PNG Department of Health

Child Morbidity and Mortality

Annual Report 2012

Paediatric Department and Child Health Advisory Committee
PNG National Department of Health

2012 Annual Report on Child Morbidity and Mortality

Summary

- This report covers data on child admissions and outcomes in 2012 from 10 hospitals
- In 2012 there were 20,546 admissions and 1660 deaths recorded (mortality rate 8.1%)
- Pneumonia was the most common reason for admission (27% of admissions), followed by neonatal conditions (20% of admissions), diarrhoeal disease (10% of admissions) and malaria (6% of admissions)
- Malnutrition either directly caused or contributed to 36% of all deaths.
- In the post-neonatal period, pneumonia (23% of deaths) and meningitis (24% of deaths) were the leading causes of death.
- Neonatal deaths accounted for 28% of all deaths. The leading causes of death in neonates were: birth asphyxia (53% of neonatal deaths), neonatal infections (27% of neonatal deaths) and very low birth weight (35% of neonatal deaths).
- In the post-neonatal period, children presenting with HIV (12.1% case fatality rate), malnutrition (23.3% case fatality rate), meningitis (19.2% case fatality rate), tuberculosis (13.2% case fatality rate), and severe pneumonia (9.6% case fatality rate) had the highest risk of death
- Among neonates case fatality rates were very low birth weight (46.9%), birth asphyxia (17.0%) and neonatal sepsis (7.2%).

In response to the findings of this report, the Child Health Advisory Committee of the National Department of Health has made a series of recommendations which are described in this Report:

1. Addressing unnecessary child deaths will depend to a large extent on reducing deaths from pneumonia and neonatal conditions, which combined make up 46% of admissions and 45% of deaths.
2. Reducing deaths from severe pneumonia require a comprehensive approach, including prevention with vaccines, improving breast-feeding and nutrition (including vitamin A and zinc), reducing indoor air pollution. Reducing pneumonia deaths also requires improved access to early diagnosis and treatment: with better education of mothers on the signs of pneumonia, timely management in health centres or aid posts, and improved hospital case management: triage for identification of the most seriously ill children, giving appropriate antibiotics, monitoring with pulse oximetry, and oxygen therapy.
3. Reducing neonatal deaths requires access to improved access to skilled birth attendants, access to obstetric care and early essential newborn care. Essential newborn care includes *immediate and thorough drying*, which stimulates breathing and prevents hypothermia. *Sustained skin-to-skin contact* prevents hypothermia, reduces infection, calms the baby and facilitates successful intake of colostrum and sustained breastfeeding. *Delaying cord clamping until cord pulsations stop* - typically around one to three minutes from birth - reduces the risk of anaemia and in preterm infants

and other complications. *Exclusive breastfeeding and elimination of formula* can prevent a large proportion of neonatal sepsis deaths. *Avoiding harmful practices*, such as separation of babies from their mothers in the first hours of life for bathing or unnecessary observation. To reduce deaths from neonatal sepsis, the application of 4% chlorhexidine to the umbilical cord should be done for all newborns.

4. Achieving minimal standard for care of seriously ill neonates in health facilities is also essential to addressing neonatal deaths. Improvements in the quality of neonatal care for very low birth weight babies, neonatal sepsis and birth asphyxia is needed. This includes the increased use of Kangaroo Mother Care (skin-to-skin contact), prevention and treatment of hypoxaemia, apnoea, hypoglycaemia, improved feeding with breast milk, more rational use of antibiotics, more careful use of IV fluids, audit and ward organisation. Models of neonatal care should be introduced in all hospitals.
5. Improving obstetric care is necessary to reduce deaths from birth asphyxia. Improved use of partographs during labour is needed.
6. To reduce death from diarrhoea, oral rehydration salts (ORS) and zinc are the most important treatments. Children with bloody diarrhoea have dysentery and need antibiotics. The antibiotic guidelines for dysentery have been recently revised.
7. Prevention of malnutrition at the community level is the best way to avoid children dying from malnutrition. Children with malnutrition have a very high risk of death. They need special attention to feeding, prevention and treatment of infections, and close monitoring for complications. A step-by-step approach to the management of severe malnutrition should be followed; this is outlined in the Pocket Book of Hospital Care for Children and the PNG Standard Treatment Manual.
8. Children with meningitis have a high risk of death, and survivors are at risk of disability. Meningitis deaths can be prevented by more widespread use of the Hib vaccine (contained within the Pentavalent vaccine given at 1, 2 and 3 months), and by the introduction of the pneumococcal vaccine in 2014. Children presenting with meningitis need to be recognised and treated early, and monitored closely. Widespread resistance to chloramphenicol in the common causes of meningitis means that third-generation cephalosporins (such as ceftriaxone or cefotaxime) are the only effective antibiotic to treat meningitis.
9. There are very major human resource gaps in neonatal and child health at all levels of the health service. Addressing these requires increasing the number and quality of community, health workers, nurses and post-basic child health nurses. This will require ensuring that the child health content of these courses is in line with national strategies, such as IMCI, Hospital Care for Children, Infant and Young Child Feeding, and EPI training. Increased investment is also needed, especially to increase the number of nurses and paediatric nurses.
10. The National Child Health Plan outlines a plan for improving child health until 2020. The Child Health Advisory Committee recommends that everyone

involved in health care for children be familiar with this, and that Provincial and District Health officials use it to formulate their Annual Activity Plans.

2012 Annual Report on Child Morbidity and Mortality

Introduction

The Child Health Advisory Committee of the National Department of Health releases the second Annual Report on Child Morbidity and Mortality in Papua New Guinea. The Committee believes the data and recommendations contained in this report should be read by all health workers and health administrators. It is only by critically examining health outcomes that we can improve our services. The data are current, covering all of 2012, with some comparisons throughout to data collected in 2011 and 2010. The recommendations cover clinical and public health issues that if taken on board by all, would result in many children's lives being saved in the coming years.

