2015

REPORT OF THE MALAYSIAN NATIONAL NEONATAL REGISTRY

A Study of Critically Ill Babies in Neonatal Intensive Care Units

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A STUDY OF CRITICALLY ILL BABIES IN NEONATAL INTENSIVE CARE UNITS

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Important information

Disclaimer

There is a potential that data for previous years printed in this report are different from what were printed in previous reports. This is because analysis for this report is based on latest dataset in the web which may have been updated by SDP.

January 2019

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CONTENTS

SUMMARY

The inclusion criteria for this study in 2015 were all preterm babies below 32 weeks gestational age, those of birth weight below or equal to 1500 g, all babies who required mechanical ventilation and/or nasal continuous positive airway pressure (nCPAP), all babies with hypoxic ischaemic encephalopathy (HIE), all babies with positive blood culture confirmed sepsis and all neonatal deaths (babies < 28 days old who died in Neonatal Unit, Obstetric Department and other wards). Both inborn and outborn babies were included.

Results

- In 2015, there were 40 participating hospitals with a total livebirths of 280764. A total of 12505 babies who were in level III NICUs met the study criteria, out of which 11134 (89.0%) were inborn while 1371 (11.0%) were outborn babies (Figure 1 and Table 1).

- There were 3060 (24.5%) babies below 32 weeks gestational age (Figure 2 and Table 2)

- There were 3415 (27.3%) babies with the birth weight of 1500g and below (Figure 3 and Table 3)

- The survival rate of very preterm babies admitted to MNNR according to gestational age were 18.4% for 24 weeks, 31.7% for 25 weeks, 54.3% for 26 weeks, 71.4% for 27 weeks, 75.3% for 28 weeks, 86.2% for 29 weeks, 92.1% for 30 weeks and 92.1% for 31 weeks (Figure 4 and Table 4)

- The survival of babies with birth weight between 501-1000g and 1001-1500g were 53.4% and 89.7% respectively (Figure 5 and Table 5)

- In 2015, 73.7% of mothers with babies less than 32 weeks gestation received antenatal corticosteroids. Antenatal corticosteroids were given to mothers of 78.2% inborn babies and 35.0% outborn babies below 32 weeks gestation. There were marked differences in the use of antenatal corticosteroids across the MNNR centres for inborn ranging from 36.4% to 100.0% (Table 6 and Figure 6)

- Correspondingly there were 74.2% of mothers with babies with birth weight ≤1500g, received antenatal corticosteroids. Antenatal corticosteroids were given to 77.45% of the mothers of these babies born in the hospital and 44.2% of those born outside. There were marked differences in the use of antenatal corticosteroids across the MNNR centres for inborn ≤ 1500g ranging from 41.7% to 100.0% (Table 7 and Figure 7)

- The rates of chronic lung disease (oxygen dependency) for babies less than 32 weeks gestation surviving to day 28 and 36 weeks post-conception age were 76.0% and 68.8% respectively for babies between 22-24 weeks gestational age, 54.0% and 46.6% for babies between 25-27 weeks gestational age and 19.9% and 19.1 % for babies between 28-31 weeks gestation (Figure 8 and Table 8)

- The rates of chronic lung disease (oxygen dependency) for babies with birth weight ≤ 1500g surviving to day 28 and 36 weeks post-conception age were 73.0% and 56.3% respectively for babies with birth weight <750g, 45.5% and 34.9% respectively for babies with birth weight 750-999g, 20.7% and 14.1% respectively for babies with birth weight 1000-1249g and 8.6% and 4.7% respectively for babies with birth weight 1250-1499g (Figure 9 and Table 9)

- Patent ductus arteriosus (PDA) was diagnosed in 809 (30.6%) inborn babies less than 32 weeks gestation admitted to NICU in MNNR centres, of which majority (96.9%) were confirmed by echocardiography. Overall 31.4% of these babies were treated with indomethacin/ ibuprofen and 0.5% were ligated. (Table 10)

- Accordingly PDA were most frequently diagnosed in the lower birth weight group with incidence of 24.6%, 40.4%, 34.1% and 21.0% for the birth weight group of <750g, 750-999g, 1000-1249g and 1250-1499g respectively. There were also tendency towards higher treatment with indomethacin/ ibuprofen in the lower birth weight group accounting for 41.3% for babies <750g, 38.3% for babies between 750-999g, 26.3% in babies between 1000-1249g and 23.5% for babies between 1250-1499g. There were only 4 cases of PDA ligation in babies weighing between 750-999g. (Table 11)

- Among 1644 inborn babies less than 32 weeks gestation that underwent retinopathy of prematurity (ROP) screening before discharge, 1446 (88.0%) have no ROP, 162 (9.9%) has ROP stage 1 and 2, 32(1.9%) has ROP stage 3 and 4(0.2%) has ROP stage 4 and 5. Incidence of ROP stage 3 and above according to gestational age group were 14.3%, 8.7% and 0.6% in babies with gestational age 22-24 weeks, 25-27 weeks and 28- 31 weeks respectively. (Figure 12 and Table 12)

- The incidence of severe ROP of stage 3 and above were highest in the lowest birth weight groups accounting for 13.4%, 5.3%, 1.0% and 0.1% in < 750g, 750-999g, 1000-1249g and 1250-1499g respectively (Figure 13 and Table 13)

- Among 2443 inborn babies less than 32 weeks gestation that underwent ultrasound cranium examination for intraventricular haemorrhage (IVH), 1553 (63.6%) has no IVH, 644 (26.4%) has IVH grade 1 and 2, 143 (5.9%) has IVH grade 3 and 103 (4.2%) has IVH grade 4. The incidence rate for severe IVH grade 3 and 4 were 19.6%, 22.2% and 6.5% in babies with gestational age 22-24 weeks, 25-27 weeks and 28-31 weeks gestation respectively (Figure 14 and Table 14)

- The incidence of severe IVH grade 3 and 4 were similarly higher in the lowest birth weight group with 22.5% in <750g , 14.0% in 750-999g , 10.3% in 1000-1249g and 3.5% in 1250-1499g (Figure 15 and Table 15)

- 126 (4.8%) inborn babies less than 32 weeks developed necrotizing enterocolitis (NEC), of which 26.2% of them required surgery. There were no NEC in inborn babies at gestational age of 22-24 weeks, 33 cases (5.7%) in babies 25-27 weeks and 96 cases (4.9%) in babies 28-31 weeks (Figure 16 and Table 16)

- Correspondingly the incidence of NEC in inborn babies according to birth weight categories were 2.6% in < 750g, 6.9% in 750-999g, 5.7% in 1000-1249g and 2.2% in 1250-1499g (Figure 17 and Table 17)

- Incidence of blood culture positive early onset sepsis among inborn babies less than 32 weeks gestation was 2.1%. The incidence were 5.9%, 3.6% and 1.4 % for gestational age group of 22-24 weeks, 25-27 weeks and 28-31 weeks respectively (Figure 18 and Table 18)

- Incidence of blood culture positive late onset sepsis among inborn babies less than 32 weeks was 7.5%. The incidence was highest in the most premature babies with 16.7% in babies 22-24 weeks, 15.1% in babies 25-27 weeks and 6.0 % in babies 28-31 weeks (Figure 19 and Table 19)

- Correspondingly the incidence of blood culture positive late onset sepsis correlated inversely with birth weight groups. The highest incidence of 23.0% in babies with birth weight < 750g followed by 12.3% in babies 750-999g, 6.8% in babies 1000-1249g and 4.4% in babies 1250-1499g (Figure 20 and Table 20)

- Survival of inborn babies less than 32 weeks gestation without any significant morbidities of PDA requiring surgical ligation, ROP stage 3 and above, oxygen dependency at 36 weeks or upon discharge, confirmed sepsis and NEC was 56.7%. Survival among inborn babies less than 32 weeks with any one, two, three or four

morbidities were 30.0%, 4.3%, 2.9% and 0.4% respectively. There was no survivor with 5 morbidities. Survivor without any morbidities according to gestational group were 16.0%, 26.0% and 62.8% for babies 22-24 weeks, 25-27 weeks and 28-31 weeks respectively (Table 21a)

- Correspondingly survival without any morbidities among inborn babies increases with birth weight group with 37.3%, 58.7%, 79.3% and 91.1% for babies with birth weight < 750g, 750-999g, 1000-1249g and 1250-1499g respectively (Table 21b)

- The overall incidence of hypoxic ischemic encephalopathy (HIE) in babies ≥ 35 weeks gestation was 2.5/ 1000 term live births. A total of 595 inborn babies and 91 outborn babies ≥ 35 weeks gestation were diagnosed with HIE. The mortality rate for babies with severe HIE was 52.6% and moderate HIE was 4.3%.

- The incidence rate for ventilated meconium aspiration syndrome (MAS) in babies ≥ 35 weeks gestation was 3.2/ 1000 term live births. A total of 743 inborn babies and 113 outborn babies were ventilated for MAS. The overall mortality rate for ventilated MAS was 12.1%. The mortality rate for inborn and outborn babies ventilated for MAS was 11.8% and 14.2% respectively.

- A total of 578 babies ≥ 35 weeks gestation had persistent pulmonary hypertension of newborn (PPHN) with an overall mortality rate of 31.8%. Inhaled nitric oxide was given to 31% of the babies with PPHN.

- 8.8% (1098/12505) of babies in the cohort had major congenital anomalies. The mortality rate for babies ≥ 35 weeks gestation with major congenital anomalies was 46.9%.

Study recommendations include collaboration with Obstetrics and Primary Healthcare staff:

- To enhance the use of antenatal steroids and continue with in-utero transfer of high-risk pregnancies.
- To reduce the number of post term deliveries and to reduce the risk of thick meconium stained liquor.
- To review preventable causes of HIE.
- To enhance antenatal detection of congenital abnormalities and to provide counselling to parents.

And in the NICUs:

- To continue to promote the use of nasal continuous positive airway pressure as early as possible after birth to reduce the need for mechanical ventilation for the spontaneously breathing preterm babies.
- To reduce the risk of pneumothorax.
- To enhance infection control in the NICUs.
- To increase availability of nitric oxide in state hospitals to reduce mortality from PPHN.
- To increase ROP screening before or soon after discharge

Report of the Malaysian National Neonatal Registry (MNNR) 2015

1. Organization of the MNNR

1.1 Objectives

The Malaysian National Neonatal Registry was set up in 2002 to study the outcome of sick babies admitted to Neonatal Intensive Care Units (NICUs) in the country. A minimum data set and a data collection system at a national level are important to monitor mortality and morbidity of babies admitted to NICUs.

The Malaysian NNR aims:

1. To determine the frequency and distribution of critically ill neonates in Malaysia. These are useful measures of the health burden of neonatal critical illnesses and its care in the country.
2. To study the mortality and some morbidity outcomes of babies admitted to NICUs in participating hospitals.
3. To calculate the perinatal, neonatal, and stillbirth mortality rates of inborn babies.
4. To compare the outcomes between various centres.
5. To develop indicators for standard of care in various areas e.g. acceptable septicaemic rates in NICUs.
6. To study, in further detail, the outcome of very low birth weight babies.
7. To stimulate and facilitate research on neonatal critical illness and its management.

1.2 Structure

The MNNR consists of a Governance Board, Steering Committee and administrative staff. The Governance Board is to monitor and to direct the functions of MNNR and it meets at least once a year.

The Steering Committee consists of nine elected members. This committee is responsible for the general running and decision-making of the Registry and for approving the use of its data.

A Registry Manager assisted by a clinical research assistant heads the administrative staff at the Neonatal Registry Unit (NRU). Statistical support was provided by the CRC.

