarding the occupancy rates of neonatal nurseries from a statewide perspective in WA is currently unavailable.[5]
- **Neonatal transfer:** The Neonatal Clinical Care Unit (NCCU) at KEMH and PMH provides the statewide transport service and coordinates the retrieval and back transfer of neonates throughout WA. This service is otherwise known as the NETS WA. In 2007, there were 621 primary retrievals (112 or 18% of these were from country WA). All retrievals were to the tertiary neonatal unit at Princess Margaret Hospital (PMH) and KEMH and the majority were for babies with respiratory distress, seizures, sepsis, surgical assessment or cardiac assessment. There has been an increase in proportion of babies transferred to the tertiary centre for management of common neonatal conditions, such as hypoglycaemia and jaundice due to workforce shortages in outer metropolitan and rural areas.
  - Of the metropolitan hospitals, most referrals come from JHC, St John of God (SJOG) Subiaco (40-50 each per year) with Peel Health Campus (PHC), Rockingham, Osborne Park and Armadale Hospitals, all referring significant number of babies approximately 20–30 per year per hospital. In addition, 123 babies were transferred between KEMH and PMH reflecting the limited imaging and surgical facilities for babies at KEMH. Country referrals to the tertiary centre were mostly from the regional centres of Bunbury, Kalgoorlie, Port Hedland and Derby.
  - NETS WA works in close cooperation with both St John Ambulance Service and the Royal Flying Doctor Service (RFDS) who provide road and air transport. Both services are currently under pressure and are increasingly finding it more difficult to respond in a timely fashion to requests for newborn transport.
- **Activity of level 3 neonatal units:** In 2007, there were 1741 admissions to the KEMH and 667 admissions to PMH. The average occupancy was 88% and 84% respectively at KEMH and PMH with peak occupancies over 100%. In 2009, the neonatal bed occupancy is regularly over 100% and continual emergent responses (otherwise known as code yellow/demand) have been recorded due to over capacity.
- **Gestational age and source of admission:** Approximately 65% of admissions to PMH are from primary and secondary units with an additional 17% transferred from the Emergency Department at PMH. All pregnancies with significant antenatal risk factors or fetal abnormalities are transferred to King

Edward Memorial Hospital where babies are delivered and require secondary and tertiary care. The number of antenatal transfers to the tertiary centre is steadily increasing annually.

- **Newborn screening test (previously known as Guthrie test):** Currently all newborns in WA have a blood test taken at 48 -72 hours of age to screen for diseases or conditions for which early treatment reduces later death or disability. These conditions include phenylketonuria, hypothyroidism, galactosaemia, cystic fibrosis, amino acid disorders, fatty acid oxidation disorders and organic acid disorders [7].
- **Congenital deafness:** Currently neonatal hearing loss screening program covers only 50% births in WA. Only some metropolitan public and private maternity hospitals screen newborns for deafness. Without newborn screening, three quarters of children with hearing loss are still undiagnosed by 12 months and the probability of normal language and cognitive development is greatly diminished. Overall the benefit of early detection and treatment is significant. [8, 9]
- **Neonatal mortality:** The neonatal mortality rate in 2002 – 2004 was 2.2 per 1,000 births. The leading categories of neonatal death by Perinatal Society of Australia and New Zealand Neonatal Death Classification (PSANZ-PDC) were prematurity 40.4% (37% in 2000-01), congenital abnormality 22.9% (28% in 2000-01) and perinatal infection 7.2% (11% in 2000-01)[6].
- **Preterm birth rate:** Preterm birth (less than 37 weeks gestation) occurred for 8.9% of the total births in 2005. The incidence of preterm birth has increased from 6.4% in 1990.[5]
- **Leading causes of neonatal death and post-natal death:** The leading causes of neonatal death are prematurity and congenital abnormality. The leading causes of post-neonatal deaths are sudden infant death syndrome, congenital abnormalities and “other” which includes injuries and indeterminate causes of death.[6]
- **Maternal behavioural factors:** Stillbirth and infant mortality rates are significantly higher in mothers who smoked, with the greatest difference being in the post-neonatal mortality rates which was five fold higher in smoking mothers. In addition, obesity and diabetes mellitus are major contemporary health problems and increasing in prevalence which may lead to an increase in perinatal deaths. Population health benefits are associated with improved living conditions, good nutrition and avoidance of harmful substance use. These factors remain challenges towards improving health outcomes for those living in disadvantaged social circumstances, particularly for many Aboriginal women. [6] In addition, maternal mental illness has been linked as a risk factors for stillbirth, neonatal death and poor outcomes.[10]
- **Identified areas for improving medical management:** Key areas where improved medical management may improve outcomes include: fetal growth restriction, labour, diabetes and hypertension in pregnancy, and neonatal sepsis.[6]

2.5 WA Neonatal bed implementation group (WANBIG)

The West Australian Neonatal bed implementation group (WANBIG) has recently been established following a statewide emergency response “to neonatal bed occupancy”. WANBIG has been established to implement immediate reforms to increase neonatal beds as outlined in the Framework for the care of Neonates in WA.

The purpose of WANBIG is to facilitate the development of neonatal beds and capacity in secondary hospitals in WA over the next six months. In August 2009, the members from both the WANBIG and NWG will amalgamate to form a new neonatal committee to provide coordination of neonatal beds and care across WA.

3. Current Service Provision for Neonates

3.1 Primary (CSF level 1, 2 &3)

Primary services are the first point of contact with the health system, such as general practice, hospital emergency departments and pharmacies[11].

- Community based care to support people within their communities
- Services with an emphasis on illness and injury prevention and early detection, such as maternal and child health programs and population health programs.

Most maternity hospitals in WA provide primary neonatal care CSF level 1, 2 and 3. The transition for women after birth to community health services and social networks are imperative. Various country health services have had a considerable increase in population growth leading to high demands on child health services resulting in limited resources specifically for antenatal care and early child health home visits. This has lead to high demand on existing child health services especially in the South West, Kimberley and the Pilbara.