Paediatric Hospital Reporting System (PHR)

The Paediatric Hospital Reporting System enables hospitals to record admissions, calculate mortality rates and monitor trends in diseases burdens and outcomes over time. When the data are compiled from all hospitals, this can focus on disease or geographical areas of high mortality where there is scope for improvement. The data are reported using standardised diagnostic criteria, consistent with clinical and public health practice in Papua New Guinea.

In each of 2010 and 2011, 11 hospitals participated, providing data for the entire 12 months. However these represented some different hospitals (see Table 1). In 2012 10 hospitals contributed data.

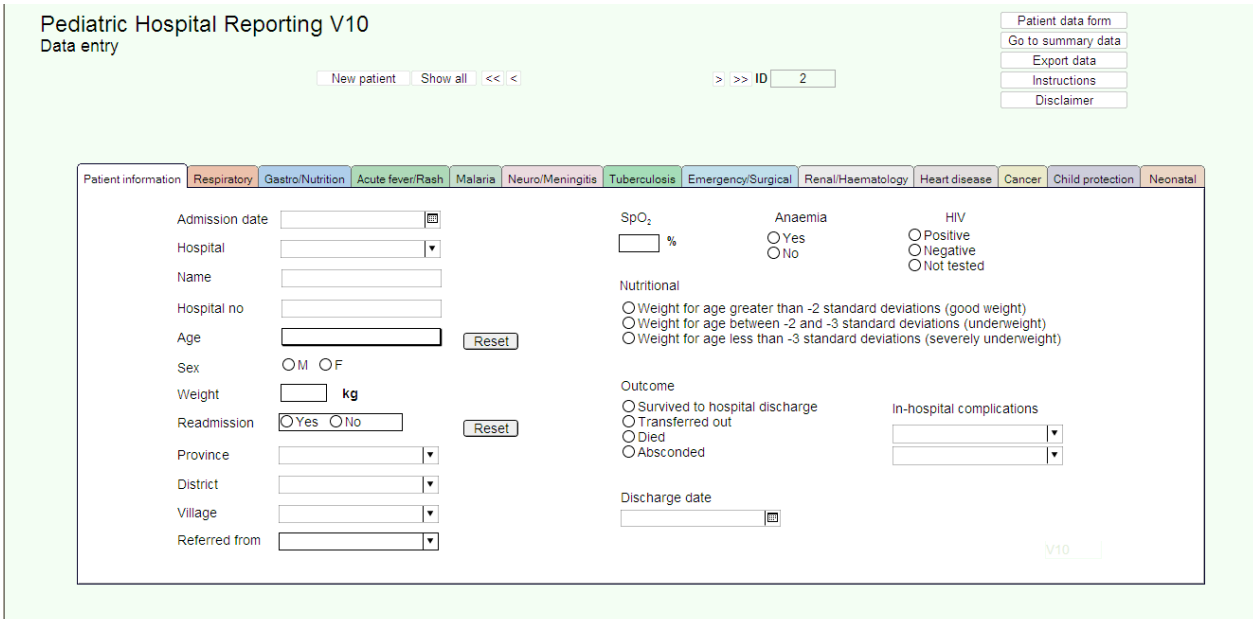
Case fatality rates varied up to twofold: from 6.2% in Vanimo Hospital to 12.5 in Angau and 11.2 in Modilon Hospital. Seven hospitals reported data for 2010 to 2012, and case fatality rates between these two years were consistent in most hospitals.

Differences in case fatality rates reflect many things: these include case mix, severity of illness at the time of presentation, human and other resources available to manage seriously ill children, and disease outbreaks.

Table 1 summarises the data for the 8 most common causes of hospital admission in children and case fatality rates, outside the neonatal period. A comparison is made with 2010 and 2011 data, but it must be realised that the hospitals contributing data were not all the same in the 3 years. However there was remarkable consistency in the case fatality rates, suggesting the data are robust.

The Appendices contain summaries of data for each major diagnostic group at each hospital.

In the last three years there have been 52,025 admissions reported through the PHR system, and 3851 deaths (case fatality rate 7.4%).



The Paediatric Hospital Reporting program

2012 Annual Report on Child Morbidity and Mortality

Diagnoses	Admissions 2010	Deaths 2010	CFR 2010	Admissions 2011	Deaths 2011	CFR 2011	Admissions 2012	Deaths 2012	CFR 2011
All admissions	**10,897**	**646**	**5.9**	**20,582**	**1545**	**7.5**	**20,546**	**1660**	**8.1**
Pneumonia	2504	140	5.6	6330	319	5.0	5458	272	5.0
Neonatal conditions	1596	150	9.4	4180	480	11.5	4012	473	11.8
Diarrhoea	1277	35	2.7	2122	57	2.7	1975	67	3.4
Malaria	1814	50	2.8	1774	61	3.4	1263	69	5.5
Severe malnutrition	739	157	21.2	1544	287	18.5	2590	604	23.3
Tuberculosis	514	58	11.3	1375	145	10.5	1510	199	13.2
Meningitis	417	92	22.1	1305	230	17.6	1452	279	19.2
HIV	54	13	24.1	195	37	19.0	470	57	12.1

Table 1. Most common causes of hospital admission and case fatality rates in children for 2010, 2011 and 2012

Pneumonia

There were 5458 admissions for pneumonia. Of these 3523 (65%) came highlands hospitals (Mt Hagen, Goroka, Mendi). Pneumonia makes up 2 admissions overall; 35% in the three highlands hospitals that provided da However, even in coastal provincial hospitals, pneumonia remains a majo needs serious attention.

The overall pneumonia CFR was 5% (272 deaths from 5458 cases of pne comparable with the pneumonia case fatality rate for 2010 and 2011 of 5. respectively. Pneumonia case fatality rates vary considerably, from 2 dea 86 admissions in Vanimo, to three hospitals (Angau, Kaviang, Kimbe) whi case fatality rates for pneumonia of 9% or more.