1.3 Funding

Funding was provided via Perinatal Society of Malaysia & sponsors from industry.

2. Data Set

2.1 Participating Centres in 2015:

1. Hospital Ampang
2. Hospital Batu Pahat, Johor
3. Hospital Bintulu, Sarawak
4. Hospital Raja Permaisuri Bainun, Ipoh, Perak
5. Hospital Kajang, Selangor
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Centre numbers allocated to centers were different from the numbers above.

2.2 Registration criteria

The MNNR audit of critically ill babies admitted to Neonatal Units (NNUs) included

A. All babies admitted to a Neonatal Unit who have any of the following criteria:
   1. Had a gestation of <32 weeks i.e. up to 31 weeks + 6 days
   2. Had a birth weight of 1500 g and below.
   3. Required respiratory support (ventilated or required CPAP)
   4. Had hypoxic ischaemic encephalopathy (HIE) with or without requirement of ventilatory support.
   5. With confirmed sepsis i.e positive blood cultures

B. All neonatal deaths (i.e. newborn babies (<28days) who die in the NNU, delivery room i.e. operating theatre, labour room, and in other wards)

- Both inborn and outborn babies were included.
- Outborn babies who died before arrival were excluded. Babies who were admitted to the NNU at a corrected gestation of > 44/52 were not considered neonatal cases and hence were omitted from the study.

2.3 Data Collection

The CRF consisted of four sheets (of forms).

- Babies discharged or transferred out to non-paediatric wards (e.g. paediatric surgical wards) in the same hospital or to other hospitals would have only one set of CRF completed and readmission of the same babies into the NNU would require a new set of CRF.
- A baby who was transferred between neonatal and paediatric wards under the same department was considered to be the same admission and the discharge CRF was completed after complete discharge from the hospital. Hardcopy CRFs were used and data from completed CRFs were entered via the MNNR website by the respective SDPs or sent to MNNR secretariat after a defined period for data entry.

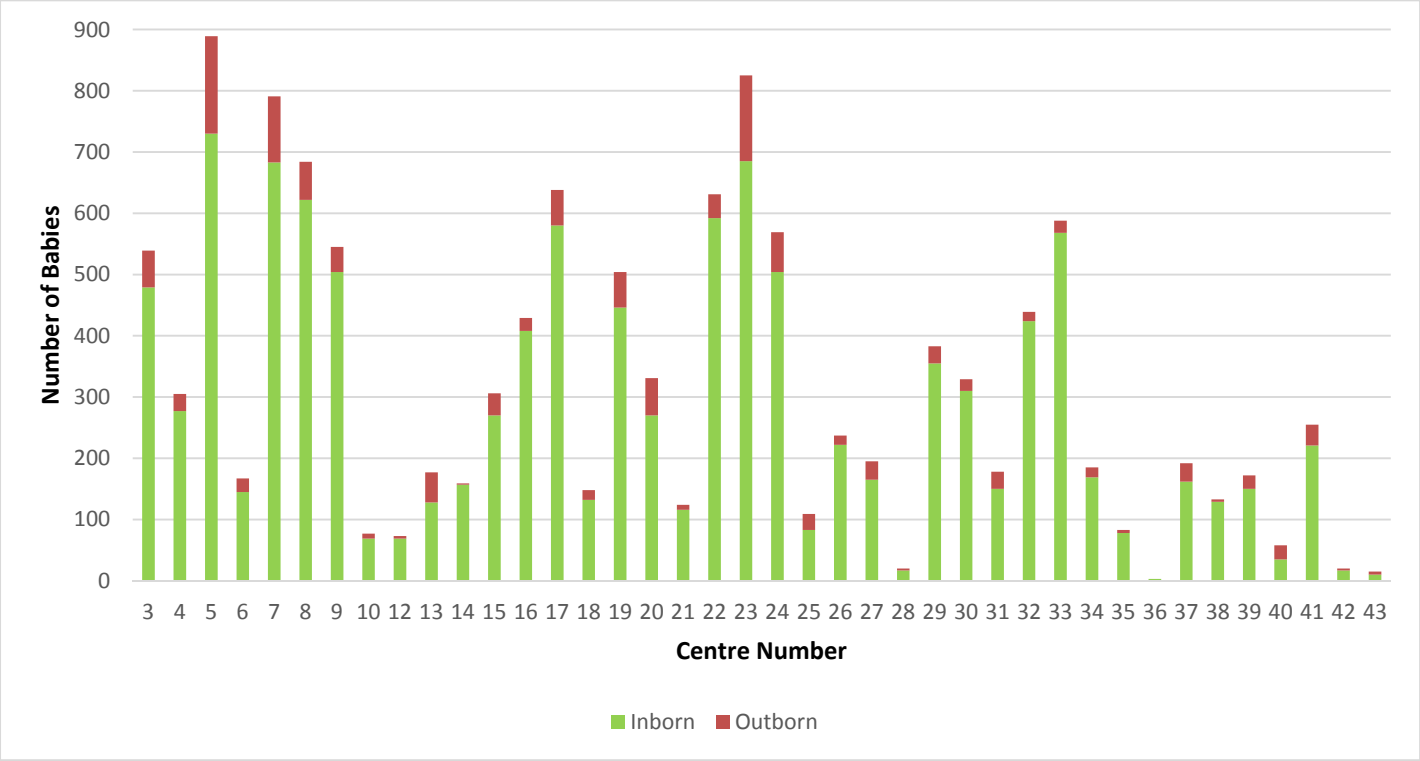
2.4 Data Verification

Missing or anomalous data was identified by manual check and then clarified with the respective centre. Further data verification was made on data entry onto the main database. Quantification of errors and the implementation of practices via website data entry to minimize errors are continually refined.

RESULTS

Figure 1

Number of babies according to place of birth



COMMENT: There were 11134 inborn babies and 1371 outborn babies in the MNNR.

Table 1: Number of babies according to place of birth

Hospitals		Place of Birth		Total
		Inborn	Outborn	
3	n	479	60	539
	(%)	(88.9)	(11.1)	(100)
4	n	277	28	305
	(%)	(90.8)	(9.2)	(100)
5	n	730	159	889
	(%)	(82.1)	(17.9)	(100)
6	n	145	22	167
	(%)	(86.8)	(13.2)	(100)
7	n	683	108	791
	(%)	(86.3)	(13.7)	(100)
8	n	622	62	684
	(%)	(90.9)	(9.1)	(100)
9	n	504	41	545
	(%)	(82.5)	(7.5)	(100)
10	n	69	8	77
	(%)	(89.6)	(10.4)	(100)
12	n	69	4	73
	(%)	(94.5)	(5.5)	(100)
13	n	128	49	177
	(%)	(72.3)	(27.7)	(103)
14	n	157	2	159
	(%)	(98.7.)	(1.3)	(100)
15	n	270	36	306
	(%)	(88.2)	(11.8)	(100)
16	n	408	21	429
	(%)	(95.1)	(4.9)	(100)
17	n	580	58	638
	(%)	(90.9)	(9.1)	(100)
18	n	132	16	148
	(%)	(89.2)	(10.8)	(100)

Table 1: Number of babies according to place of birth (continued)

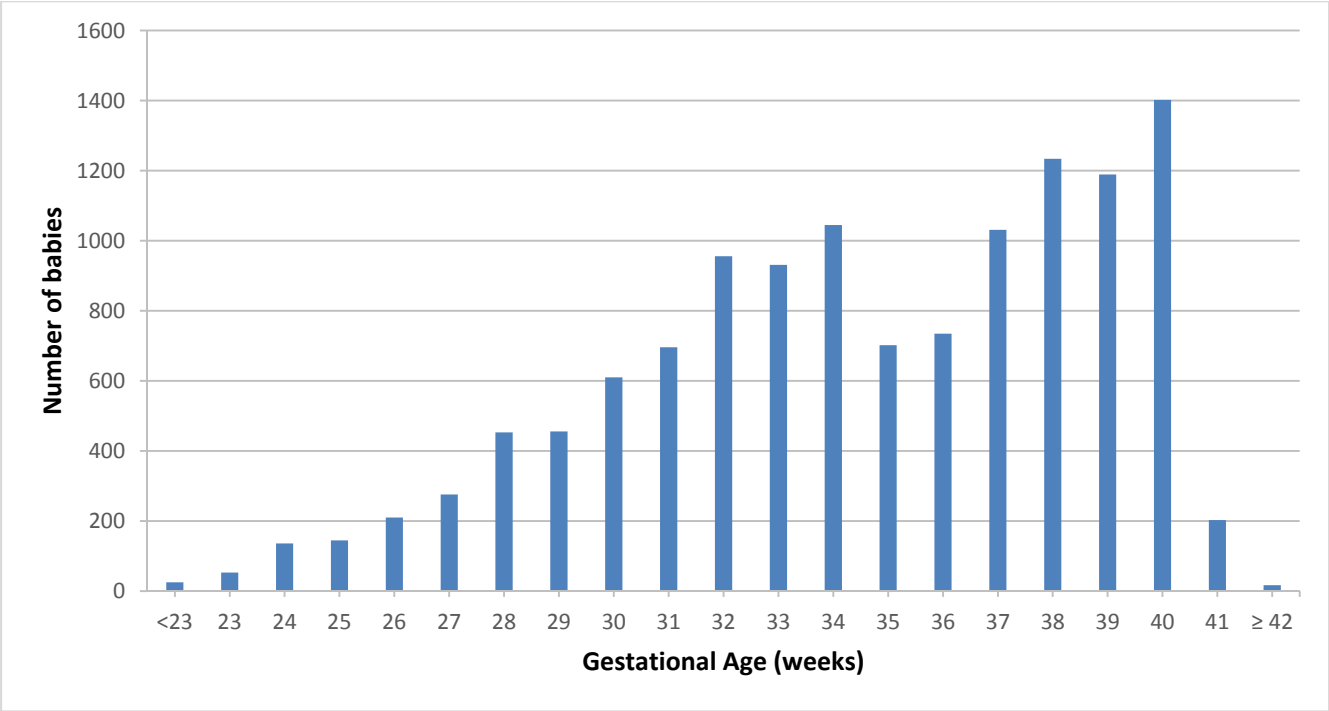
Hospitals		Place of Birth		Total
		Inborn	Outborn	
19	n	446	58	504
	(%)	(88.5)	(11.5)	(100)
20	n	270	61	331
	(%)	(81.6)	(18.4)	(100)
21	n	116	8	124
	(%)	(93.5)	(6.5)	(100)
22	n	592	39	631
	(%)	(93.8)	(6.2)	(100)
23	n	685	140	825
	(%)	(83.0)	(17.0)	(100)
24	n	504	65	569
	(%)	(88.6)	(11.4)	(100)
25	n	83	26	109
	(%)	(76.1)	(23.9)	(100)
26	n	222	15	237
	(%)	(93.7)	(6.3)	(100)
27	n	165	30	195
	(%)	(84.6)	(15.4)	(100)
28	n	17	3	20
	(%)	(85.0)	(15.0)	(100)
29	n	355	28	383
	(%)	(92.7)	(7.3)	(100)
30	n	310	19	329
	(%)	(94.2)	(5.8)	(100)
31	n	150	28	178
	(%)	(84.3)	(15.7)	(100)
32	n	424	15	439
	(%)	(96.6)	(3.4)	(100)
33	n	568	20	588
	(%)	(96.6)	(3.4)	(100)
34	n	169	16	185
	(%)	(91.4)	(8.6)	(100)
35	n	78	5	83
	(%)	(94.0)	(6.0)	(100)

Table 1: Number of babies according to place of birth (continued)

Hospitals		Place of Birth		Total
		Inborn	Outborn	
36	n	3	0	3
	(%)	(100)	(0)	(100)
37	n	162	30	192
	(%)	(84.4)	(15.6)	(100)
38	n	129	4	133
	(%)	(97.0)	(3.0)	(100)
39	n	150	22	172
	(%)	(87.2)	(12.8)	(100)
40	n	35	23	58
	(%)	(60.3)	(39.7)	(100)
41	n	221	34	255
	(%)	(86.7)	(13.3)	(100)
42	n	17	3	20
	(%)	(85.0)	(15.0)	(100)
43	n	10	5	15
	(%)	(66.7)	(33.3)	(100)
TOTAL	**n**	**11134**	**1371**	**12505**
	(%)	**(89.0)**	**(12.3)**	**(100)**

Figure 2

Frequency distribution of all babies in MNNR according to according to gestational age



COMMENT: For the categories ≥ 32 weeks, the case distribution does not include all livebirths in that respective gestational age group (See inclusion criteria).