The current ambulatory and community services, non-government organisations and health professionals available to women and babies post birth in WA include:

- Home visits by midwives (this service is limited and variable).
- Child health nurses.
- Hospital in the home (HITH) provided by PMH and KEMH
- KEMH NICU home visiting nurse
- Community Health staff
- Allied Health professionals
- Community midwives (Community Midwifery Program)
- Women and Newborn Drug and Alcohol Service (WANDAS) clinic
- Childbirth and Mental Illness (CAMI) clinic
- WA Perinatal Mental Health Unit (WAPMHU)
- Mother Groups e.g. Australian Breastfeeding Association
- Community services
- Consumer information centres and websites

WA has a limited newborn hearing screening program for babies in the community. The current program covers 50% of births and is confined to certain hospitals (public and private) in the metropolitan area. There are currently equity issues in the program, with accessibility to the service dependent on place of birth and/or ability to pay. The advancements in technology and training programs for non-professional personnel have made universal screening a feasible service.[9]

The Kimberly, Pilbara, Goldfields, and Midwest have a high proportion of Aboriginal people with a disproportionate level of poor health, particularly maternal and neonatal health outcomes for at risk groups. The WNHN is working with various stakeholders and agencies such as WA Health Area Health Service planners, OAH, Council of Australian Government, CAHS and Institute of Child Health & Research to improve maternity services for Aboriginal families based on research evidence and successful specific models of care that have proven benefit in reducing Aboriginal perinatal mortality and morbidity.

The Adolescent Clinic at KEMH provides intense obstetric, midwifery, social work and psychological support in the perinatal period (including postnatal checks and intensive adolescent midwifery home visiting) to adolescents up to the age of 18 years. This patient group includes high percentages of CaLD and Aboriginal young women. Specific Aboriginal ambulatory and community services currently available to women up to 6 weeks post birth in WA include:

- Adolescent mothers support service (CAHS).
- Birth to school Aboriginal program (CAHS).
- Rockingham and Peel Hospitals.
- South Coastal Women's Health Services (SCWHS)
- Aboriginal Medical Services (AMS): Ord Valley, Ngangganawili, Puntukurnu, South West, Wirraka Maya and the Ngaanyatjarra Health Service.
- Aboriginal health workers (AHW), counsellors and educators.
- Strong women, Strong babies, Strong culture program: Pilbara, Kimberley and Midwest.
- Core of Life: Peel, Rockingham and Kwinana (P.A.R.K) regions.
- WAPMHU.

3.2 Secondary (CSF level 4 & 5)

Secondary services are provided by medical specialists who generally do not have first contact with patients. Secondary medical care is the medical care provided by a physician who acts as a consultant at the request of the primary provider[12].

Current secondary neonatal services are level 2a and 2b neonatal nurseries in WA. The licensed level 2 neonatal nurseries (CSF level 4) in WA include:

- **Public:** Bunbury Regional Hospital (BRH), Derby Regional Hospital (DRH), KEMH, Port Hedland Hospital (PHH), PMH and Swan Health Service.
- **Private:** Attadale Private Hospital (APH), Glengarry Private Hospital, JHC, Mercy Private Hospital and SJOG (Bunbury, Murdoch and Subiaco).

The number of beds registered with the licensing standards and review unit, Department of Health, WA 2008 is noted in Table 2 below.

Currently the activity in most units is below capacity due to workforce shortages although exceptions are noted at KEMH, PMH and SJOG Subiaco. Regional Centres in the country have difficulty attracting and retaining trained staff especially as the workload may be spasmodic.

The activity of the neonatal units is not reflected accurately in the bed numbers and for some units the number of beds stated is incorrect. KEMH has 60 level 2 beds and PMH has 15 level 2 beds. An example of nursery 2 occupancy rates in a secondary unit is JHC where the occupancy rates have risen from 56% in 2006/2007, 61% in 2007/2008 and the current occupancy rate of 80% in 2008/2009.

Geraldton and Kalgoorlie hospital provide some secondary neonatal care although they are not listed as licensed level 2 nurseries. There are also a number of sites including Broome, Kalgoorlie, Bunbury and Albany are undertaking facility upgrades including the development of neonatal nurseries. In addition, Peel Health campus provides some limited level 2 capacity.

Table 2. Number level 2 units and beds licensed and inspected by the Commonwealth in WA.

Public Hospitals	Last Inspection date	Next inspection date	Number of beds
Bunbury Regional Hospital	Sept 2005	2008	10
Derby Regional Hospital	March 2007	2011	4
King Edward Memorial Hospital	March 2007	2011	40
Port Hedland Hospital	March 2007	2011	1-2
Princess Margaret Hospital	March 2007	2011	10-12
Swan Health Service	August 2005	2008	2
Private Hospitals	**Last Inspection date**	**Next inspection date**	**Number of beds**
Attadale Private Hospital	Feb 2007	2011	3
Glengarry Private Hospitals	Feb 2007	2011	4
Joondalup Health Campus*	Feb 2007	2011	12
Mercy Private Hospital	Feb 2007	2011	4
SJOG – Bunbury	March 2007	2011	4
SJOG – Murdoch	March 2007	2011	3
SJOG – Subiaco	March 2007	2011	18

* This hospital provides care to both public and private babies.

3.3 Tertiary (CSF level 6)

Tertiary healthcare is specialized consultative care, usually on referral from primary or secondary medical care personnel, by specialists working in a centre that has personnel and facilities for special investigation and treatment[13].

The NCCU is located over two campuses, one at KEMH and the other at PMH. The NCCU provides all neonatal tertiary services for the state. There are approximately >2,500 neonates admitted to the unit each year. KEMH provides an 80 bed neonatal unit (with 20-30 ventilated beds) for predominantly inborn preterm or sick babies. Outborn babies and all those requiring surgery are admitted to the 25 bed neonatal unit at PMH. Both units are administered and funded through NMAHS.[14] In early 2008, the Department of Treasury and Finance approved and granted $10,000,000 to redevelop and expand the KEMH neonatology units to improve facilities and increase bed capacity.

3.4 Outreach Services

NETS WA is a statewide transport services for sick neonates and young infants. This service consists of two teams of medical and nursing staff trained in the stabilisation and transportation of babies requiring referral to a tertiary hospital. NETS WA also provides a 24 hour advice line. The service operates with St John Ambulance and the RFDS. NETS WA provides service as far north as Geraldton. Further north of Geraldton, the paediatricians from Port Hedland hospital may transport sick

neonate(s) in collaboration with the RFDS and NETS WA. This may have a flow on impact on the ability to sustain a neonatal service within the Pilbara region.

There has been a steady increase in total number of transports especially from the South West of the state and Southern Metropolitan Hospitals since 2001. The NETS WA team use a private jet (Careflight) or commercial (Qantas) for interstate transfers (i.e. Melbourne, Sydney, Brisbane) which are necessary for infants requiring complex cardiac surgery.