The PHR system enables the calculation of mortality rates for both total c pneumonia overall and for cases of *severe* pneumonia (WHO-defined ver pneumonia). The overall case fatality rate for severe pneumonia was 9.6 hospitals had case fatality rates in excess of 10% in 2012. Three (Kavian Mendi) had case fatality rates of 20% or more. However some of these h very small numbers of severe pneumonia cases, so it is difficult to draw c

Severe pneumonia case fatality rates, as they are partly standardised for severity at the time of presentation, better reflect systems of practice, staf training and resources than do overall rates. High case fatality rates from pneumonia may occur if children present late, or are not recognised to be unwell, if antibiotics and oxygen are not given promptly, or if children are monitored closely.

Recommendations

It is recommended that hospitals ensure that there is:

- a system of triage and rapid treatment of the sickest patients in the and outpatients departments
- a part of the children's ward that is properly equipped and stocked high dependency care and close monitoring
- adequate oxygen supplies and staff trained in when and how to eff give oxygen
- appropriate stocks of antibiotics to treat pneumonia
- regular clinical monitoring, including the use of pulse oximetry
- training for staff in the care of seriously ill children
- sufficient nursing and medical staff to provide clinical care at all tim
- senior supervision of nursing and medical practice

Chloramphenicol may be becoming less effective in the treatment of very pneumonia, and this may be one factor that explains the high case fatality some hospitals. Treatment options include penicillin (or ampicillin) and ge or ceftriaxone for the seriously ill, septic or deteriorating child with pneum

The high numbers of deaths from pneumonia and meningitis (551 or 33% of all deaths) underline the importance of the more widespread use of the *Hemophilus influenzae* type b (Hib) vaccine, which was introduced in 2008, and the pneumococcal conjugate vaccine, which is due for introduction in 2014.

While these vaccines are the only real solution to deaths and disability from bacterial meningitis (see below) in other countries these two vaccines have made a modest difference to pneumonia presentations to hospitals. This is because there are other common causes of pneumonia, including viruses (particularly respiratory syncitial virus, influenza) and bacteria that are not prevented by these two vaccines (such as Group A streptococcus, *Staphylococcus aureus*, enteric gram negative bacilli, Chlamydia and Mycoplasma). This means that even with these important vaccines, pneumonia will continue to be a major cause of hospitalisation and death in children in PNG. Therefore improving systems for clinical care and preventative measures to reduce pneumonia are also essential.

The PNG Child Health Plan 2009-2020 outlines a comprehensive approach to pneumonia. This includes key areas to address:

Prevention

- Nutrition and breast feeding
- Parental awareness of the signs of pneumonia and care seeking
- Reduction in indoor air pollution
- Hand-washing
- Vaccines: measles, Hib, pneumococcal

Curative

- Improving quality of hospital and health centre of pneumonia through IMCI, Standard Treatment Guidelines and Hospital Care for Children training
- Models of community care for pneumonia
- Focus on pneumonia in high risk patients (malnourished, HIV-affected, neonates)
- Oxygen and other methods of respiratory support, including CPAP
- Addressing rising rates of bacterial resistance and trying to improve rational antibiotic prescribing
- Exploring the role of zinc sulphate in pneumonia treatment

Diarrhoea

1975 admissions and 67 deaths (CFR 3.4%) due to diarrhoea were reported in the 10 hospitals in 2012. The case fatality rate was relatively low compared with that of pneumonia (5%), but only slightly higher than in 2010 and 2011 (diarrhoea case fatality rate 2.7%).

Deaths from diarrhoea can be due to severe dehydration where the child does not have access to effective rehydration, from sepsis from bacillary dysentery, or other co-morbidity. Severe diarrhoea can be prevented by timely use of oral rehydration in the community, by parents bringing their child to a health facility if they have

diarrhoea, by improved assessment of the severity of dehydration, the use of zinc as additional treatment, and the appropriate use of antibiotics in bloody diarrhoea.

Most watery diarrhoea is due to viruses and does not require antibiotics, but require that children have access to ORS, zinc and breast feeding. If children receive these when they have watery diarrhoea, death is very unlikely.

Dysentery is bloody diarrhoea, and is commonly due to a bacterium called *Shigella flexneri*. A recent study in PNG found very high levels of resistance to amoxicillin and cotrimoxazole among *Shigella flexneri* isolates causing diarrhoea. The study confirmed that cotrimoxazole is ineffective and ciprofloxacin is needed to treat dysentery. Oral ciprofloxacin is currently recommended treatment by WHO for dysentery in a dose of 10-15mg/kg twice daily for 5 days. If children are too sick to take oral medications, give ceftriaxone intravenously (IV) or intramuscularly (IM).

Recommendations

- Give ORS and zinc to all children with diarrhoea
- Treat bloody diarrhoea (dysentery) with ciprofloxacin

Malaria

In 2012 malaria accounted for 1263 admissions and 69 deaths (case fatality rate of 5.5%). This is substantially fewer malaria admissions than in 2010 and 2011: Buka and Kimbe recorded major reductions in malaria cases in both years. Malaria case fatality rates were around 3-4% in the coastal and islands hospitals that have a substantial burden of malaria. It is concerning that Modilon and Goroka had more than 100 malaria admissions and malaria case fatality rates exceeding 9%, wheras other hospitals with comparable admission numbers had case fatality rates of 2-4%.

PNG has changed malaria guidelines to:

- Uncomplicated malaria: artemether-lumefantrine
- Severe or complicated malaria: artesunate as initial treatment, followed by artemether-lumefantrine

It is important that health workers are familiar with these new treatments. They are described in the 9th Edition of the Standard Treatment Book for Common Illnesses in Children, published in 2011.

Malnutrition

The PHR records malnutrition as a co-morbidity, so even if it is not the primary diagnosis it is still recorded. In 2012 in the 10 hospitals that used the standardised PHR, 2590 children were admitted with severe malnutrition (weight for age <60% of expected, or with clinical marasmus or kwashiorkor). This represented 12.6% of all admissions. However severe malnutrition in these 10 hospitals was associated with 604 deaths: 36% of all deaths, and the case fatality rate was 23.3%, a figure consistent with that recorded in 2010 (21%) and 2011 (18.8%). Case fatality rate for

malnutrition in 2012 was more than 10% in 9 of 10 hospitals, and more than 20% in 4 hospitals.