Table 2 :
Frequency distribution of all babies in MNNR according to gestational age

Gestational age in completed weeks at birth	Frequency	Percent
< 23	25	0.2
23	53	0.4
24	136	1.1
25	145	1.2
26	210	1.7
27	276	2.2
28	453	3.6
29	456	3.6
30	610	4.9
31	696	5.6
32	956	7.6
33	931	7.4
34	1045	8.4
35	702	5.6
36	735	5.9
37	1031	8.2
38	1234	9.9
39	1189	9.5
40	1402	11.2
41	203	1.6
≥ 42	17	0.1
Total included	12505	100
Total no. of babies with missing gestational age	0	
Total no. of babies	12505	

Figure 3

Frequency distribution of all babies in MNNR according to birth weight categories

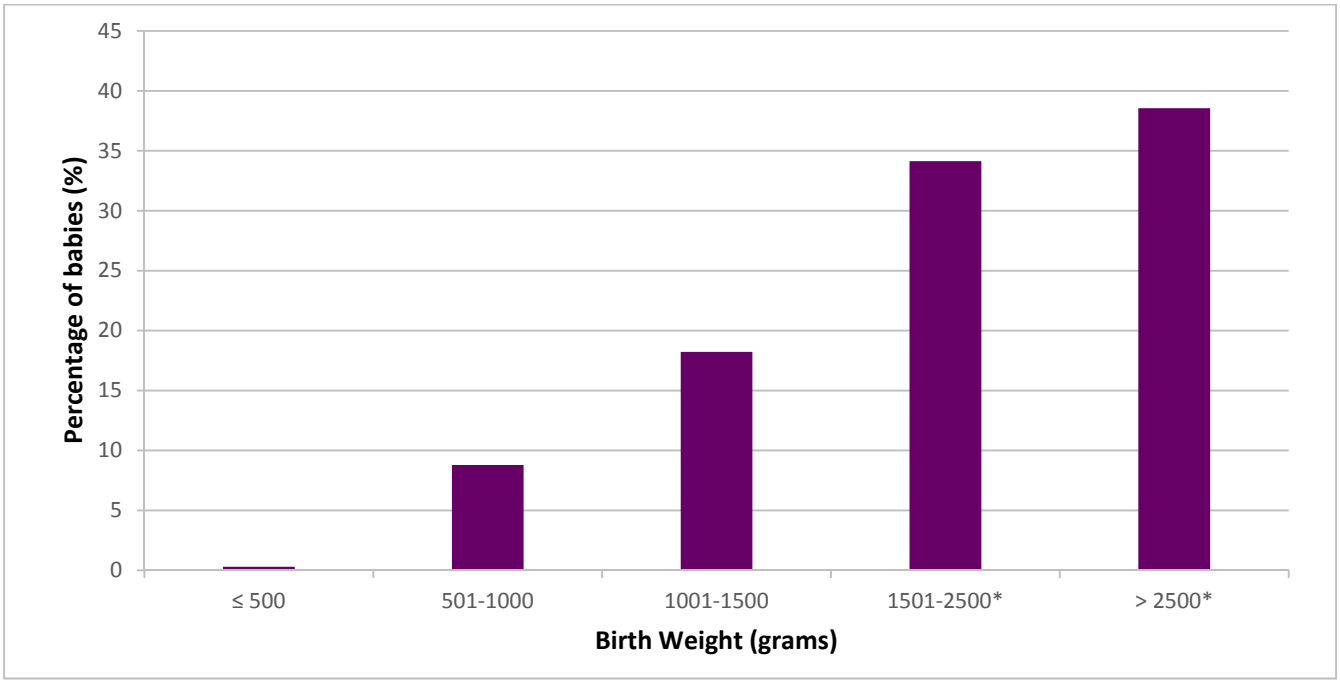


Table 3 :
Frequency distribution of all babies in MNNR according to birth weight (BW) categories

Birth weight (grams)	Frequency	Percent from total number of babies
≤ 500	37	0.3
501-1000	1099	8.8
1001-1500	2279	18.2
1501-2500*	4269	34.1
< 2500	4821	38.6
Total included	12505	100.0
Total no. of babies with missing birth weight	0	
Total no. of babies	12505	

*COMMENT: * For the category > 1500 gram birth weight, calculated percentage does not include all live births in that category (see inclusion criteria).*

Figure 4

Survival to discharge of all live births admitted to MNNR hospitals according to gestational age

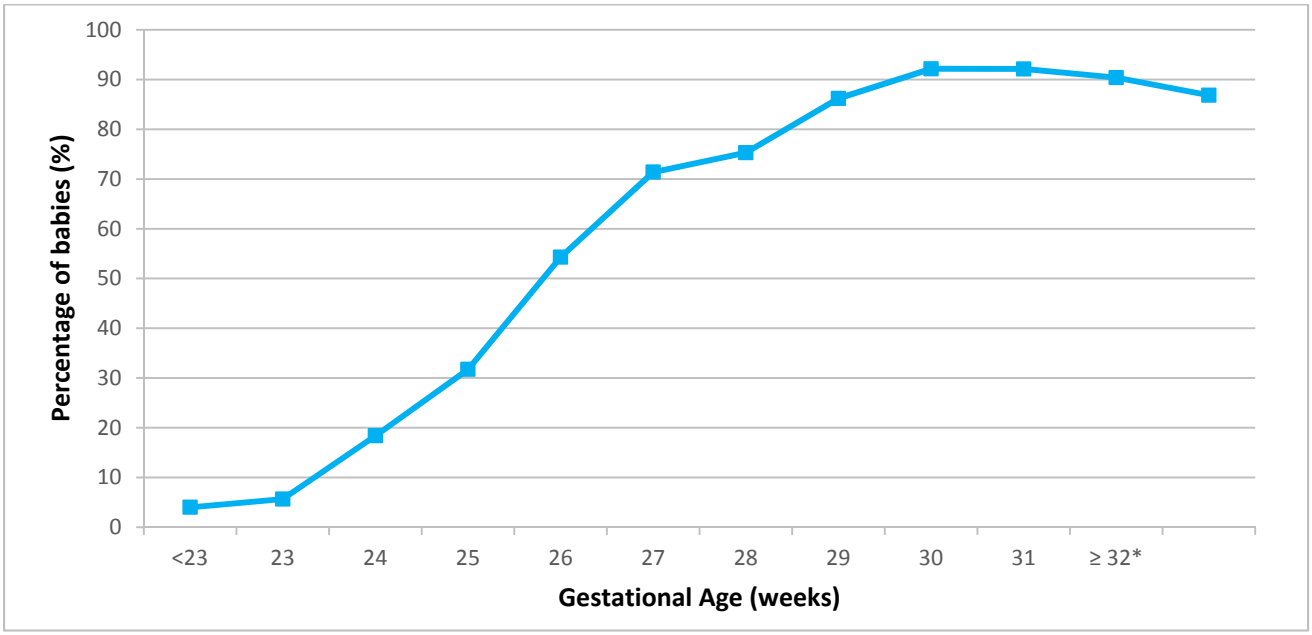


Table 4 :
Survival to discharge of all live births admitted to MNNR hospitals according to gestational age

Gestational age (completed weeks)	Total number of inborn & outborn babies	Number of survivors	% survival
<23	25	1	4.0
23	53	3	5.7
24	136	25	18.4
25	145	46	31.7
26	210	114	54.3
27	276	197	71.4
28	453	341	75.3
29	456	393	86.2
30	610	562	92.1
31	696	641	92.1
≥32*	9445	8535	90.4
Total included	12505	10858	86.8
Total no. of missing (GA)	0		
Total babies	12505		

*COMMENT: * For the category ≥ 32 weeks gestation, calculated survival rate does not include all live births in that category (see inclusion criteria).*

Figure 5

Survival to discharge of all babies admitted to MNNR hospitals according to birth weight categories

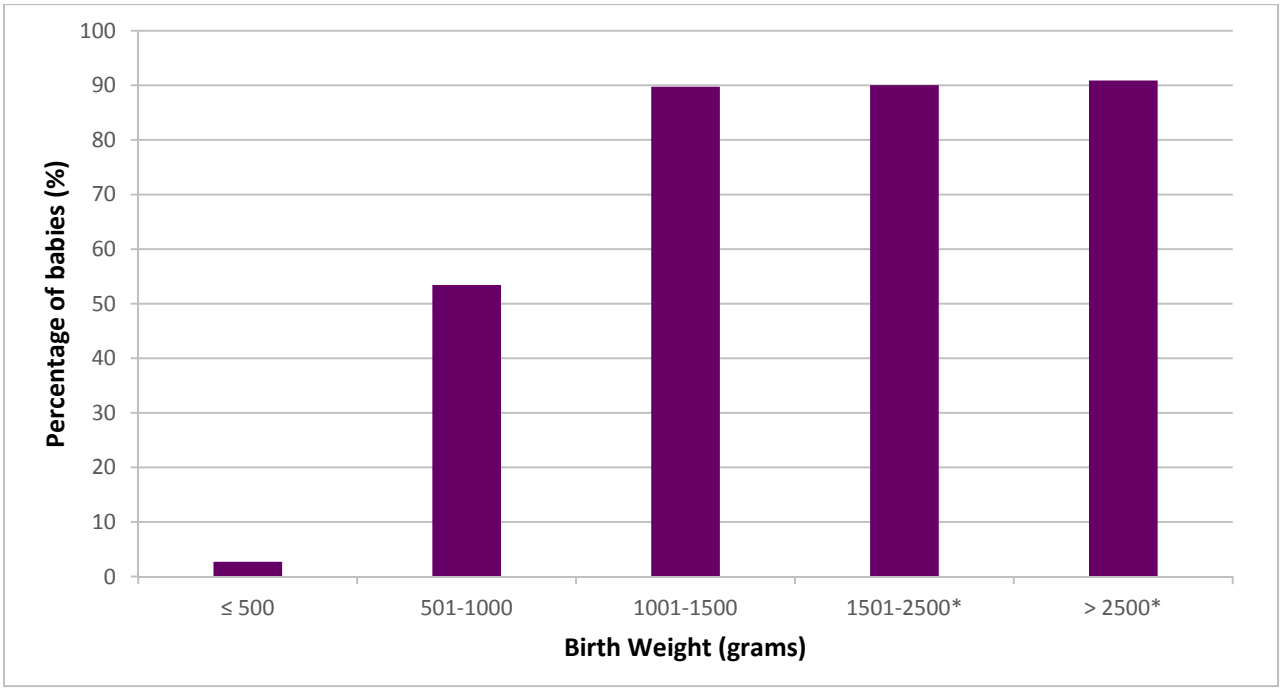


Table 5 :
Survival to discharge of all babies admitted to MNNR hospitals according to birth weight categories