3.5 Workforce Development and Training

The MANsmap identified that WA has a widespread shortage of midwifery, nursing and medical workforce in maternity and neonatal services. The MANSmap identified that 16 maternity hospitals would benefit from additional nursery staff and training opportunities[4]. Excluding KEMH, there are approximately 40 paediatricians working across the other 29 maternity public hospitals. The MANSmap identified at least 5 neonatal units that would benefit from additional paediatric medical staff.[4]

The high costs of rental in the country areas places restriction and limitation on the retention of staff. WACHS has submitted numerous proposals seeking to support improvements in accommodation and is actively progressing improvements in this area. Low occupancy of regional neonatal nurseries may lead to decreased job satisfaction and retention issues. In addition, access for staff to training sessions for the development of appropriate communication skills with parents regarding adverse outcomes and complex neonatal and medical circumstances is needed.

NCCU has a Department of Outreach Education which facilitates and conducts regular multidisciplinary courses in neonatal resuscitation and acute care at various locations including KEMH and other metropolitan and rural hospitals with maternity and neonatal facilities.

3.5.1 Education and Training

The education and training available to current health professionals' providing neonatal care includes:

- Diploma of Child Health (Medical)
- Advanced Neonatal - Royal Australasian College of Physicians (Medical)
- Advanced Paediatrics - Royal Australasian College of Physicians (Medical)
- Registered Nurse Postgraduate (NICU)
- Enrolled Nurse Postgraduate (Level 2 neonatal unit)
- Neonatal upskilling (Nursing)
- Bachelor of Science Midwifery (Midwifery)
- Postgraduate Diploma of Midwifery (Midwifery)
- Certificate of Family and Child Health Nursing (Nursing)
- Diploma of Family and Child Health Nursing (Nursing)
- Multidisciplinary: Neonatal Resuscitation Program, Stabilisation and transport for neonates, and neonatal emergencies.
- Research (UWA)

3.5.2 Clinical Guidelines

The NCCU at KEMH has developed Neonatal Clinical Care Guidelines which WA maternity hospitals can adopt and adapt to their own site and/or Area Health Service.[15] These guidelines are available on the internet on http://kemh.health.wa.gov.au/services/nccu/guidelines/.

3.6 Quality of Care

3.6.1 Clinical Indicators

- **Australian and New Zealand Neonatal Network (ANZNN)**: The network has established clinical indicators that are collected throughout Australia and New Zealand for all babies less than 33 weeks which are admitted to neonatal intensive care and special care units. These clinical indicators include neonatal survival and incidence of chronic lung disease, necrotising enterocolitis, sepsis, intraventricular haemorrhage and retinopathy due to prematurity. The network provides each hospital with a report containing the mean and raw data.
- **The Australian Council of Healthcare Standards (ACHS):** The following three clinical indicators are specific measurements for neonatal outcomes:
  - Term babies born with an apgar score of four or below at five minutes
  - Preterm babies born with an apgar score of four or below at five minutes
  - Term babies transferred to a NICU other than for congenital abnormalities.
- **Women's Hospitals Australasia (WHA):** Regular surveys are conducted amongst member hospitals of WHA on a range of clinical indicators relating to maternity care. The ranges of clinical indicators collected are dynamic and reviewed annually. Current neonatal clinical indicators collected includes: neonatal mortality, hypoxic-ischemic encephalopathy (HIE) grades 2 or 3 and apgar score.
- **Neonatal follow up program**: In WA all babies less than 33 weeks are followed until 12 months of age. This includes monitoring the babies' growth, neurological development and behaviour. Babies less than 29 weeks gestation are followed up until school age. Incidence of intellectual impairment, cerebral palsy, hyperactivity, blindness and deafness are monitored during follow up.
- **Growth and neonatal development outcomes**: All neonates undergoing surgery or admitted with HIE have their growth and development followed until 12 months of age.

3.6.2 Audits

- Perinatal Statistics Annual Report[5]
- Report of the Perinatal and Infant Mortality Committee of WA[6]
- Root cause analysis of serious adverse events
- Medical Advisory Committee KEMH - annual report from NCCU (KEMH and PMH) of activity, clinical indicators, adverse events, audits and risk management.
- Australia and New Zealand Neonatal Network (tertiary care)

3.6.3 Committees

- Perinatal and Infant Mortality Committee[6]
- Hospital based Morbidity and Mortality Committee
- Neonatal Clinical Review Committee (KEMH/PMH)

4. Future Service Provision for Neonates

Western Australia is fortunate in having one centralised coordinated tertiary service for neonatal care. Some states in Australia have fragmented services that at times compete with each other. The recent report of the special commission of enquiry into acute care services in NSW public hospitals (otherwise known as the Garling report 2008) recommends that responsibility for acute care services for newborns and children be taken over by a newly created body which is a single health service for the whole state. The report states that the two early tasks of such a single health service would be to organise all hospital facilities such that newborns and children in rural and remote areas get as good care as those in central metropolitan areas, and plan a single new tertiary and quaternary level children's hospital to service the whole state[16].

The recommended future service provision for neonates in Western Australia is to maintain a central, unified and coordinated care approach for newborns, with strong support provided from the centralised tertiary service to all secondary and primary facilities. This model is commonly referred to as the 'Hub and Spoke model'. The following chapter highlights the support in WA for one tertiary centralised neonatal service that provides statewide coordination and unification of all secondary and primary neonatal services. In addition it supports the development of both secondary and primary neonatal services to ensure that care is provided and available in the community for women and their families.

4.1 Primary (CSF level 1 and 2)

- Health services to maintain safety standards in primary care setting by endeavouring to have two appropriately qualified and credentialed health care workers are at every birth.
- Area Health Services to provide training and support to ensure that all health professional providing newborn care are trained in neonatal resuscitation.
- Health services to engage families and community groups in the antenatal period to promote and raise awareness of a healthy diet and lifestyle, reduce the consumptions of alcohol, tobacco and drugs during pregnancy and detect, prevent and manage disease.
- Develop and improve social and community maternity services to enhance practical, social and emotional support provided to women and their families in both the antenatal and postnatal period. A significant investment in prenatal, antenatal and postnatal care has been shown to reduce morbidity and mortality and a high level of investment in best practice primary health care is required.
- Area Health Services to collaborate with General Practitioners, midwives and community services to improve access and increase attendance at antenatal services for women and their families across the state in order to improve antenatal care and neonatal outcomes.
- Area Health Services to screen all women during the antenatal and postnatal period using the Edinburgh Postnatal Depression Scale (EPDS) to identify women at risk of mental health problems and refer if appropriate for assessment and treatment.