Recommendations

Health centres and hospitals need early identification and intervention for children with severe *and moderate* malnutrition:

- staff need to be trained in Infant and Young Child Feeding
- all staff should promote breast feeding
- hospitals should adopt the Baby Friendly Hospital Initiative
- growth monitoring should be a regular part of child health care
- there should be ready access in the health centre or hospital to formulas and diets for the management of children with malnutrition
- guidelines for the management of malnutrition should be in place and used. These include prevention and treatment of fatal complications such as sepsis, hypothermia and hypoglycaemia
- children with acute severe malnutrition should be nursed in a high dependency area in the children's ward, where close monitoring and identification of complications can occur
- children with chronic illnesses that are likely to result in malnutrition, such as HIV, tuberculosis, osteomyelitis or chronic cardiac, respiratory or renal disease should be identified early and provided with supplemental feeding
- zinc and vitamin A should be available
- staff should be trained in the prevention and management of malnutrition

The *prevention* of malnutrition must have the highest priority. This requires improved rates of breast feeding and complimentary (weaning) feeding. This will be helped by increased participation in education by girls and by greater economic empowerment for mothers. Mothers who have been educated to at least primary school completion are much more likely to breast feed their infants for longer, as well as more likely to seek care when their children are sick, and be up-to-date with immunization.

The *management* of malnutrition is outlined in the PNG Standard Treatment Manual and the WHO Pocket Book of Hospital Care for Children. Many children in hospitals are inadequately supplied with food. Steps should be taken to improve the caloric intake of sick hospitalised children. Having trained nutritionists and paediatric nurses skilled in the management of malnutrition is essential to reducing the case fatality rates from malnutrition.

Meningitis

In the 10 hospitals meningitis accounted for 1452 admissions. There were 279 deaths (case fatality rate 19.2, which is comparable to 2011 (18%) and 2010 (22%).

With nearly one-fifth of all children admitted to hospital dying from meningitis there is an urgent need to address this. Case fatality rates for meningitis in 2012 and 2011

were above 10% in all hospitals. This is just part of the tragedy, for every death more children survive with serious brain injury which will reduce the child's ability to gain a proper education, or participate in the community or workforce.

There were 150 cases of meningitis due to S. pneumoniae and 132 cases due to H. influenzae type b recorded through clinical reporting. Therefore an aetiology was identified for only 19% of cases of meningitis (similar to last year, when only 18% were identified). Many hospitals cannot do bacterial culture of blood or CSF. Latex antigen testing has been available in some of the hospital laboratories.

The best method of preventing meningitis is the universal use of conjugate Hib and pneumococcal vaccines. Hib vaccine was introduced in PNG in 2008. Cases are still being reported, suggesting that the vaccine is not yet reaching all children. Meningitis due to *S. pneumoniae*, one of the two commonest causes, can only be effectively addressed by the introduction of the conjugate pneumococcal vaccine, which is scheduled for introduction in 2014.

Most Hib and some pneumococci causing meningitis are now resistant to chloramphenicol, so this is now no longer effective treatment for bacterial meningitis. If children receive chloramphenicol for meningitis, rates of death and brain injury will be very high.

Recommendations

All children should receive Pentavalent vaccine, which contains the Hib vaccine at 1, 2 and 3 months of age. The Pentavalent vaccine also protects against diphtheria (a throat infection), tetanus, pertussus (whooping cough) and hepatitis B (a liver infection which eventually may cause liver cancer in adults).

All children with suspected meningitis should have a lumbar puncture if it is safe to do so. They should be treated with ceftriaxone 50mg/kg twice daily IV or IM for 10 days.

Acute complications can lead to high case fatality rates, and may be minimised by

- € Nursing all children with meningitis in a high dependency unit
- € Monitoring with pulse oximetry to detect hypoxaemia
- € Monitoring the blood glucose and treatment of hypoglycaemia
- € Close observation for convulsions

Recommendations on identification and treatment of severe infections

It is very important that health workers recognise the signs of severe sepsis (severe pneumonia, meningitis, septicaemia), and know how to give emergency management.

There should be a system of Triage in every emergency or outpatients department to enable prompt identification of seriously ill children.

The **general signs of severe sepsis** include:

- € high fever
- € fast breathing and respiratory distress
- € Heart rate >160 with pulses that are difficult to feel

- € cold skin of arms and legs
- € low blood pressure
- € prolonged poor capillary refill
- € pallor
- € lethargy or unconsciousness

There may be **localising signs suggesting meningitis**

- € severe headache
- € neck stiffness
- € severe vomiting
- € repeated convulsions
- € bulging fontanelle

There may be **purpura** (red or black spots on the skin).

There may be **signs of Staph infection**

- € skin sepsis: boils, pustules, abscess, infected scabies or infected skin sores, cellulitis
- € swollen red, hot, tender and painful joint
- € empyema (pus in the chest)

The **emergency treatment for severe sepsis** should be known by all health workers. This includes:

- € If the child is unconscious or convulsing, nurse on the side and keep the airway clear
- € Give oxygen if there is severe respiratory distress, cyanosis or the oxygen saturation is <90%
- € If the child has signs of shock (several signs: lethargy or drowsiness, low volume pulses, heart rate >160, cold skin or low blood pressure), give an IV bolus of Normal Saline or Hartmanns, 20ml/kg, then reassess.
- € Give appropriate parenteral (IV or IM) antibiotics: ceftriaxone +/- flucloxacillin (if Staph infection is present) or flucloxacillin & gentamicin if there is no ceftriaxone
- € Monitor for signs of sepsis in a high dependency area in the ward or in the ICU. Monitor with pulse oximetry to detect hypoxaemia
- € Check blood glucose. Give a bolus of glucose if the BSL is low
- € Seek assistance from an experienced doctor
- € Look up treatment recommendations in the PNG Standard Treatment Book for Children, and the WHO Pocketbook of Hospital Care for Children.