Birth weight (grams)	Total number of inborn &outborn babies	Number of survivors	% survivors
≤500	37	1	2.7
501-1000	1099	587	53.4
1001-1500	2279	2045	89.7
1501-2500*	4269	3844	90.0
>2500*	4821	4381	90.9
Total included	12505	10858	86.8
Total no. of missing (BW)	0		
Overall Total babies	12505		

*COMMENT: * For the category > 1500 gram birth weight, calculated survival rate does not include all live births in that category (see inclusion criteria).*

Figure 6a

Antenatal corticosteroid for all babies born at < 32 weeks gestational according to centres

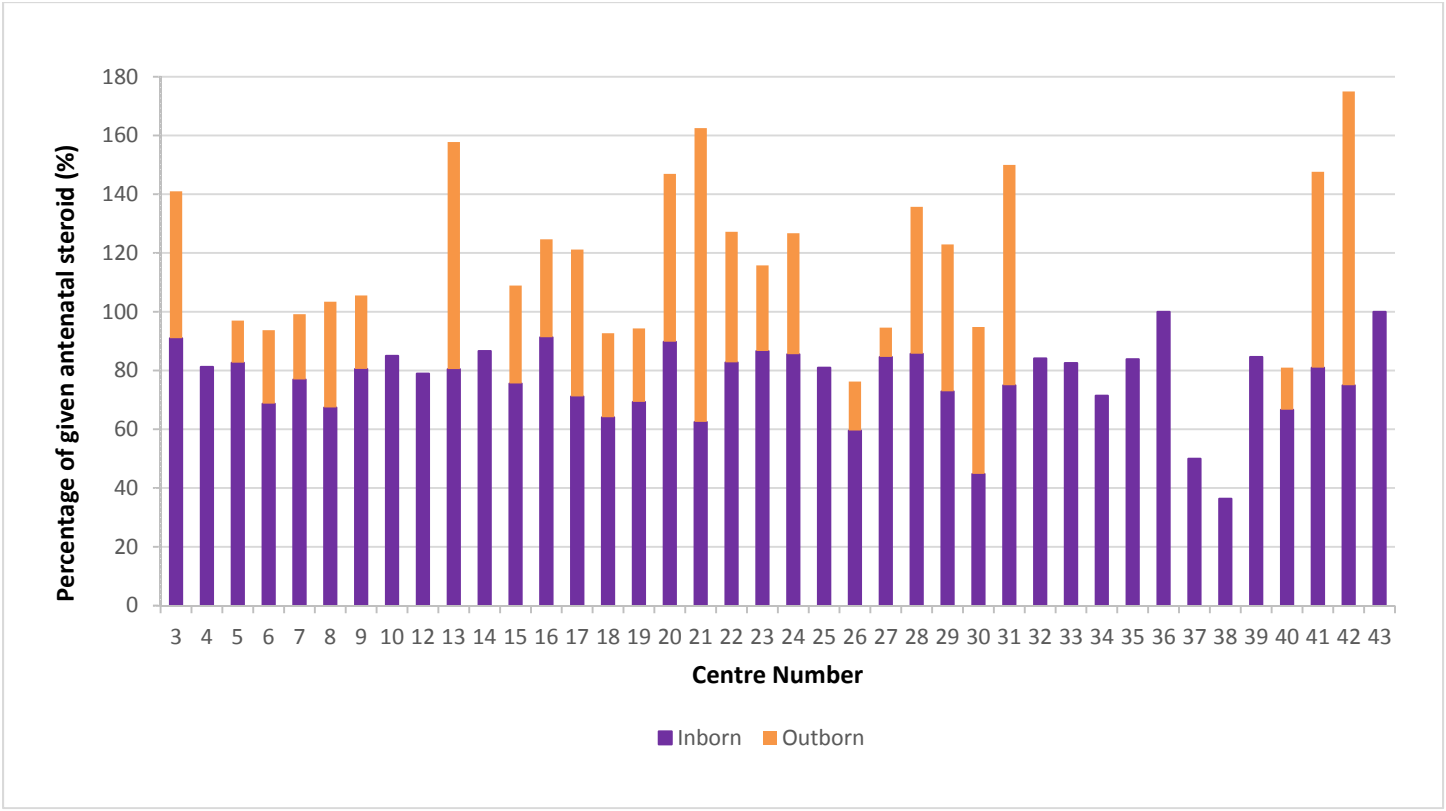


Table 6:
Antenatal corticosteroid for all babies born at < 32 weeks gestational age according to centres

Hospitals	Inborn			Outborn		
	Total number of babies	Given Antenatal Steroid		Total number of babies	Given Antenatal Steroid	
	n	*n*	%	*n*	*n*	%
Overall	2740	2142	78.2	320	112	35.0
3	133	121	91.0	12	6	50.0
4	48	39	81.3	4	1	0.0
5	231	191	82.7	28	4	14.3
6	32	22	68.8	4	1	25.0
7	195	150	76.9	18	4	22.2
8	181	122	67.4	25	9	36.0
9	108	87	80.6	8	2	25.0
10	20	17	85.0	1	0	0.0
12	19	15	78.9	0	0	0.0
13	41	33	80.5	22	17	77.3
14	45	39	86.7	0	0	0.0
15	86	65	75.6	9	3	3.3
16	104	95	91.3	6	2	3.3
17	104	74	71.2	8	4	50.0
18	39	25	64.1	7	2	28.6
19	88	61	69.3	12	3	25.0

Table 6 (continued):
Antenatal corticosteroid for all babies born at < 32 weeks gestational age according to centres

Hospitals	Inborn			Outborn		
	Total number of babies	Given Antenatal Steroid		Total number of babies	Given Antenatal Steroid	
	n	*N*	%	*n*	*n*	%
20	49	44	89.8	14	8	57.1
21	48	30	62.5	3	3	100.0
22	87	72	82.8	9	4	44.4
23	172	149	86.6	24	7	29.2
24	173	148	85.5	17	7	41.2
25	21	17	81.0	1	0	0.0
26	47	28	59.6	6	1	16.7
27	52	44	84.6	10	1	10.0
28	7	6	85.7	2	1	50.0
29	96	70	72.9	8	4	50.0
30	29	13	44.8	2	1	50.0
31	60	45	75.0	8	6	75.0
32	101	85	84.2	4	0	0.0
33	86	71	82.6	4	0	0.0
34	28	20	71.4	1	0	0.0
35	31	26	83.9	4	0	0.0
36	2	2	100.0	0	0	0.0
37	40	20	50.0	10	0	0.0
38	33	12	36.4	3	0	0.0

Table 6 (continued):
Antenatal corticosteroid for all babies born at < 32 weeks gestational age according to centres

Hospitals	Inborn			Outborn		
	Total number of babies	Given Antenatal Steroid		Total number of babies	Given Antenatal Steroid	
	n	*N*	%	*n*	*N*	%
39	26	22	84.6	4	0	0.0
40	6	4	66.7	7	1	14.3
41	63	51	81.0	12	8	66.7
42	8	6	75.0	2	2	100.0
43	1	1	100.0	1	0	0.0

Figure 7

Antenatal corticosteroid for all babies born at ≤ 1500g birth weight according to centres

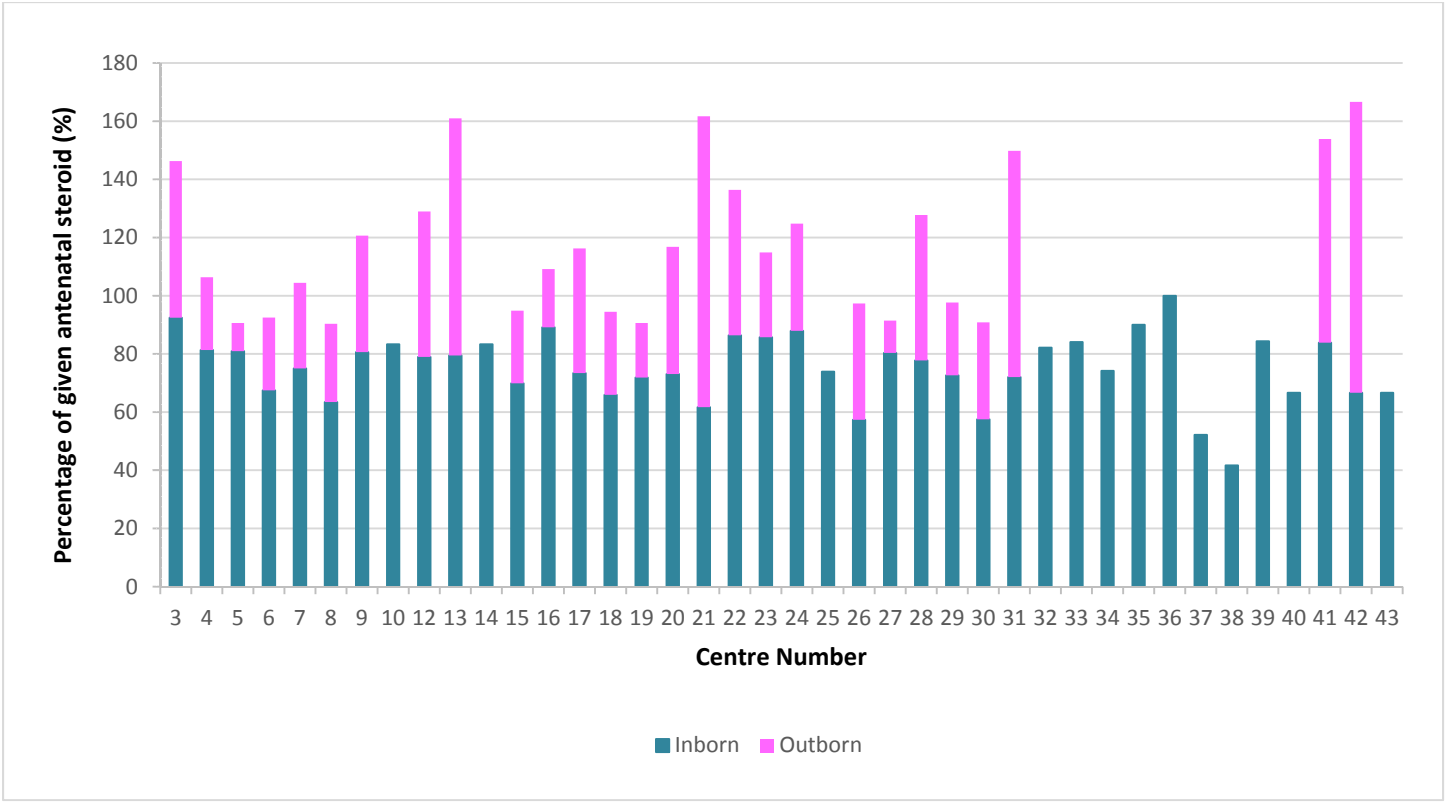


Table 7 :
Antenatal corticosteroid for all babies born at ≤ 1500 grams birth weight according to centres

Hospitals	Inborn			Outborn		
	Total number of babies	Given Antenatal Steroid		Total number of babies	Given Antenatal Steroid	
	n	*N*	%	*n*	*n*	%
Overall	3089	2390	77.4	326	144	44.2
3	159	177	92.5	13	7	53.8
4	59	48	81.4	4	1	25.0
5	257	208	80.9	31	3	9.7
6	40	27	67.5	4	1	25.0
7	224	168	75.0	17	5	29.4
8	186	118	63.4	26	7	26.9
9	124	100	80.6	10	4	40.0
10	24	20	83.3	1	0	0.0
12	19	15	89.2	2	1	50.0
13	39	31	73.4	27	22	81.5
14	42	35	65.9	0	0	0.0
15	93	65	71.9	8	2	25.0
16	120	107	73.1	5	1	20.0
17	109	80	61.7	7	3	42.9
18	44	29	86.4	7	2	28.6
19	96	69	85.7	16	3	18.8