- Area Health Services to support the expansion of child health services in order to improve the provision of community services to women and their families.
- Area Health Services to develop specific and culturally appropriate antenatal services for Aboriginal women and their families.
- Area Health Services to support and develop neonatal hearing screening (including appropriate assessment and management services) for all neonates in WA using automated auditory brain stem response.

4.2 Secondary (CSF level 3, 4 and 5)

- Area Health Services, WNHN and WNHS to identify gaps in the secondary services and support the reconfiguration of services to increase secondary capacity that is linked with development of obstetric services. Specifically:
  - SMAHS to commission the establishment of level 4 neonatal services at Armadale, Kaleeya and Rockingham hospitals and increase the number of neonatal beds at Fremantle Hospital from 4 to 8-10 in the short to medium term (within the next 12 – 18 months).[17] FSH stage 1 will include a CSF level 5 obstetrics and neonatal paediatrics with 18 neonatal beds. FSH neonatal services will replace the neonatal services at Kaleeya and Fremantle Hospital.
  - NMAHS to increase capacity in level 4 and 5 neonatology with appropriate expansion of the workforce, including 24 hour paediatric rosters at each site. NMAHS to develop a level 5 neonatal unit for the population requirements in the medium to long term at JHC.
  - WACHS to progress neonatal unit developments and/or unit upgrades to Kalgoorlie, Broome, Bunbury and Albany hospitals based on service modelling and current proposals.
- Area Health Services to provide and develop culturally appropriate and safe accommodation facilities for families when a baby is transferred from primary to secondary care for women and their families' pre and post birth.

Table 3. Recommendations for neonatal beds in 2007/08 and 2011 in Western Australia

Area Health Service	Public hospitals / CSF classification level for neonatology	Number of beds in 2007/2008	Number of beds in 2009	Number of beds in 2011	Number of beds in 2015
NMAHS	King Edward Memorial Hospital / Level 6	60	80	100	100
	Princess Margaret Hospital / Level 6	25	25	25	30
	Swans District Hospital / Level 4	2	4	4	
	Osborne Park Hospital / Level 4	0	3	4	
	Joondalup Health Campus / Level 5	8	12	12	
SMAHS	Rockingham / Level 4	4	4	4	
	Fremantle / Level 4	4	8-10	8-10	0
	Kaleeya / Level 4	0	4	4	0
	Armadale / Level 4	0	4	4	
	Fiona Stanley Hospital / Level 5	0	0	0	18
	Peel Health Campus / Level 2/3	1	1	1	
WACHS	Bunbury / Level 4	8	8	8	
	Port Hedland/Level 4	1	1	3	
	Derby / Level 4	4	4	4	
	Kalgoorlie/ Level 2/3	6	2*	2	
	Geraldton/ Level 2	4	2*	4	
	Broome/ Level 2/3	None	4*	4	
	Albany/ Level 2/3	1	2*	2	

***** Kalgoorlie, Geraldton, Broome and Albany hospital may increase to a level 4 between 2009 to 2010 dependent on staffing.

4.3 Tertiary (CSF level 6)

- WA Health to support and expand the strengths and efficiencies of the centralised tertiary and retrieval services and expansion of secondary services in WA. WNHS to foster and formalise a statewide referral and receiving system for babies in collaboration with Area Health Services to improve transfer, levels of care, safety and quality of care for babies.
- WNHS to support the expansion of NETS WA to provide a statewide emergency and retrieval service.
- WNHS to provide a statewide role in workforce training and education for all neonatal units in WA.
- WNHS to provide a statewide role in clinical policy and guideline development in collaboration with WNHN and CAHS for all neonatal units in WA. Policies and guidelines should be sourced by other neonatal centres, viewed as guiding principles and may be adapted (as appropriate) for their hospital.
- CAHS in collaboration with WNHS to consider an increase the number of beds in the proposed new Children's Hospital (co-located at Sir Charles Gairdner

Hospital).[18] The increase in beds would be essential if neonatal paediatrics is not included in Phase I FSH.

- WNHS and PMH to develop accommodation facilities for families when a baby is transferred to the tertiary centre.
- WNHS and PMH to develop appropriate accommodation facilities for Aboriginal and rural women and their families commuting to Perth for neonatal care.
- WNHS to support and develop Aboriginal health care workers in the provision of neonatal care.
- WNHS to support, develop and implement Aboriginal cultural training package for health professionals providing neonatal care.
- WNHS in collaboration with CAHS to support and expand the use of telehealth to facilitate and access subspecialty care in both the secondary and primary setting.

4.4 Patient flow for babies requiring neonatal care

Refer to Appendix 4. Patient flow chart based on neonatal care required in WA.

4.5 Workforce Development and Training

- WA Health to develop attractive workforce models to recruit and retain medical, midwifery, nursing and allied health staff.
- WNHS in collaboration with CAHS to support and develop paediatricians' skill set in neonatal primary and secondary care.
- WNHS to support and develop career pathways, training and upskilling for nurses in neonatal care.
- WNHS in collaboration with Area Health Services to develop and strengthen neonatal services, including joint appointments and alternative models of care to attract and retain staff and maintain clinical skills.
- WNHS and WACHS to support long distance learning and telehealth to improve access to training and development opportunities for all health professionals in Western Australia.

4.6 Best Practice Service Provision and Workforce Requirements for the Care of Neonates

WA Health needs to improve, expand and reconfigure various neonatal unit facilities in Western Australia.[4] The number of beds required for level three neonatal intensive care (CSF level 6) depends on the number of babies who require intensive care, the average length of stay and the specified occupancy level.

A report by the Super Speciality Services Subcommittee of the Australian Health Ministers' Advisory Council in December 1990, identified that assuming 2 to 3 percent of all live births require such care, average length of stay is 11.5 or 13 days and occupancy rates are 75 or 80 percent[19]. The report highlighted the minimum standards recommended by each state. In Western Australia the following recommendations were made based on 85% occupancy in the NICU:

- In a CSF level 4 and 5 (secondary hospital) there should be a minimum of 3 beds per 1000 live births.
- In CSF level 6 (tertiary hospital) there should be a minimum of 1.3 Intensive care beds per 1,000 live births.

These calculations were formulated nearly two decades ago. Neonatal survival has improved significantly in the past two decades for very preterm infants who occupy NICU beds for a longer duration. In the last decade there has been an increased use of nasal CPAP rather than ventilation which has converted the level of patient care for many neonates from CSF level 6 to level 5 (tertiary to secondary).