Neonatal admissions

Neonatal admissions made up 4012 (19.5%) of all 20,546 paediatric admissions to the 10 hospitals in 2012. There were 473 neonatal deaths reported, meaning that 28% of all deaths in children were in the neonatal period.

Neonatal infections

44.6% of all neonatal admissions were due to infections (n=1789). Neonatal infections included pneumonia, meningitis, cord sepsis, skin sepsis and diarrhoea. The case fatality rate for neonatal infections in the 10 hospitals was 7.2%, consistent with the case fatality rate for neonatal sepsis in 2011 (7.1%). This is very likely to be an under-estimate, as some hospitals reported few cases (e.g. Kaviang Hospital reported only 1 case of neonatal sepsis).

Measures to prevent neonatal infections are described below in immediate newborn care.

Birth asphyxia

Birth asphyxia is lack of oxygen at or around the time of birth. Many babies survive without serious damage, but the consequences for some children are severe brain injury or death. There were 1485 hospital admissions due to birth asphyxia, and the CFR was 17% (253 of 1485). 53% of neonatal deaths (15% of deaths in children of all ages) were due to perinatal asphyxia. Eight of 10 hospitals had more than 50 cases of birth asphyxia for the year, the largest hospitals (PMGH, Goroka, Mt Hagen and Angau) had between 4 and 6 cases per week on average.

The developmental implications for many surviving children are significant: cerebral palsy, intellectual disability, blindness, and seizures are common. Prevention of perinatal asphyxia requires encouragement of delivery with a skilled midwife, identification of delays in labour, active management of labour and close communication between obstetric / midwifery services and paediatric services. Provision of immediate newborn care described below can also prevent some cases of asphyxia, as babies are stimulated to initiate breathing early by drying. Neonatal resuscitation training for nurses and doctors can also reduce the effects of birth asphyxia.

Very low birth weight

Very low birth weight is a birth weight between 1000 and 1499g. There were 354 very low birth weight admissions in the 10 hospitals. The case fatality rate for these babies is very high, with 46.9% of VLBW newborns dying while in hospital.

	2010			2011			2012		
Diagnoses	**Admissions**	**Deaths**	**CFR**	**Admissions**	**Deaths**	**CFR**	**Admissions**	**Deaths**	**CFR**
All neonatal	2752	335	**12.3**	4180	480	**11.5**	4012	473	**11.8**
Neonatal sepsis	592	37	**6.3**	2124	152	**7.1**	1789	128	**7.2**
Asphyxia	467	54	**11.6**	1219	165	**13.5**	1485	253	**17.0**
VLBW (1000-1500g)	106	32	**30.2**	518	169	**32.6**	354	166	**46.9**

Table 4. The most common causes of neonatal admissions and deaths for 2010 and 2011

Recommendations for improving neonatal care

Early essential newborn care is often neglected, and potentially harmful p
too common. These reduce the access for babies to basic protective care
of early essential newborn care can have a dramatic effect on reducing ne
sepsis, birth asphyxia and other complications. The following should be c
newborns:

- ***Immediate and thorough drying*** stimulates breathing and preven
  hypothermia which can threaten newborns with delayed foetal-to-n
  circulatory adjustment, acidosis, hyaline membrane disease, coagu
  defects, infection, hypogycaemia and brain haemorrhage. In some
  number of babies who do not breathe at birth was found to decreas
  than half once immediate and thorough drying was instituted.
- ***Sustained skin-to-skin contact*** prevents hypothermia, initiates co
  of the newborn with maternal flora (as opposed to hospital flora wh
  includes multi-resistant bacteria), calms the baby and facilitates su
  intake of colostrum and sustained breastfeeding.
- ***Delaying cord clamping until cord pulsations stop***, typically arc
  three minutes from birth, reduces the risk of anaemia and in preter
  intraventricular haemorrhages.
- ***Exclusive breastfeeding and elimination of formula*** can preven
  proportion of neonatal sepsis deaths.
- ***Avoiding harmful practices***, such as separation of babies from th
  in the first hours of life for bathing or unnecessary observation. Se
  reduces the chance a baby will breast feed successfully and mean
  less likely to receive colostrum, which contains antibodies that prot
  infection.

Babies who require a higher level of care

Despite thorough drying, 2-3% of newborns will not breathe at birth. ***Bag***
resuscitation for all babies who are not breathing at birth reduces neona

All hospitals should have neonatal areas that reach a minimum standard t
babies who require a higher level of care. However in a Special Care Uni
that newborn care practices are as least invasive and most natural as pos
that babies spend as much time as possible with their mothers having ski
warming and breast feeding.

**MAINTAINING SKIN-TO-SKIN CONTACT WITH THE MOTHER AT ALL
PROTECTS BABIES FROM HYPOTHERMIA, HYPOGLYCAEMIA, APN
SEPSIS**

Improved care for sick neonates includes early essential newborn care,

- Keeping babies warm, best done using Kangaroo Mother Care (KM
  is even safe for many very low birth weight babies, unless they are
  sick with danger signs such as apnoea, cyanosis or severe hypoxa