Table 7 (continued):

Antenatal corticosteroid for all babies born at ≤ 1500 grams birth weight according to centres

Hospitals	Inborn			Outborn		
	Total number of babies	Given Antenatal Steroid		Total number of babies	Given Antenatal Steroid	
	n	*N*	%	*n*	*n*	%
20	52	38	73.1	16	7	43.8
21	47	29	61.7	3	3	100.0
22	103	89	86.4	16	3	50.0
23	189	162	85.7	24	7	29.2
24	166	146	88.0	19	7	36.8
25	23	17	73.9	1	0	0.0
26	75	43	57.3	5	2	40.0
27	61	49	80.3	9	1	11.1
28	9	7	77.8	2	1	50.0
29	117	85	72.6	8	2	25.0
30	40	23	57.5	3	1	33.8
31	68	49	72.1	9	7	77.0
32	129	106	82.2	4	0	0.0
33	113	95	84.1	4	0	0.0
34	31	23	74.2	2	0	0.0
35	30	27	90.0	4	0	0.0
36	1	1	100.0	0	0	0.0
37	46	24	52.2	7	0	0.0
38	36	15	41.7	3	0	0.0
39	32	27	84.4	4	0	0.0

Hospitals	Inborn			Outborn		
	Total number of babies	Given Antenatal Steroid		Total number of babies	Given Antenatal Steroid	
	n	*N*	%	*N*	*N*	%
40	12	8	66.7	2	0	0.0
41	62	52	83.9	10	7	70.0
42	9	6	66.7	2	2	100.0
43	3	2	66.7	1	0	0.0

Figure 8

Incidence of oxygen dependency among admitted inborn babies with gestational age < 32 weeks

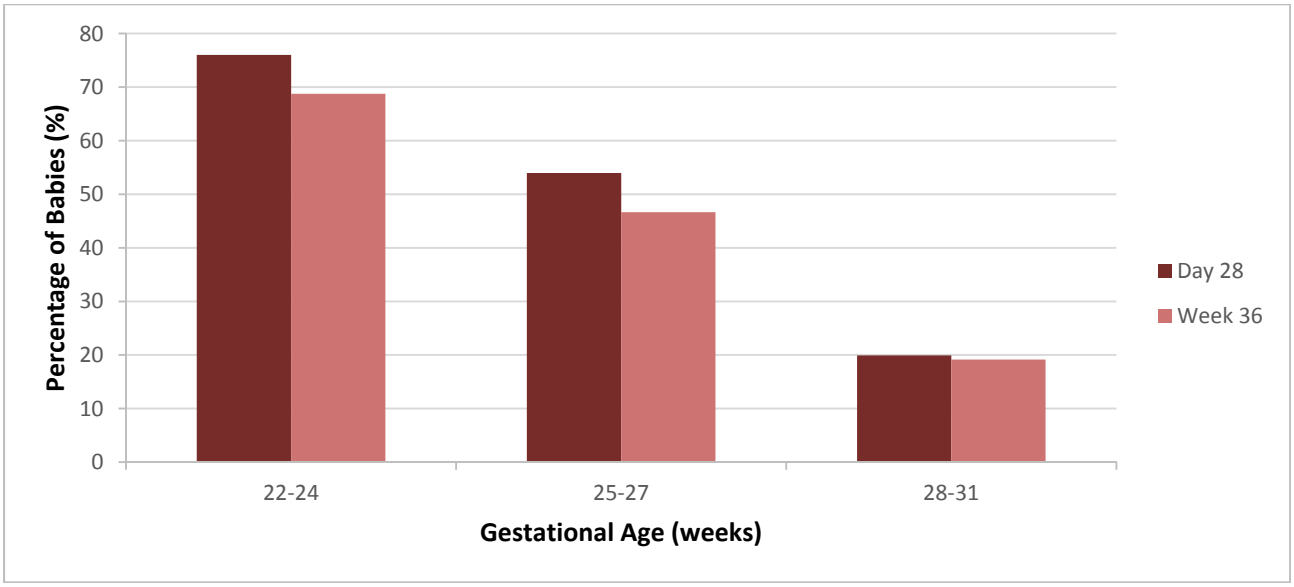


Table 8 :
Incidence of oxygen dependency among admitted inborn babies with gestational age < 32 weeks

Gestational age at birth (weeks)		Total no of admitted inborn babies	Babies alive at day 28	Babies with oxygen dependency beyond day 28 among survivors	Babies alive at 36 weeks postmenstrual age	Babies with oxygen dependency beyond 36 weeks among survivors
22-24	*n*	152	25	19	16	11
	%	5.7	16.4	76.0	10.0	68.8
25-27	*n*	528	339	183	238	111
	%	20.0	64.2	54.0	45.1	46.6
28-31	*n*	1966	1481	295	904	173
	%	74.3	75.3	19.9	46.0	19.1
Total included	*n*	2646	1845	497	1158	295
	%	100	69.7	26.9	43.8	25.5
Total no. of missing (GA)		0				
Total babies		2646				

Figure 9

Incidence of oxygen dependency among admitted inborn babies with birth weight ≤ 1500 grams

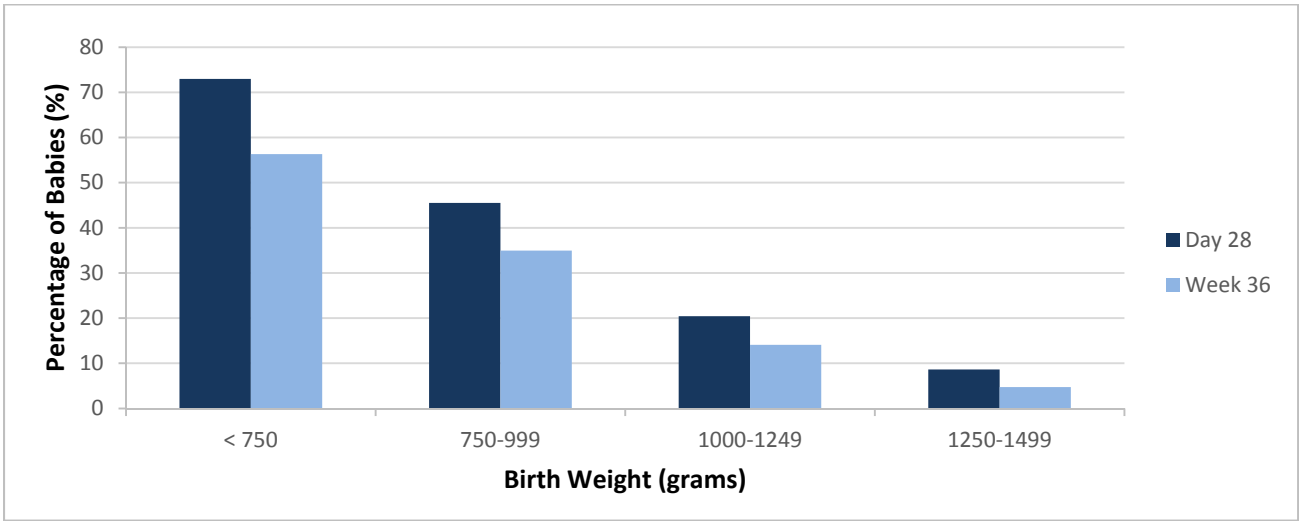


Table 9:
Incidence of oxygen dependency among admitted inborn babies with birth weight ≤ 1500 grams

Birth Weight (grams)		Total no of admitted inborn babies	Babies alive at 28	Babies with oxygen dependency beyond day 28 among survivors	Babies alive at 36 weeks postmenstrual age	Babies with oxygen dependency beyond 36 weeks among survivors
< 750	*n*	305	74	54	71	40
	%	10.6	24.3	73.0	23.3	56.3
750-999	*n*	562	389	177	352	123
	%	19.6	69.2	45.5	62.6	34.9
1000 – 1249	*n*	872	720	147	546	77
	%	30.4	82.6	20.7	62.6	14.1
1250 - 1499	*n*	1134	833	72	674	32
	%	39.5	73.5	8.6	59.4	4.7
Total Included	*n*	2873	2016	450	1643	272
	%	100	70.2	22.3	57.2	16.6
Total no. of missing (GA)		0				
Total babies		2873				

Table 10

Treatment of patent ductus arteriosus (PDA) in admitted inborn babies in the MNNR by gestational age categories

Gestational age at birth (weeks)	Total no. of admitted inborn babies		No. of babies with data available on PDA diagnosis		No. of babies with diagnosed PDA		Confirmed by ECHO		Treatment			
									Indo-methacin/ Ibuprofen		Ligation	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
22-24	152	5.7	152	100	30	19.7	28	93.3	16	53.3	0	0.0
25-27	528	20.0	528	100	238	45.1	234	98.3	85	35.7	2	0.8
28-31	1966	74.3	1966	100	541	27.5	522	96.5	153	28.3	2	0.4
Total included	2646	100	2646	100	809	30.6	784	96.9	254	31.4	4	0.5

Table 11
Treatment of patent ductus arteriosus (PDA) in admitted inborn babies by birth weight categories

Birth weight (grams)	Total number of admitted inborn babies		No. of babies with data available on PDA diagnosis		No. of babies with diagnosed PDA		Confirmed by ECHO		Treatment			
									Indo-methacin/ Ibuprofen		Ligation	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
< 750	305	10.6	305	100	75	24.6	71	94.7	31	41.3	0	0.0
750-999	562	19.6	562	100	227	40.4	221	97.4	87	38.3	4	1.8
1000-1249	872	30.4	872	100	297	34.1	288	97.0	78	26.3	0	0.0
1250-1499	1134	39.5	1134	100	238	21.0	230	96.6	56	23.5	0	0.0
Total included	2873	100	2873	100	837	29.1	810	96.8	252	30.1	4	0.5

Figure 12

Incidence of retinopathy of prematurity (ROP) in admitted inborn babies by gestational age categories

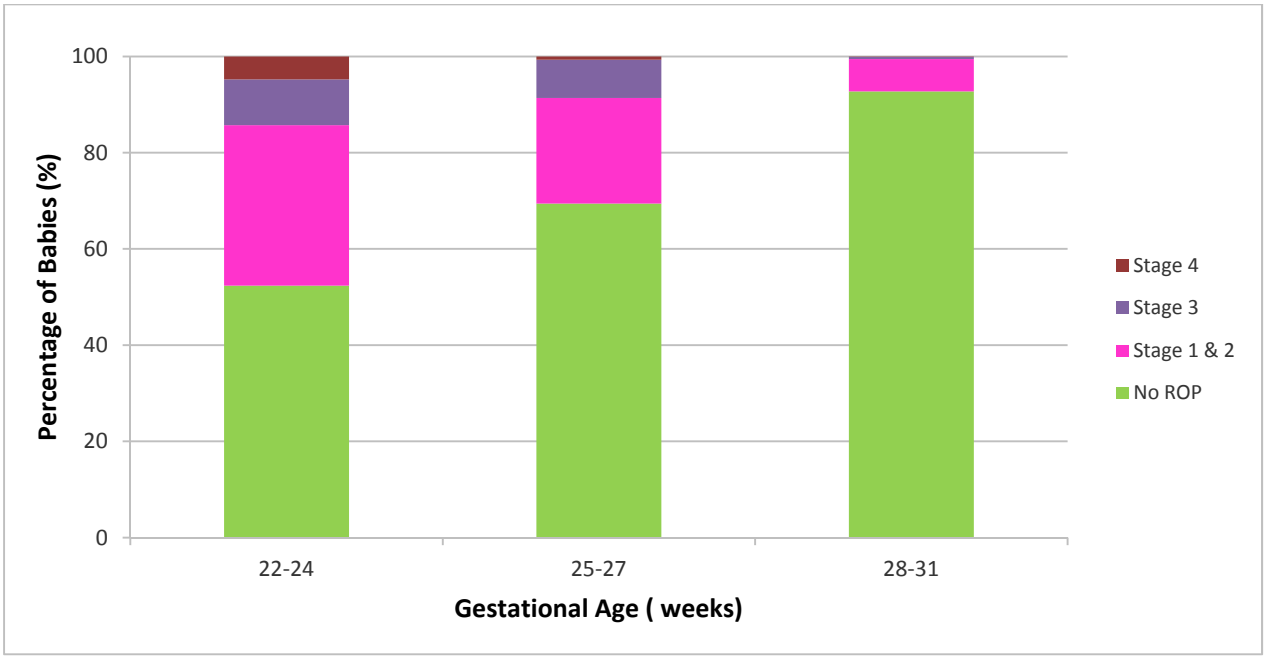


Table 12:
Incidence of retinopathy of prematurity (ROP) in admitted inborn babies in the MNNR by gestational age categories