Bed numbers should aim for an average occupancy rate of 75% to allow for emergencies.[20] Currently private and public neonates requiring tertiary care are admitted to KEMH and PMH neonatal units in WA. Currently there are 20 tertiary beds at KEMH although the unit frequently functions with a 30 tertiary bed capacity. Following the NICU refurbishment at KEMH there will be 30 tertiary beds available in 2011. There are currently 10 tertiary beds available at PMH and it is anticipated that these beds will remain in the new Children's Hospital. Due to the increasing number of births per year the quantity of tertiary neonatal beds should be increased to meet the future demands.

Consideration of geography is essential when planning neonatal beds in WA as vast distances and delays in transport require regional neonatal units to provide care for sick babies. It is likely that more secondary beds will be required per 1,000 births. Future planning of neonatal beds in WA should be based on the following calculations: a minimum of 4.6 secondary beds per 1,000 births in a level 4 and 5 CSF (secondary hospital) and a minimum of 1.3 intensive care beds per 1,000 births in a level 6 CSF (tertiary hospital).

Note: These recommended calculations are of lower than the rates used in the Eastern states.

4.6.1 Neonatal equipment required according to level of care [21]

The following listings for appropriate equipment in a neonatal nursery are consistent with other states and territories in Australia.

4.6.1.1 Level 1 (CSF level 1, 2 and 3)

- Equipment for resuscitation
- Incubator
- Venous access and emergency intravenous infusion
- Equipment suitable for hand ventilation
- Oxygen therapy
- Oxygen saturation monitoring with a neonatal probe
- Blood glucose monitoring
- Portable X-ray facilities
- Equipment suitable for drainage of a pneumothorax
- Phototherapy

4.6.1.2 Level 2 low dependency (CSF level 4)

As above, and in addition:

- Apnoea monitor
- Non-invasive blood pressure monitoring
- Headbox
- Mechanical ventilator
- Oxygen analyser
- Phototherapy unit

- Equipment for tube feeding

4.6.1.3 Level 2 high dependency (CSF level 5)

As above, and in addition:

- Radiant heater with servo-control
- Facilities for heater humidification of gases
- Cardiorespiratory monitoring
- Intra-arterial blood gas monitoring
- Equipment for Continuous positive airway pressure (CPAP)
- Access to resources for screening for complications of prematurity, including cranial ultrasounds and ophthalmological review
- Equipment for safe infusion of intra-arterial fluids.

4.6.1.4 Level 3 (CSF level 6)

As above, and in addition:

- Equipment for assisted ventilation must include alarm systems to monitor gas supply failure and breathing system disconnection and humidification with monitoring of inspired temperature and high temperature alarms
- An intra-hospital transport system, including mechanical ventilation
- Equipment for specialised diagnostic or therapeutic procedures to be available when clinically indicated and to support the delineated role of the unit.
- Facilities for preparation of parenteral nutrition.

4.6.2 Space allocation for neonatal units

Guidelines on the sizes of bed bays have been reviewed from the United Kingdom, Canada, New Zealand, United States of America and Australia and the general international consensus are noted below in Table 4 [21]

Table 4. Sizes of bed bays based on the level of the neonatal unit

Level of unit	Size of bed bays
Level 3 (CSF level 6)	14m² *
Level 2 High Dependency (CSF level 5)	12m²
Level 2 Low Dependency (CSF level 4)	10m²
Level 2 Long Term Care (CSF level 4)	12m²

*In general, 2 to 4 SCN beds are required for each NICU bed.

The following areas exclude centre aisles between facing beds, hand basins and any additional storage or workstation included in a room. Each bay should have a distinct "baby" zone and "parent" zone.

4.6.3 Staffing neonatal units

- A baby requiring CSF level 3 and 4 care will require a nurse to patient ratio 1:4 and an attending paediatrician.
- A baby requiring CSF level 5 and 6 care will require a nurse to patient ratio 1:2 or if critically unwell 1:1 and a neonatal paediatrician, paediatricians and paediatric registrars.
- Access to mental health worker and allied health professionals (especially social workers and dieticians).

In addition refer to Appendix 3. WA Health Revised Clinical Services Framework.

4.7 Evaluation

- Improve accountability and transparency of all public obstetric and neonatal units by developing key performance indicators and systems to facilitate data collection.

5. Key Recommendations

The following recommendations are consistent with strategies, objectives and recommendations of the Maternity Policy Framework, the WNHN and Reid Report.

5.1 Primary

- Area Health Services to support initiatives to improve antenatal care and both access and attendance to antenatal services for:
  - Aboriginal women such as Boodjari Yorgas (SMAHS), South Coastal Women's Health Service (SMAHS), Derbarl Yerrigan (NMAHS) and Maternity Group Practice (NMAHS).
  - Medium to high risk women especially those in lower socio economic situations.
- Area Health Services to support public health programs for pregnant women that promote healthy diet (i.e. increasing folate intake) and avoidance of harmful substance use (i.e. smoking, alcohol and drugs) to prevent and reduce the incidence of congenital abnormalities.
- Area Health Service to support and ensure that all health professionals and/or health care workers, who are in attendance at births and specifically have a responsibility for caring for the newborn are trained and accredited in neonatal resuscitation.
- Area Health Services to support and ensure that health professionals and health care workers to have an adequate understanding of the mental health issues affecting parents which may impact on neonatal outcomes. In addition, appropriate pathways to care should be identified, promoted and developed to care for both support and mental health treatment.
- Area Health Services to support and develop neonatal hearing screening (including appropriate assessment and management services) in the community for all neonates in WA using automated auditory brain stem response.
- Area Health Services to strengthen pathways to care for women identified as "at risk" of mental health concerns in the perinatal period.
- Area Health Services to facilitate better integration with community services to improve the support provided to women and their families pre and post discharge through improved communication protocols, care coordination process, case and data management protocols, pathways to care for access to allied and mental health services and co-location of clinical and community services.
- Area Health Services to support and develop a statewide midwifery and nursing home visiting program and associated promotion of the service to decrease a newborns length of stay and improve the provision of care and support for women and their families in the community following discharge.
- Area Health Services to improve integration between child health nurses, community health nurses, home visiting midwives, mental health services, lactation consultants, neonatal nurses and maternity services, providing antenatal and postnatal care to women and their families in the community through improved communication protocols, care coordination process and data and caseload management (i.e. Community health perinatal project).

- Area Health Services to support and establish appropriate communication and case management protocols for child health nurses, community health nurses, mental health services, lactation consultants, neonatal nurses, midwives and General Practitioners to provide care to parents and babies in both the clinical and community setting.
- Area Health Services to support General Practitioners maintain knowledge and skills in providing care to healthy newborns and recognising early signs of disease.