- Supplemental oxygen administration and pulse oximetry. Because clinical signs predicting hypoxaemia in neonates are relatively insensitive, use of protocols for supplemental oxygen administration based on monitoring of pulse oximetry is recommended.
- Detecting and treating apnea. Apnoea is a major cause of neonatal mortality among premature neonates and also among babies with sepsis and birth asphyxia. The use of apnoea monitors, aminophyline for premature neonates and close observation of all very sick babies are recommended.
- Prevention and treatment of hypoglycaemia. Hypoglycaemia complicates many neonatal conditions, particularly low birth weight and sepsis. Early breast feeding and close contact with the mother immediately after birth prevents hypoglycaemia – this is best achieved by early skin-to-skin contactr and KMC. In neonates hypoglycaemia occurs because of insufficient glycogen stores in the liver, inability to feed or separation from the mother, and increased glucose metabolism during illness. The clinical signs are non-specific, and regular blood glucose monitoring of high-risk ill neonates is required. Contact with the mother is essential for most sick babies. Careful correction of hypoglycaemia using breast feeds in babies who can suck, or nasogastric expressed breast milk feeding or IV glucose in babies too sick to feed should be started.
- Ward organisation to ensure close observation of the most seriously ill and highest risk ill babies
- Safe use of intravenous fluids in seriously ill neonates. In very low birth weight neonates, large volumes of enteral feeding in the first day or two of life is not well tolerated and may increase the risk of necrotising enterocolitis. The use of any artificial formula feeding is not recommended at any time in low birth weight babies. For babies less than 1.5 kg, slow increases in expressed breast milk with cautious intravenous fluids to maintain hydration and prevent hypoglycaemia in the first few days of life is recommended. Babies on IV fluids are at risk of overhydration and nosocomial infection through the IV drip site.
- Antibiotics. Although many seriously ill neonates have bacterial infections, the inappropriate use of broad-spectrum antibiotics will lead to colonization of babies, and of neonatal units, with bacteria that are resistant to standard antibiotics. Standard treatment of neonatal sepsis is benzylpenicillin (or ampicillin or amoxicillin) and gentamicin, which are effective against most bacteria causing sepsis. *Staphylococcus aureus* is another common cause of infection in young infants in some hospitals, and resistant enteric gram negative bacilli are a common cause of neonatal death. Flucloxacillin or cloxacillin should be used if there are signs Staphylococcal infection, such as purulent umbilical cord, skin pustules or purulent conjunctivitis.
- Prevention of neonatal sepsis. Strict hand washing and other basic infection control measures are recommended. There is good evidence now that prolonged antibiotics lead to colonisation of the newborns gastrointestinal tract with pathogenic bacteria that are likely to be invasive, rather than the protective bacteria that comes from the mother. So avoiding antibiotics in babies who do not have serious infections also helps to protect them against

infection. Ceasing antibiotics after 24 or 48 hours if the baby is well will also reduce colonisation with pathogenic or highly-resistance bacteria, and reduce infections in babies.

- € Auditing of practice. It is only by keeping accurate records of all admissions and outcomes that patterns of adverse events will become identified. Clinical audit is essential to reduce neonatal mortality.
- € Training of nurses in early essential newborn care and neonatal high-dependency care

Tuberculosis

In the 10 hospitals there were 1510 children admitted with tuberculosis, with 199 known deaths, and a case fatality rate of 13.2%. This may represent only a fraction of the children with TB in PNG, given that many cases are diagnosed by other hospitals or health facilities or remain undiagnosed in the community. However these data underlines that in its severest forms TB cause many childhood deaths.

The source of transmission of TB to a child is usually an adult family member who has sputum smear-positive pulmonary TB (PTB), although many adults who pass on TB to children will not know they are affected. Children who develop TB disease usually do so within a year after being infected. Children under the age of 3 are at much higher risk of developing TB disease if infected.

Recommendations

It is important to screen all family members (particularly children) of adult patients who are known to be sputum smear-positive PTB.

If there is a person with sputum smear-positive PTB in the household child contacts should be screened. If they are asymptomatic they should be commenced on Isoniazid Preventive Therapy. If they have symptoms of TB, do a TB score. If the score is >7, register them and commence TB treatment.

The most effective way to prevent transmission of TB to children is by early identification and treatment of those people in the community with infectious TB i.e. usually adults and older children with PTB, especially sputum smear-positive PTB.

BCG immunization is effective in preventing severe and disseminated forms of TB (such as miliary TB and TB meningitis) in young children.

Early identification and treatment of children with TB disease will reduce the numbers of childhood deaths and complications (such as bronchiectasis and cerebral palsy) due to TB.

In remote areas, where chest xray and acid fast bacilli staining is not possible, it is valid to diagnose TB clinically, based on symptoms, signs and the TB score. It is better to treat and closely monitor response than to have children deteriorate because diagnostic tests were not abailable.

HIV

In 2012 there were 470 new cases of HIV admitted to the 10 hospitals, and 57 deaths. In 2011 there were 195 new cases, with 37 recorded deaths. Port Moresby General (159 cases), Mt Hagen (138 cases) and Goroka (122 cases) reported the majority. This only represents cases that were reported in hospitals, based on admissions, and may be an underestimate of new cases in the population, as some children are diagnosed as outpatients, or through Prevention of Parent to Child Transmission (PPTCT) programs.

Recommendations

- € All children diagnosed with HIV should see a paediatrician, for consideration for starting on antiretroviral therapy.
- € All children with HIV need prophylaxis with cotrimoxazole and INAH, treatment of intercurrent infections and good nutrition.
- € Mothers who are diagnosed with HIV during or after pregnancy are now treated with three anti-retroviral drugs for life, not just for shorter periods to prevent transmission to the baby. The ongoing care of the mother is paramount, and what is good for the mother is good for her children.

Other vaccine preventable diseases

In 2012 in 10 hospitals there were 41 cases of Pertussis, down on last year's 71 cases reported. Outbreaks of pertussis are concerning, and occur because of low vaccination coverage, especially waning vaccine coverage in adults who can pass the infection onto small children who are at highest risk of severe illness.

There were 9 cases of acute flaccid paralysis, and 8 cases of tetanus with one death. Although there were 2 cases of measles reported in 2012, reporting through the PHR may have been done on clinical grounds before laboratory testing confirmed or excluded cases.

Cases of suspected measles, acute flaccid paralysis, and tetanus are all reportable. Measles and AFP require laboratory investigation and confirmation.

Since 2008 there have been no confirmed cases of measles, a major achievement. Supplemental immunization activities every 3 years has interrupted transmission of measles virus and averted many deaths.