Gestational age at birth (weeks)	Total number of admitted inborn babies	No. of babies alive at 6 weeks	No. of babies with eye examination		Retinopathy of prematurity								Therapy	
					No ROP		ROP Stage 1 & 2		ROP Stage 3		ROP Stage 4 & 5		Cryo	Laser
	n	*n*	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%		
22-24	152	26	21	80.8	11	52.4	7	33.3	2	9.5	1	4.8	0	3
25-27	528	327	301	92.0	209	69.4	66	21.9	24	8.0	2	0.7	0	21
28-31	1966	1781	1322	74.2	1226	92.7	89	6.7	6	0.5	1	0.1	1	6
Total Included	2646	2134	1644	77.0	1446	88.0	162	9.9	32	1.9	4	0.2	1	30

Comment: Screening refers to those screened during the ward admission

Figure 13

Incidence of retinopathy of prematurity (ROP) in admitted inborn babies by birth weight categories

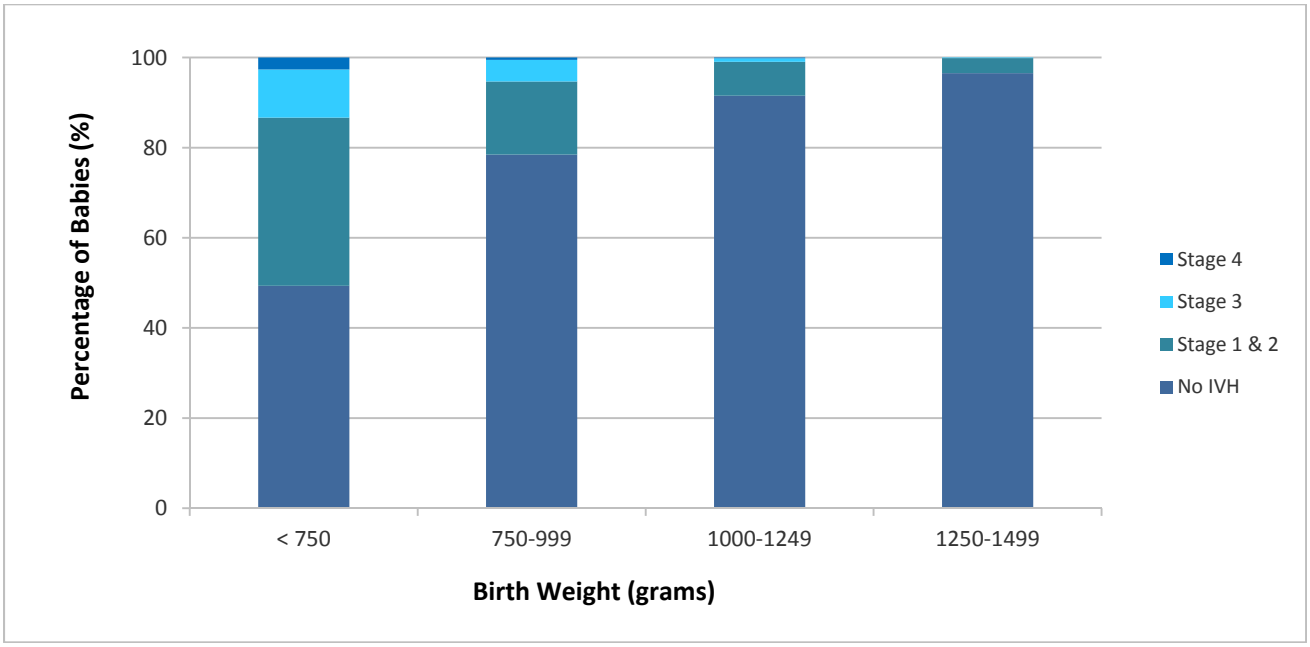


Table 13 :
Incidence of retinopathy of prematurity (ROP) in admitted inborn babies in the MNNR by birth weight categories

Birth weight (grams)	Total no of admitted inborn babies	No. of babies alive at 6 weeks	No. of babies with eye examination		Retinopathy of prematurity								Therapy	
					No ROP		ROP Stage 1 & 2		ROP Stage 3		ROP Stage 4 & 5		Cryo	Laser
	n	*n*	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%		
< 750	305	80	75	93.8	37	49.3	28	37.3	8	10.7	2	2.7	0	9
750-999	562	407	376	92.4	295	78.5	64	16.2	18	4.8	2	0.5	0	16
1000-1249	872	769	638	83.0	584	91.5	48	7.5	5	0.8	1	0.2	0	4
1250-1499	1134	1068	718	67.2	693	96.5	24	3.3	1	0.1	0	0.0	0	1
Total included	2873	2324	1807	77.8	1609	89.0	161	8.9	32	1.8	5	0.3	0	30

Comment: Screening refers to those screened during the ward admission

Figure 14

Incidence of intraventricular haemorrhage (IVH) in admitted inborn babies < 32 weeks gestational age

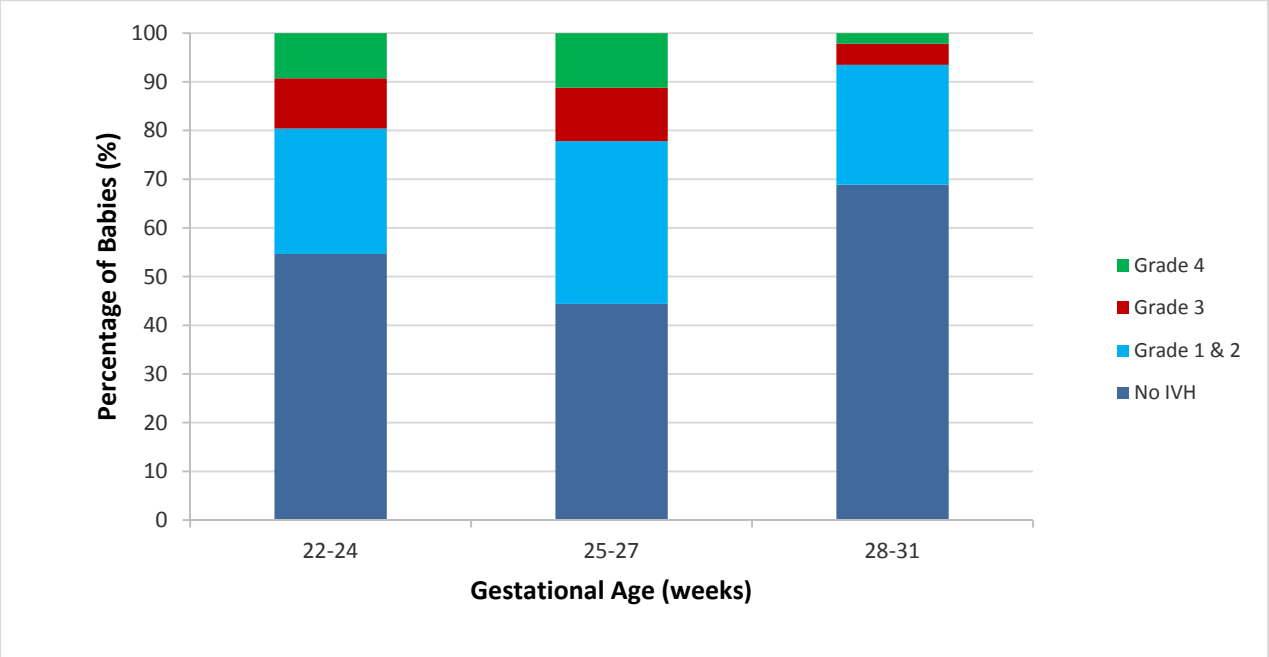


Table 14 :
Incidence of intraventricular haemorrhage (IVH) in admitted inborn babies < 32 weeks gestational age

Gestational age (completed weeks)		Total no. of admitted inborn babies	Babies with CUS	NO IVH	IVH Grade 1 & Grade 2	IVH Grade 3	IVH Grade 4
22-24	**n**	152	97	53	25	10	9
	%	5.7	63.8	54.6	25.8	10.3	9.3
25-27	**n**	528	473	210	158	52	53
	%	20.0	89.6	44.4	33.4	11.0	11.2
28-31	**n**	1966	1873	1290	461	81	41
	%	74.3	95.3	68.9	24.6	4.3	2.2
Total included	**n**	2646	2443	1553	644	143	103
	%	100	92.3	63.6	26.4	5.9	4.2
Total no. of missing (GA)	0						
Total babies	2646						

CUS – cranial untrasound

Figure 15

Incidence of intraventricular haemorrhage (IVH) in admitted inborn babies ≤ 1500 grams birth weight

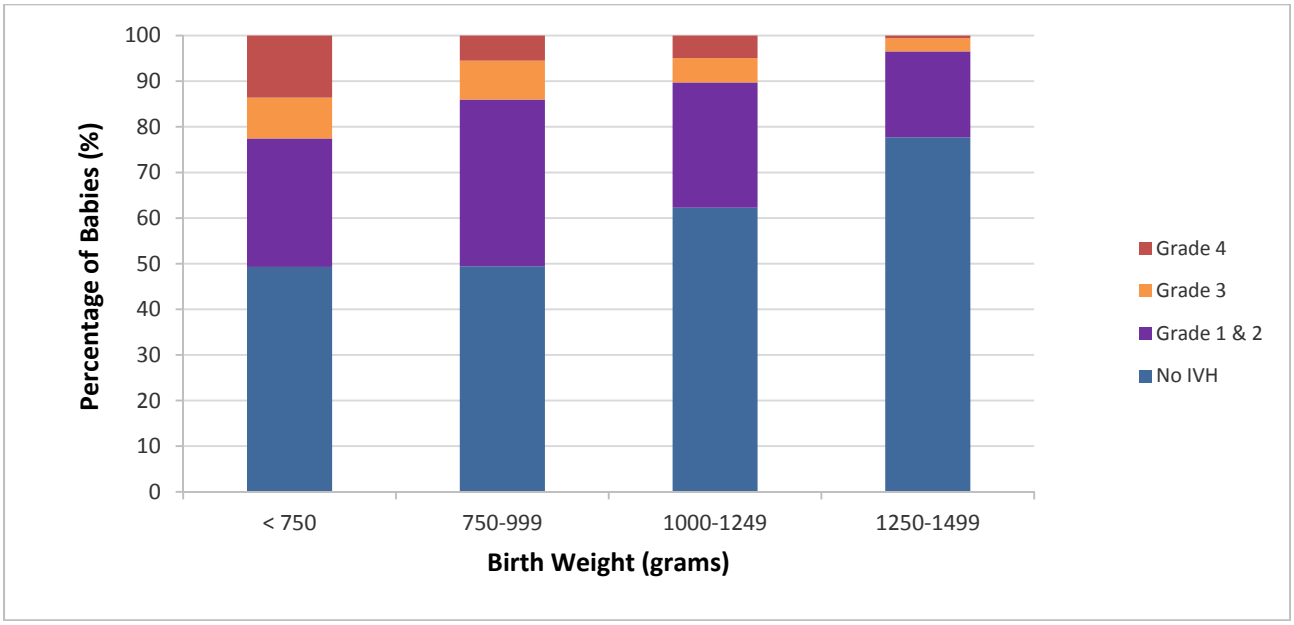


Table 15 :
Incidence of intraventricular haemorrhage (IVH) in admitted inborn babies <u>≤</u> 1500 grams birth weight