5.2 Secondary

- Area Health Services to support the WNHN initiative to facilitate the expansion of BFHI accreditation for all maternity hospitals in WA.
- Area Health Services to increase secondary neonatal capacity (level 4 and 5) in metropolitan and rural areas outside the tertiary catchment. The following recommendations are provided for each Area Health Service:

  NMAHS:

  - Increase the number of beds at JHC, Swans District Hospital and develop a neonatal unit at Osborne Park Hospital.
  - Support and develop the infrastructure and workforce at JHC to meet criteria for a level 5 (otherwise known as a level 2b) neonatal unit.

  SMAHS:

  - Increase the number of beds at Fremantle Hospital and Health Service, recommission the neonatal unit at Armadale Hospital and develop a neonatal unit at Kaleeya Hospital.
  - Relocation of maternal and neonatal paediatric care from both Kaleeya and Fremantle Hospitals to FSH in Stage 1. Relocation would improve access for women and their families to emergency care, anaesthetic and paediatric staff, radiology and pathology services and provide an intensive care back-up for high risk pregnant women in SMAHS.

  WACHS:

  - Progress the development and/or unit upgrades to Kalgoorlie, Broome, Bunbury and Albany hospital based on CSF service modelling and role delineation definitions.
- Area Health Services to establish and support a statewide coordinated neonatal bed management and transport service such that babies can stay closer to their home for secondary care.
- Area Health Services to support and increase accommodation that is culturally appropriate and safe for all women and families (including Culturally and Linguistically Diverse, Aboriginal and disabled) at secondary neonatal units for pre and post birth.
- Area Health Services to improve the integration of child health nurses, midwives and General Practitioners in the clinical and community setting to provide appropriate continuity of care for parents and their babies.
- Area Health Services to support the ongoing training and maintenance of clinical neonatal skills of paediatricians.

5.3 Tertiary

- WNHS to continue to support and develop integrated statewide neonatal services and facilitate greater responsiveness to the needs of sick babies and their parents.
- WA Health to recognise WNHS as the centre of excellence that provides a statewide service, including policy advice, clinical guidelines and service coordination.
- WA Health to support the statewide directorate of neonatology to provide a centralised and coordinated leadership role and improve the collaboration with primary, secondary and tertiary neonatal services in Western Australia. The role would also provide advocacy and support to strategic and operational planning for the development of workforce and infrastructure.
- WA Health support the establishment of a statewide neonatal committee to provide coordination of neonatal beds and care across WA and support the directorate of neonatology implement the Framework for Neonates and improve the collaboration of primary, secondary and tertiary neonatal services in WA. The committee would be a amalgamation of the members from the Neonatal working group and the WA Neonatal bed implementation group and chaired by the directorate of neonatology
- WNHN and the WNHS to develop statewide policies and clinical guidelines for babies in collaboration and consultation with key stakeholders and organisations (i.e. CAHS). Guidelines should be sourced by other neonatal centres, viewed as guiding principles and may be adapted (as appropriate) for their hospital.
- WNHS to complete the refurbishment of the neonatal unit at KEMH by 2010/11.
- WNHS in consultation with CAHS to consider an increase in the number of beds at the new Children's Hospital.
- WNHS to increase culturally appropriate and safe accommodation available to women and their families near tertiary neonatal units for pre and post birth.
- WNHS to expand the HITH program to reduce length of stay and provide support and care to the family in the community setting.

5.4 Transport and Accommodation

- WNHS to develop a statewide criterion for transfers between levels of neonatal care and discharge to home.
- WA Health and WNHS to support the development of NETS WA to reach an equal and consistent standard to the Eastern states (i.e. NSW and Victoria). Fund raising, in addition to state Government funding will facilitate the expansion of the services and engage the community in the development.
- WNHS and NETS WA to establish a centralised neonatal bed management system (that coincides with maternity bed management system) to ensure timely transfer of all infants who require tertiary care to the tertiary centre while facilitating appropriate referral to secondary centres. A paediatrician in a secondary hospital will need to accept the patient and approve the transfer before transport is organised.
- WA Health and WNHS to develop culturally appropriate and safe transport and accommodation for parents of babies transferred, to maximise the utilisation of beds in secondary units and minimise inconvience to families.

5.5 Workforce Development and Training

- WNHS and the Area Health Services to support and expand Neonatal Outreach education and training to all health care personnel and workers who attend births and provide care to sick babies in WA.
- Area Health Services to provide access to training, skill maintenance and improvement programs to doctors, nurses, midwives and allied health staff including access to education packages. This may include clinical rotations, best practice learning opportunities, e-learning, video-conferencing and satellite programs.
- Area Health Services to support the retention of workforce providing care to babies including the provision of accommodation assistance where the cost of home rentals are high.
- Area Health Services to support the WNHN initiative to improve health professionals communication with Aboriginal families and culturally appropriate care for Aboriginal neonates requiring special care through the education and training of the WNHN package on Culturally appropriate communication with Aboriginal families.
- Area Health Services to support long distance learning and telehealth to improve access to training and development opportunities for all health professionals providing neonatal care in Western Australia.
- Area Health Services to support the training of health professional and expansion of programs for home visiting midwives and nurses during both pre and postnatal period.

5.5.1 Medical – Paediatrician, Neonatologist, GP

- WNHS and CAHS to increase the number of paediatricians trained with neonatology skills and/or neonatology paediatrics in order to service level 2a, 2b and 3 neonatology units (otherwise known as CSF level 4, 5 and 6).

5.5.2 Nursing/Midwifery – Neonatal nurses, midwives

- WNHS and Area Health Services to increase the number of nurses and midwives with neonatal skills trained to sustain and increase staffing levels for level 2a, 2b and 3 neonatology units (otherwise known as CSF level 4, 5 and 6).
- WNHS and Area Health Services to facilitate the rotation of neonatal nurses to the tertiary centre to maintain neonatal skills and competencies and promote recruitment and retention of the neonatal workforce. Establishment of staff rotations would be beneficial although it may be limited by available resources and supervising staff in the tertiary centre.
- WA Health to increase the number of mental health nurses to provide appropriate perinatal mental health services.

5.5.3 Allied Health – Social worker, psychologist, dieticians, pastoral care, physiotherapist, Aboriginal health workers

- Health services to incorporate neonatal resuscitation and care modules into training package for Aboriginal Health Care workers providing maternal and newborn care.
- Area Health Services to improve access to allied health and mental health professionals.