2012 Annual Report on Child Morbidity and Mortality

Summary

The Paediatric Hospital Reporting System has highlighted problem areas in hospitals and the health system. Addressing these in a systematic way will lower the death rates from common diseases. The Child Health Advisory Committee asks that all health workers and hospital administrators play their part to address specific problems, adopt the recommendations in this report, and see these results improve in the coming years.

The PHR program has been modified such that from 2014 it will also report cases of childhood cancer, acute rheumatic fever, rheumatic and congenital heart disease, and child abuse.

2012 Annual Report on Child Morbidity and Mortality

Appendices: summaries of data for each major diagnostic group at each hospital

Hospital	Total Admissions 2010	Total Deaths 2010	Overall CFR 2010	Total Admissions 2011	Total Deaths 2011	Overall CFR 2011	Total Admissions 2012	Total Deaths 2012	Overall CFR 2012
Alotau	1002	28	2.8						
Angau				2457	244	9.9	2161	270	12.5
Buka	659	46	7.0	574	42	7.3	632	53	8.4
Daru									
Goroka	1517	90	5.9	3125	114	3.6	3618	279	7.7
Kavieng	378	14	3.7				326	13	4.0
Kimbe	1013	72	7.1	881	102	11.6	1145	103	9.0
Kerema									
Kundiawa									
Manus	494	9	1.8						
Mendi	2262	112	5.0				2143	123	5.7
Modilon	977	109	11.2	1342	143	10.7	1533	171	11.2
Mt Hagen				4198	303	7.2	4232	298	7.0
Nonga	720	46	6.4	833	61	7.3			
Oro				612	53	8.7			
PMGH	5180	431	8.3	4901	373	7.6	3954	300	7.6
Vanimo	820	31	3.8	668	15	2.2	802	50	6.2

Hospital	Pneumonia admissions	Pneumonia deaths	Pneumonia CFR	Severe pneumonia admissions	Severe pneumonia deaths	Severe pneumonia CFR
Alotau						
Angau	389	35	9.0	196	30	15.3
Buka	171	6	3.5	40	5	12.5
Daru						
Goroka	1225	49	4.0	548	44	8.0
Kavieng	41	4	9.8	8	4	50.0
Kimbe	162	15	9.3	55	13	23.6
Kerema						
Kundiawa						
Manus						
Mendi	541	32	5.9	104	30	28.9
Modilon	269	17	6.3	77	13	16.9
Mt Hagen	1757	78	4.4	1255	65	5.2
Nonga						
Oro						
PMGH	817	34	4.2	172	32	18.6
Vanimo	86	2	2.3	21	2	9.5
Wabag						
Wewak						
Total	**5458**	**272**	**5.0**	**2476**	**238**	**9.6**

Hospital	Diarrhoea admissions	Diarrhoea deaths	Diarrhoea CFR
Alotau			
Angau	160	11	6.9
Buka	62	3	4.8
Daru			
Goroka	472	15	3.2
Kavieng	13	1	7.7
Kimbe	145	5	3.5
Kerema			
Kundiawa			
Manus			
Mendi	337	6	1.8
Modilon	116	4	3.5
Mt Hagen	547	22	4.0
Nonga			
Oro			
PMGH	14	0	0.0
Vanimo	109	0	0.0
Wabag			
Wewak			
Total	**1975**	**67**	**3.4**

Hospital	Malaria admissions 2010	Malaria Deaths 2010	Malaria CFR 2010	Malaria Admissions 2011	Malaria deaths 2011	Malaria CFR 2011	Malaria admissions 2012	Malaria deaths 2012	Malaria CFR 2012
Alotau	284	7	2.5						
Angau				373	17	4.6	240	10	4.2
Buka	233	5	2.1	127	4	3.1	106	2	1.9
Daru									
Goroka	20	2	10.0	20	0	0.0	104	18	17.3
Kavieng	128	4	3.1				29	0	0.0
Kimbe	467	15	3.2	169	8	4.7	154	1	0.7
Kerema									
Kundiawa									
Manus	52	1	1.9						
Mendi	150	3	2.0				44	4	9.1
Modilon	130	3	2.3	174	8	4.6	174	17	9.8
Mt Hagen				294	10	3.4	209	9	4.3
Nonga	170	5	2.9	160	9	5.6			
Oro				127	3	2.4			
PMGH	270	1	0.3	140	1	0.7	97	4	4.1
Vanimo	175	4	2.3	190	1	0.5	106	4	3.8
Wabag	5	1	20.0	0	0	0			
Wewak									
Total	**2084**	**51**	**2.4**	**1774**	**61**	**3.4**	**1263**	**69**	**5.5**

Hospital	Malnutrition admission	Malnutrition deaths	Malnutrition CFR
Alotau			
Angau	329	92	28.0
Buka	38	5	13.2
Daru			
Goroka	879	149	17.0
Kavieng	18	1	5.6
Kimbe	139	39	28.1
Kerema			
Kundiawa			
Manus			
Mendi	81	21	25.9
Modilon	173	43	24.9
Mt Hagen	149	113	17.4
Nonga			
Oro			
PMGH	679	121	17.8
Vanimo	105	20	19.1
Wabag			
Wewak			
Total	**2590**	**604**	**23.3**

Hospital	Meningitis admissions	Meningitis deaths	Meningitis CFR	Meningitis admissions (deaths) due to S. pneumoniae	Meningitis admissions (deaths) due to H. influenzae
Alotau					
Angau	212	54	25.5	9	6
Buka	47	15	31.9	0	10
Daru					
Goroka	270	46	17.0	8	1
Kavieng	5	1	20.0	0	0
Kimbe	98	12	12.2	2	14
Kerema					
Kundiawa					
Manus					
Mendi	51	12	23.5	3	4
Modilon	85	25	29.4	0	1
Mt Hagen	406	67	16.5	58	8
Nonga					
Oro					
PMGH	222	39	17.6	65	87
Vanimo	56	8	14.3	5	1
Wabag					
Wewak					
Total	1452	279	19.2	150	132