Birth weight (grams)		Total no. of admitted inborn babies	Babies with CUS	NO IVH	IVH Grade 1 & Grade 2	IVH Grade 3	IVH Grade 4
< 750	**n**	305	213	105	60	19	29
	%	10.6	69.8	49.3	28.2	8.9	13.6
750-999	**n**	562	528	261	193	45	29
	%	19.6	94.0	49.4	36.6	8.5	5.5
1000-1249	**n**	872	848	528	233	45	42
	%	30.4	97.2	62.3	27.5	5.3	5.0
1250-1499	**n**	1134	1041	809	196	30	6
	%	39.5	91.8	77.7	18.8	2.9	0.6
Total included	**n**	2873	2630	1703	682	139	106
	%	100	91.5	64.8	25.9	5.3	4.0
Total no. of missing (GA)	0						
Total babies	2873						

CUS – cranial untrasound

Figure 16

Incidence of necrotizing enterocolitis (NEC) in admitted inborn babies according to gestational age categories

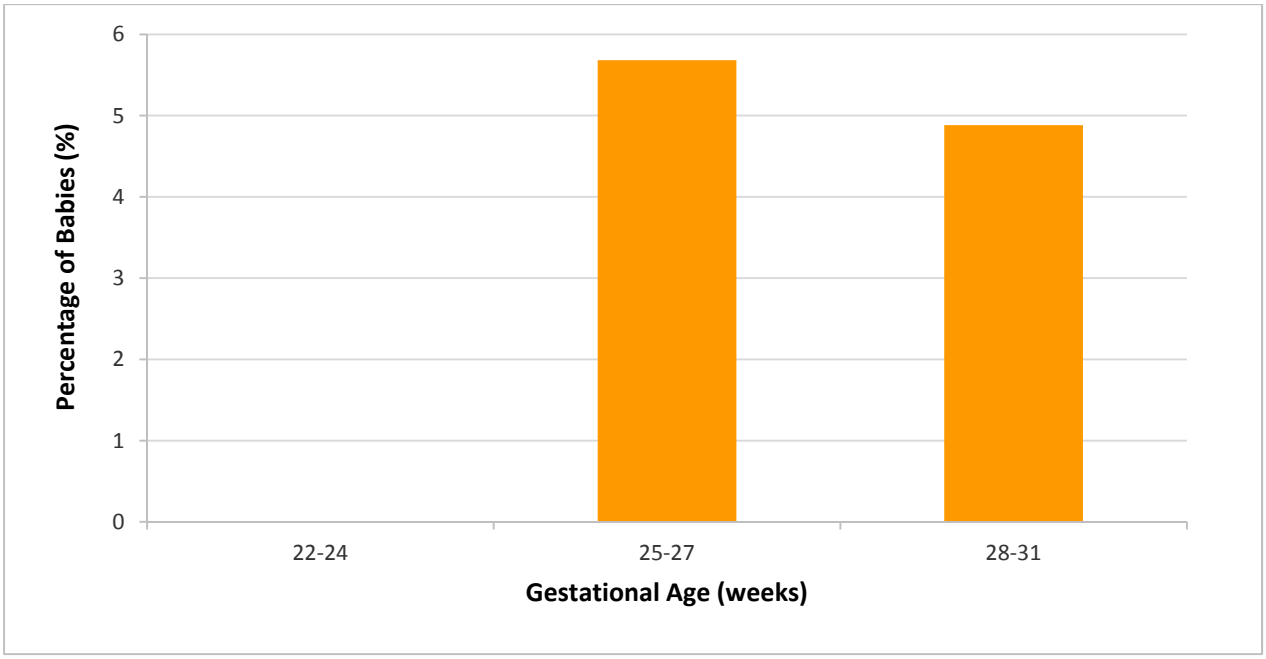


Table 16 :
Incidence and treatment of necrotizing enterocolitis (NEC) in admitted inborn babies according to gestational age categories

Gestational age (weeks)	Total number of admitted inborn babies	Babies with NEC		With Surgical treatment	
	n	*n*	*%*	*n*	*%*
22-24	152	0	0.0	0	0.0
25-27	528	30	5.7	8	26.7
28-31	1966	96	4.9	25	26.0
Total included	2646	126	4.8	33	26.2
Total no. of missing (GA)	0				
Overall Total babies	2646				

Comment: NEC refers to those with at least Stage 2 modified Bell's criteria

Figure 17

Incidence of necrotizing enterocolitis (NEC) in admitted inborn babies according to birth weight categories

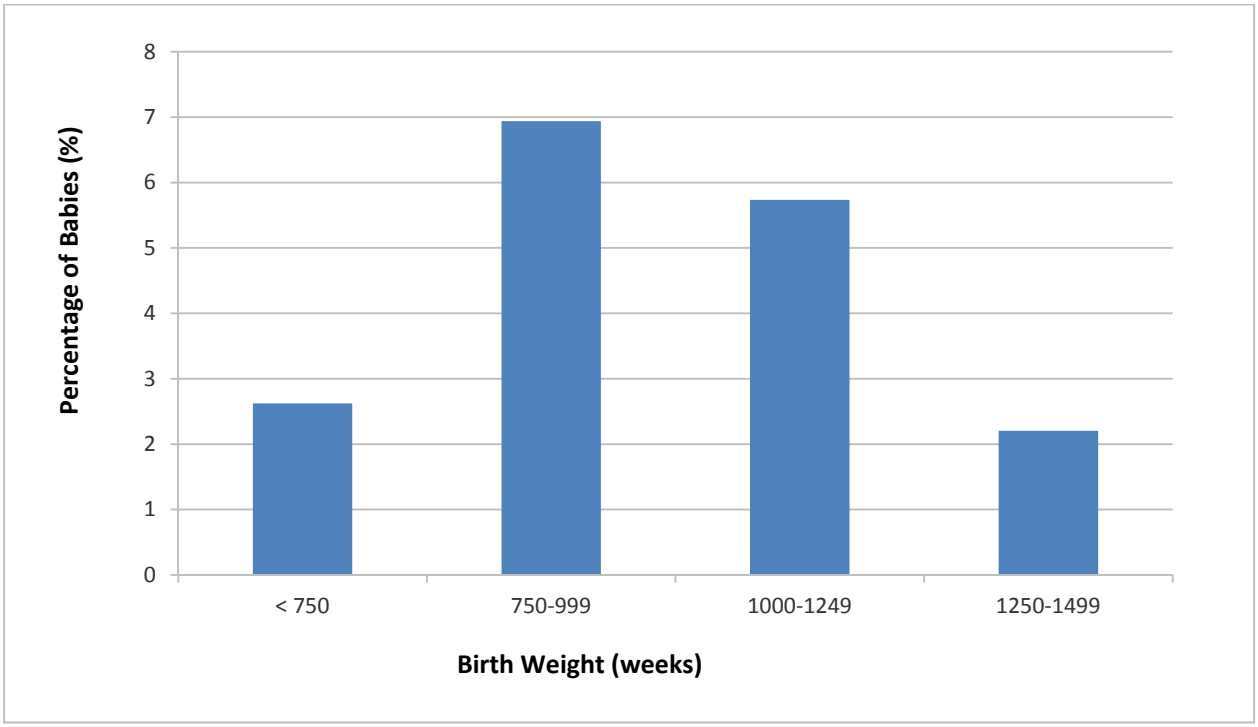


Table 17 :
Incidence and treatment of necrotizing enterocolitis (NEC) in admitted inborn babies according to birth weight categories

Birth weight (grams)	Total number admitted of inborn babies	Babies with NEC		With Surgical treatment	
	n	*n*	*%*	*n*	*%*
< 750	305	8	2.6	0	0.0
750-999	562	39	6.9	11	28.2
1000-1249	872	50	5.7	15	30.0
1250 - 1499	1134	25	2.2	4	16.0
Total included	2873	122	4.2	30	24.6
Total no. of missing (BW)	0				
Overall total babies	2873				

Comment: NEC refers to those with at least Stage 2 modified Bell's criteria

Figure 18

Incidence of blood culture positive early onset sepsis in admitted inborn babies by gestational age categories

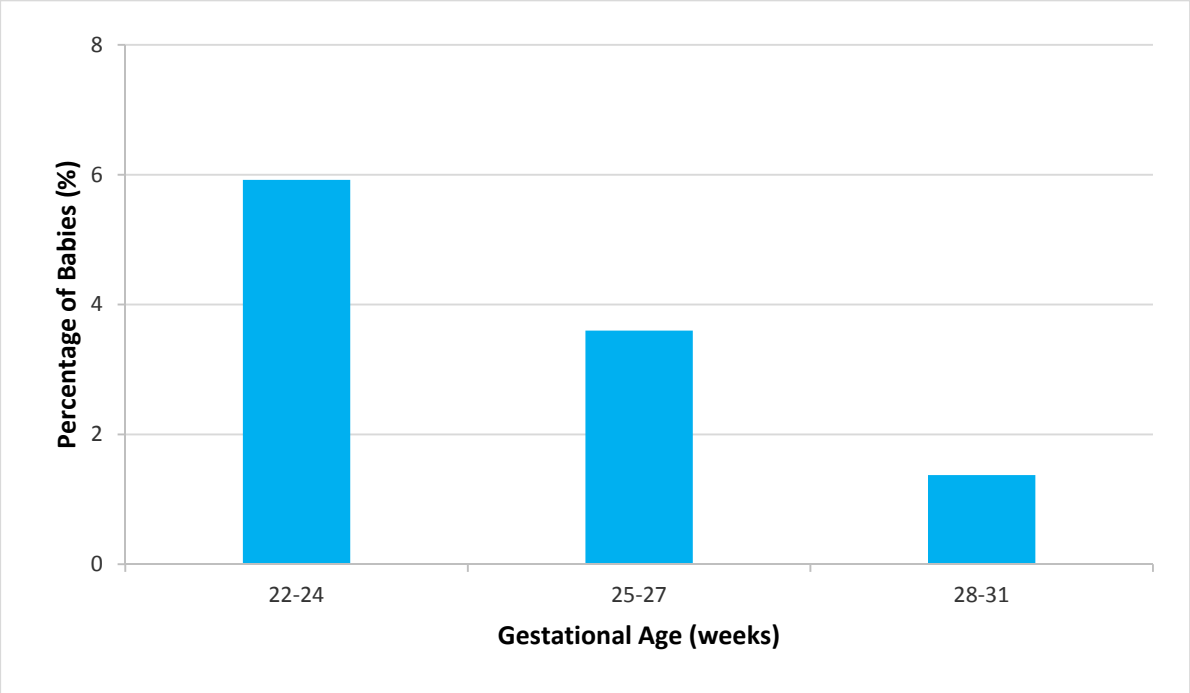


Table 18 :
Incidence of blood culture positive early onset sepsis in admitted inborn babies by gestational age categories