5.6 Quality of Care

- WNHS and WNHN to develop a data collection system for all peripheral neonatal units to enable the monitoring of quality and safety of neonatal care.
- WNHS and WNHN to develop clinical indicators for all public hospitals delivering maternity care in WA. Clinical indicators are required to monitor neonatal outcomes across the state. These indicators should include neonatal outcomes such as mortality, 5 minutes apgar score and unexpected admission to SCN or neonatal retrieval. Consideration should be given to including all private maternity hospitals.
- WNHS and WNHN to develop specific clinical indicators for secondary neonatal units (level 2a and 2b) in WA. It is recommended that these indicators are based on the New Zealand guidelines for secondary neonatal units.

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Acronyms

ACHS	The Australian Council of Healthcare Standards
AHW	Aboriginal Health Worker
AMS	Aboriginal Medical Services
ANZNN	Australian and New Zealand Neonatal Network
APH	Attadale Private Hospital
BFHI	Baby Friendly Health Initiative
BRH	Bunbury Regional Hospital
CAHS	Child and Adolescent Health Service
CaLD	Cultural and Linguistically Diverse Groups
CPAP	Continuous Positive Airway Pressure
CSF	Clinical Service Framework
DoH	Department of Health
DRH	Derby Regional Hospital
FSH	Fiona Stanley Hospital
HIE	Hypoxic-Ischemic Encephalopathy
HITH	Hospital in the Home
JHC	Joondalup Health Campus
KEMH	King Edward Memorial Hospital
MANSmap	Maternity and Newborn service map
NCCU	Neonatal Clinical Care Unit
NETS WA	Neonatal Emergency Transport Service Western Australia (previously known as WANTS – Western Australian Neonatal Transport Service)
NICU	Neonatal Intensive Care Unit
NMAHS	North Metropolitan Area Health Service
NWG	Neonatal Working Group

OAH	Office of Aboriginal Health
PHC	Peel Health Campus
PHH	Port Hedland Hospital
PMH	Princess Margaret Hospital
PSANZ-PDC	Perinatal Society of Australia and New Zealand Neonatal Death Classification
RFDS	Royal Flying Doctor Service
SCN	Special Care Nursery
SCWHS	South Coastal Women's Health Services
SJOG	St John of God Health
SMAHS	South Metropolitan Area Health Service
SOSU	Statewide Obstetric Support Unit
SRN	Senior Registered Nurse
WA	Western Australia
WACHS	West Australian Country Health Service
WAPMHU	WA Perinatal Mental Health Unit
WHA	Women's Hospitals Australasia
WNHN	Women's and Newborns' Health Network
WNHNEAG	Women's and Newborns' Health Network Executive Advisory Group
WNHS	Women's and Newborns' Health Service

Appendices

Appendix 1: Women's and Newborns' Health Network Executive Advisory Group

Area of Representation	Name
Women's and Newborns' Health Network Co-Lead	Dr Janet Hornbuckle
Women's and Newborns' Health Network Co-Lead	Prof Karen Simmer
Neonates Representation	Ms Debbie Chiffings
SOSU Representation	Mrs Kay Hyde
GP Obstetrician Representation	Dr Peter Kell
Midwives and Nurses Board Representation	Ms Robyn Collins
ACMI/Midwifery Representation	Ms Janice Butt
Mental Health Representation	Ms Sue Somerville
Allied Health Representation	Mrs Anne Rae
Aboriginal Health Representation	Ms Sylvia Lockyer
Community & Child Health Representation	Ms Margaret Abernethy
Consumer Representation	Ms Kathryn Godwin
Health Planner Representation	Mrs Caroline Roper
WACHS Representation	Dr Rodger Todd
WAGP Network Representation	Ms Naomi Green
Obstetrics & Gynaecology Representation	Dr Diane Mohen
Women's and Newborns' Health Network	Ms Jenny Goyder
Women's and Newborns' Health Network	Ms Philippa Lenferna de la Motte

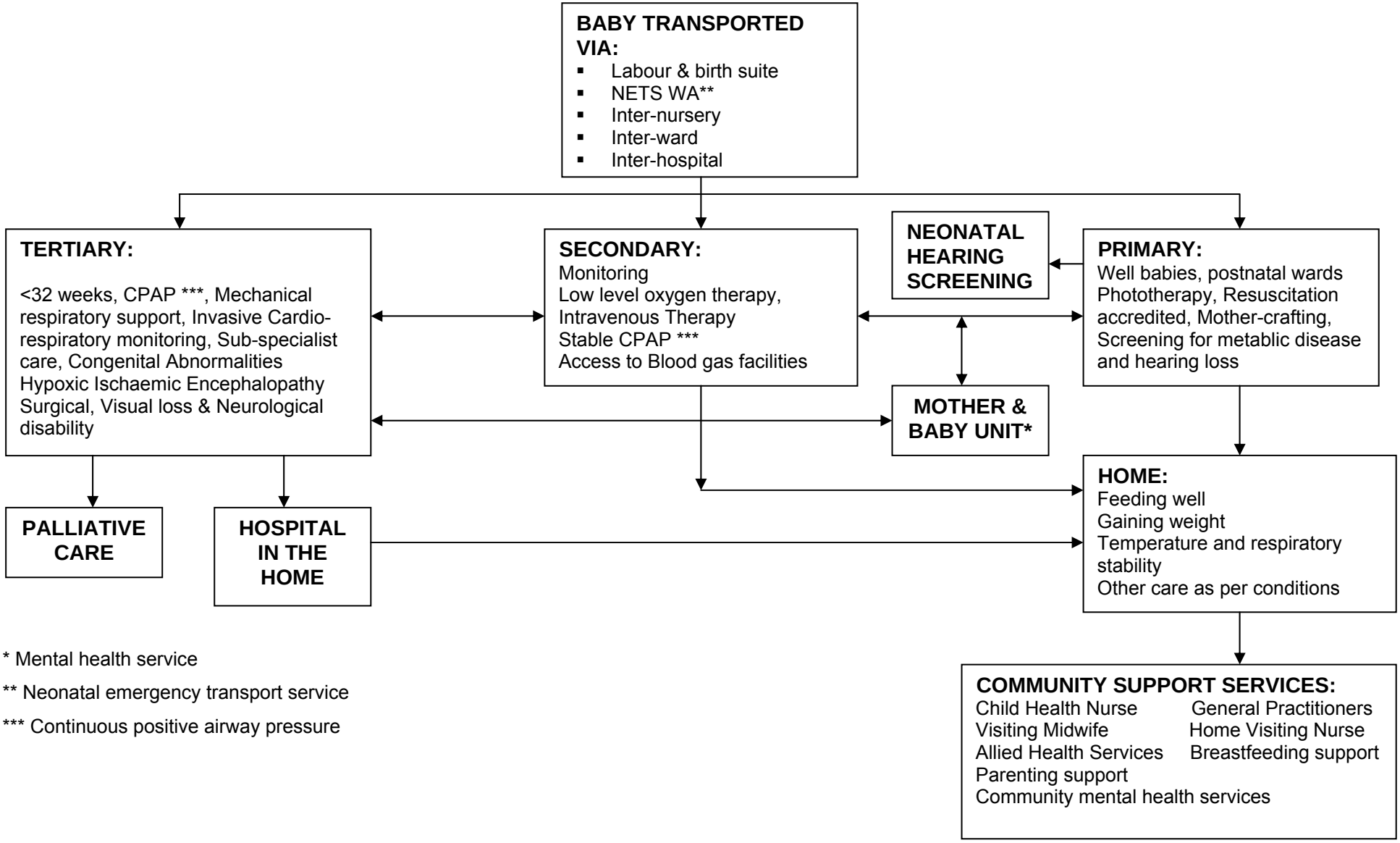
Appendix 2: Women's and Newborns' Health Network: Neonatal Working Group