Hospital	TB admissions	TB deaths	TB CFR	HIV admissions	HIV deaths	HIV CFR
Alotau						
Angau	261	42	16.1	32	10	31.3
Buka	65	8	12.3	0	0	0
Daru						
Goroka	290	50	17.2	122	8	6.6
Kavieng	2	0	0.0	0	0	0
Kimbe	125	11	8.8	4	0	0.0
Kerema						
Kundiawa						
Manus						
Mendi	112	10	8.9	0	0	0
Modilon	135	18	13.3	15	1	6.7
Mt Hagen	204	27.0	13.24	138	19	13.8
Nonga						
Oro						
PMGH	274	26	9.5	159	19	12
Vanimo	42	7	16.7	0	0	0
Wabag						
Wewak						
Total	**1510**	**199**	**13.2**	**470**	**57**	**12.1**

Hospital	Neonatal admissions 2010	Neonatal deaths 2010	Neonatal CFR 2010	Neonatal admissions 2011	Neonatal deaths 2011	Neonatal CFR 2011	Neonatal admissions 2012	Neonatal deaths 2012	Neonatal CFR 2012
Alotau	212	10	4.7						
Angau				665	72	10.8	571	75	13.1
Buka	30	10	33.3	54	9	16.7	79	12	15.2
Daru									
Goroka	188	7	3.7	420	19	4.5	546	71	13.0
Kavieng	61	6	9.8				67	2	3.0
Kimbe	40	7	17.5	217	34	15.7	226	33	14.6
Kerema									
Kundiawa									
Manus	165	4	2.4						
Mendi	248	21	8.5				117	4	3.4
Modilon	271	56	20.7	417	45	10.8	551	78	14.2
Mt Hagen				827	103	12.5	852	96.0	10.88
Nonga	217	21	9.7	256	21	8.2			
Oro				94	13	13.8			
PMGH	1156	185	16.0	1102	162	14.7	801	86	10.7
Vanimo	159	8	5.0	126	2	1.6	202	16	7.9
Wabag	5	0	0.0	2	0	0.0			
Wewak									
Total	**2752**	**335**	**12.3**	**4180**	**480**	**11.5**	**4012**	**473**	**11.8**

Hospital	Neonatal Infections Admissions 2010	Neonatal Infections Deaths 2010	Neonatal Infection CFR 2010	Neonatal Infections Admissions 2011	Neonatal Infections Deaths 2011	Neonatal Infection CFR 2011	Neonatal Infections Admissions 2012	Neonatal Infections Deaths 2012	Neonatal Infection CFR 2012
Alotau	129	3	2.3						
Angau				334	21	6.3	258	24	9.3
Buka	15	4	26.7	40	5	12.5	41	3	7.3
Daru									
Goroka	128	3	2.3	223	3	1.3	249	13	5.2
Kavieng	30	3	10.0				1	0	0.0
Kimbe	40	7	17.5	87	14	16.1	70	7	10.0
Kerema									
Kundiawa									
Manus	16	0	0.0						
Mendi	123	5	4.1				51	0	0.0
Modilon	34	3	8.8	62	10	16.1	29	6	20.7
Mt Hagen				577	63	10.9	682	61.0	8.94
Nonga	12	8	66.7	124	11	8.9			
Oro				47	3	6.4			
PMGH							310	10	3.2
Vanimo	61	1	1.6	59	0	0.0	98	4	4.1
Wabag	4	0	0.0	2	0	0.0			
Wewak									
Total	**592**	**37**	**6.3**	**1555**	**130**	**8.4**	**1789**	**128**	**7.2**

Hospital	VLBW admissions 2010	VLBW deaths 2010	VLBW CFR 2010	VLBW admissions 2011	VLBW deaths 2011	VLBW CFR 2011	VLBW admissions 2012	VLBW deaths 2012	VLBW CFR 2012
Alotau	8	2	25.0						
Angau				46	25	54.3	37	15	40.5
Buka	11	2	18.2	3	1	33.3	9	4	44.4
Daru									
Goroka	13	6	46.2	29	15	51.7	51	35	68.6
Kavieng	5	0	0.0				3	0	0.0
Kimbe				22	7	31.8	33	17	51.5
Kerema									
Kundiawa									
Manus	10	1	10.0						
Mendi	19	8	42.1				26	15	57.7
Modilon	19	7	36.8	39	14	35.9	58	19	32.8
Mt Hagen				33	14	42.4	21	10.0	47.6
Nonga	17	5	29.4	10	5	50.0			
Oro				4	0	0.0			
PMGH							105	45	42.9
Vanimo	4	1	25.0	3	2	66.7	11	6	54.6
Wabag									
Wewak									
Total	**106**	**32**	**30.2**	**189**	**83**	**43.9**	**354**	**166**	**46.9**

2012 Annual Report on Child Morbidity and Mortality

Hospital	Asphyxia admissions 2010	Asphyxia deaths 2010	Asphyxia CFR 2010	Asphyxia admissions 2011	Asphyxia deaths 2011	Asphyxia CFR 2011	Asphyxia admissions 2011	Asphyxia deaths 2012	Asphyxia CFR 2012
Alotau	79	5	6.3						
Angau				263	43	16.3	256	46	18.0
Buka	6	2	33.3	10	2	20.0	26	3	11.5
Daru									
Goroka	53	3	5.7	169	13	7.7	285	52	18.3
Kavieng	18	1	5.6				2	0	0.0
Kimbe				94	12	12.8	124	20	16.1
Kerema									
Kundiawa									
Manus	7	2	28.6						
Mendi	101	12	11.9				59	4	6.8
Modilon	55	18	32.7	102	19	18.6	95	21	22.1
Mt Hagen				246	35	14.2	230	34.0	14.78
Nonga	58	5	8.6	84	5	6.0			
Oro				41	8	19.5			
PMGH			#DIV/0!				315	62	19.7
Vanimo	90	6	6.7	58	1	1.7	93	11	11.8
Wabag									
Wewak									
Total	467	54	11.6	1067	138	12.9	**1485**	**253**	**17.0**