Area of representation	Name
Women's and Newborns' Health Network Co-Lead	Prof Karen Simmer
Neonatal Nursing Representation (Public)	Ms Debbie Chiffings
Neonatal Nursing Representation (Private)	Ms Jay Lay
Neonatal Education Representation	Dr Andy Gill
Paediatrician (outer metropolitan centre) Representation	Dr Rick Christie
Paediatrician (rural centre) Representation (membership rotated)	Dr Harvey Graham Dr Mark Burrow Dr Stephen Adams Dr Rafig Hemani
Private sector Representation	Dr Lindsay Adams
NETS WA Director	Dr Steve Resnick
Allied Health Representation	Ms Sandra McGorman
Consumer Representation	Ms Kathryn Godwin
Director Clinical Services Representation	Dr Geoff Williamson
Health Service Planner Representation	Mrs Caroline Roper
Nursing Outreach Educator Representation	Ms Linda McKean Mrs Emma Anderton
Community & Child Health Representation	Ms Nancy Da Costa
Non-Government and Aboriginal Health Representation (SIDS & Kids)	Mrs Sharron Yarron
Obstetric Representation	Dr Paul McGurgan
Women's and Newborns' Health Network	Ms Philippa Lenferna de la Motte

Appendix 3: Revised WA Health Clinical Services Framework

	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Obstetrics Services						
Obstetrics	• No planned births • Inpatient care following birth elsewhere • Antenatal, post natal care is carried out by GPs with the assistance of RN/RM depending on the type of patient care needed	As for level 1 plus: • Normal low-risk pregnancies and births and management of newborns > 37+0 weeks gestation with minimal complications • Service by GPs/GP obstetricians/DMOs and midwives • Caesarean section transferred elsewhere but must be within safe timeframe • Access to 24 hr telephone support from obstetricians • Access to allied health • Onsite Level 1 neonatal facilities	As for level 2 plus: • Elective and emergency caesarean capability • 24 hr anaesthetic service provided • Visiting obstetrician	As for level 3 plus: • Planned births of low and moderate risk mothers/babies • Access to specialist obstetricians, pediatricians and anaesthetists • On-call roster for obstetricians and anaesthetists • Onsite Level 2A neonatal facilities	As for level 4 plus: • Births of low, moderate and high risk mothers/babies • Service provided to high risk mothers/babies by specialist obstetricians, neonatal paediatricians and anaesthetists • Onsite 24 hr medical officer obstetric cover by registrar or above • 24 hr cover by specialist obstetricians, pediatricians and anaesthetists • Access to HDU/ICU facility • Regional referral role • Onsite Level 2B neonatal facilities	As for level 5 plus: • Tertiary obstetric services • Specialist obstetric services including subspecialty maternal fetal medicine, obstetric medicine, genetic services • Dedicated HDU facilities • Onsite access to ICU • Has facilities to undertake obstetric and fetal research • Coordinates training of specialist obstetricians and specialist midwives • Onsite Level 3 NICU
Paediatrics Services						
Neonatology	• A neonatal service is not applicable, but for postnatal care of newborn infants, the standards within Level 2 (onsite Level 1 neonatal facilities) should be applied	• Onsite Level 1 neonatal facilities • Normal low-risk pregnancies and births and management of newborns > 37+0 weeks gestation with minimal complications • 24 hr onsite access to a health professional skilled in initiating (accredited) neonatal resuscitation • phototherapy for physiological jaundice • Telephone access to emergency care and transport **Level 1 neonatal facilities**	As for level 2 **Level 1 neonatal facilities**	As for level 3 plus: • Onsite Level 2A neonatal facilities with low dependency patients and apnoea monitoring, low-level Oxygen therapy (including monitoring) and nasal/oral-gastric feeding • Paediatricians on-call 24 hours • Low to moderate risk pregnancies and births and management of newborns > 34+0 weeks gestation with minimal complications • Short term intravenous therapy available • All patients are referred for management by attending paediatrician **Level 2A neonatal facilities**	As for level 4 plus: • Onsite Level 2B neonatal facilities with high dependency patients and provision of short-term mechanical ventilation (< 6 hours) pending transfer, nasal CPAP with facilities for arterial blood gas monitoring • Non invasive BP monitoring • Has access to clinical and diagnostic paediatric subspecialties • Service led by neonatal paediatricians • Paediatricians on-call 24 hours • Paediatric registrar or above on site 24 hours • Moderate to high-risk pregnancies and births and management of newborns > 32+0 weeks gestation with minimal complications • Access to specialist SRN • Role in post graduate medical and nursing education • Careful consideration to receiving transfers from L1 neonatal facilities (Level 2 or Level 3 hospital) **Level 2B neonatal facilities**	As for level 5 plus: • Onsite Level 3 NICU with high dependency patients and provision of medium-long term mechanical ventilation and full life-support • Neonatal paediatricians on-call 24 hours • High-risk, high dependency pregnancies and births • Management of newborns < 32+0 weeks gestation • Undertakes neonatal surgery and care for complex congenital and metabolic diseases of the newborn • Coordinates statewide retrieval service • Coordinates post graduate medical and nursing neonatal education • Has neonatology research **Level 3 NICU**

Appendix 4: Patient flow chart based on neonatal care required in Western Australia.



* Mental health service

** Neonatal emergency transport service

*** Continuous positive airway pressure

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