Gestational age at birth (completed weeks)	Total number of admitted inborn babies	No. of babies with early infection	
	n	*n*	%
22-24	152	9	5.9
25-27	528	19	3.6
28-31	1966	27	1.4
Total included	2646	55	2.1
Total no. of missing (GA)	0		
Total babies	2646		

Figure 19

Incidence of blood culture positive late onset sepsis in admitted inborn babies by gestational age categories

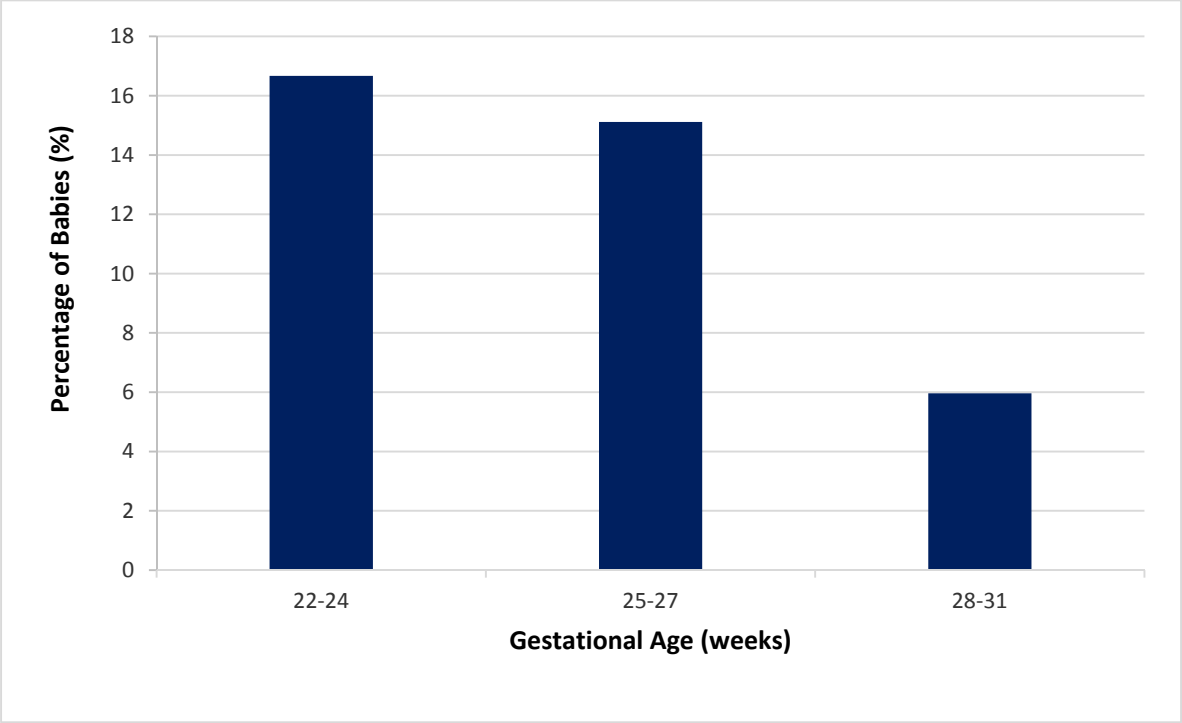


Table 19 :
Incidence of blood culture positive late onset sepsis in admitted inborn babies by gestational age categories

Gestational age (weeks)	Total number of admitted inborn babies	No. of babies who survived beyond day 3 after birth	No. of babies with at least one episode of late onset sepsis	
	n	*n*	n	%
22-24	152	24	4	16.7
25-27	528	311	47	15.1
28-31	1966	1744	104	6.0
Total included	2646	2079	155	7.5
Total no. of missing (GA)	0			
Total babies	2646			

Figure 20

Incidence of blood culture positive late onset sepsis in admitted inborn babies by birth weight categories

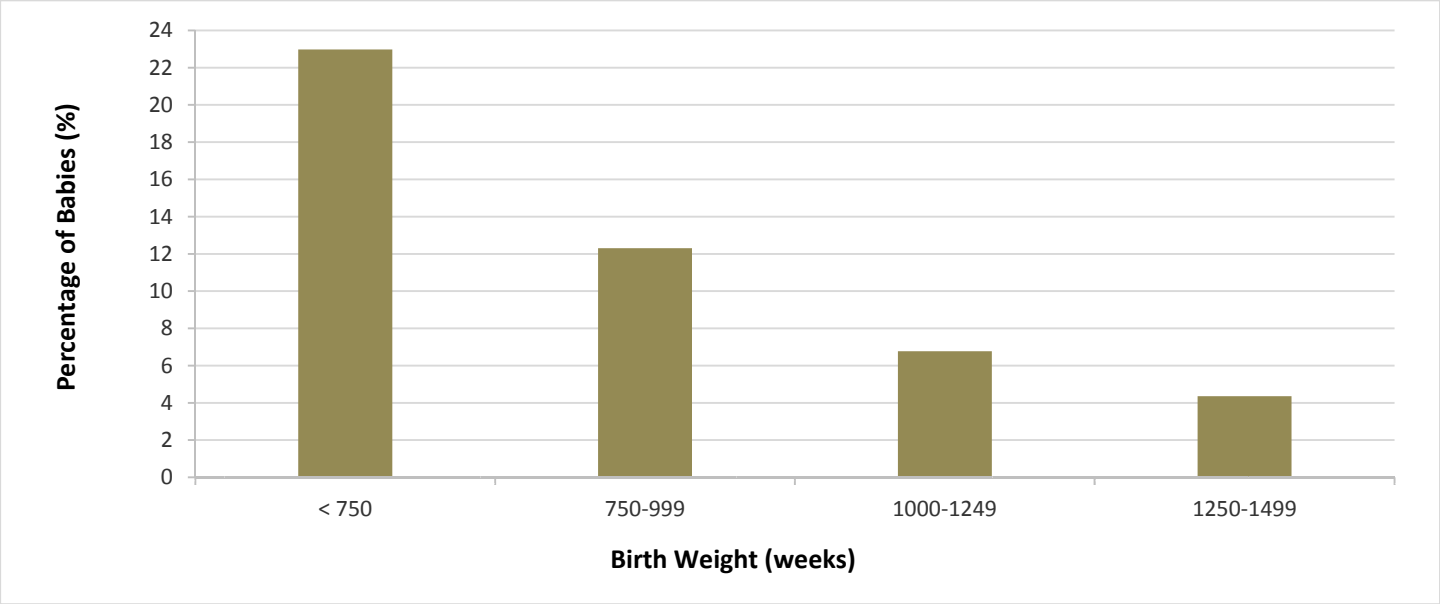


Table 20 :
Incidence of blood culture positive late onset sepsis in admitted inborn babies by birth weight categories

Birth weight (grams)	Total number of admitted inborn babies	No. of babies who survived beyond day 3 after birth	No. of babies with at least one episode of late onset sepsis	
	n	*n*	n	%
< 750	305	74	17	23.0
750-999	562	390	40	12.3
1000-1249	872	753	51	6.8
1250 - 1499	1134	1055	46	4.4
Total included	2873	2272	162	7.1
Total no. of missing (BW)	0			
Overall total babies	2873			

Table 21a

Gestational age specific mortality or significant morbidity in admitted inborn babies (five morbidities)

Gestational age at birth (weeks)		Total no. of admitt-ed inborn babies	Numb er Surviv ed	No. with any one morbiditi es prior to discharge among survivors	No. with any two morbiditi es prior to discharge among survivors	No. with any three morbiditi es prior to discharge among survivors	No. with any four morbiditi es prior to discharge among survivors	No. with any five morbiditi es prior to discharge among survivors	No. without any five morbiditi es prior to discharge among survivors
22-24	n	152	25	18	2	1	0	0	4
	%	5.7	16.4	72.0	16.0	4.0	0.0	0.0	16.0
25-27	n	528	315	116	79	33	5	0	82
	%	20.0	59.7	36.8	13.3	10.5	1.6	0.0	26.0
28-31	n	1966	1756	495	129	26	4	0	1102
	%	74.3	89.3	28.2	2.6	1.5	0.2	0.0	62.8
Total Included	n	2646	2096	629	210	60	9	0	1188
	%	100	79.2	30.0	4.3	2.9	0.4	0.0	56.7
Total no. of missing (GA)	-								
Total babies	2646								

i. PDA requiring surgical ligation
ii. Stage 3 / 4 or 5 ROP
iii. Oxygen dependency at 36 weeks or discharge
iv. Confirmed sepsis
v. NEC

Table 21b

Birth weight specific mortality or significant morbidity in admitted inborn babies (five morbidities)

Gestational age at birth (weeks)		Total no. of admitt-ed inborn babies	Numb er Surviv ed	No. with any one morbiditi es prior to discharge among survivors	No. with any two morbiditi es prior to discharge among survivors	No. with any three morbiditi es prior to discharge among survivors	No. with any four morbiditi es prior to discharge among survivors	No. with any five morbiditi es prior to discharge among survivors	No. without any five morbiditi es prior to discharge among survivors
< 750	n	305	75	25	20	2	0	0	28
	%	10.6	24.6	33.3	26.7	2.7	0.0	0.0	37.3
750 - 999	n	562	395	120	35	8	0	0	232
	%	19.6	70.3	30.4	8.9	2.0	0.0	0.0	58.7
1000 - 1249	n	872	755	131	22	3	0	0	599
	%	30.4	86.6	17.4	2.9	0.4	0.0	0.0	79.3
1250 - 1499	n	1134	1062	82	11	2	0	0	967
	%	39.5	93.7	7.7	1.0	0.2	0.0	0.0	91.1
Total Included	n	2873	2287	651	88	15	0	0	1826
	%	100	79.6	15.7	3.8	0.7	0.0	0.0	79.8
Total no. of missing (GA)	-								
Total babies	2873								

i. PDA requiring surgical ligation

ii. Stage 3 / 4 or 5 ROP

iii. Oxygen dependency at 36 weeks or discharge

iv. Confirmed sepsis

v. NEC

APPENDICES

Appendix 1 Level of Neonatal Care

(Adapted from Committee on Foetus and Newborn, Levels of Neonatal Care, Paediatrics, Vol. 114 no. 5, November 2004, p.1345)

Level I Neonatal Care (Basic), well- newborn nursery: has the capability to:

- Provide neonatal resuscitation at every delivery
- Evaluate and provide postnatal care to healthy newborn infants
- Stabilise and provide care for infants born at 35 to 37 weeks gestation who remain physiologically stable
- Stabilise newborn infants who are ill and those born at <35 weeks gestation, until transfer to a hospital that can provide the appropriate level of neonatal care

Level II Neonatal Care (Specialty), Special care nursery: Level II units are subdivided into two categories on the basis of their ability to provide assisted ventilation including continuous positive airway pressure

1. ***Level II A*** *has the capability to:*
   - Resuscitate and stabilise preterm and/or ill infants before transfer to a facility at which newborn intensive care is provided
   - Provide care for infants born at >32 weeks gestation and weighing ≥1500 g (1) who have physiologic(al) immaturity such as apnoea of prematurity, inability to maintain body temperature, or inability to take oral feeding or (2) who are moderately ill with problems that are anticipated to resolve rapidly and are not anticipated to need subspecialty service on an urgent basis
   - Provide Care for infants who are convalescing after intensive care

2. ***Level II B*** *has the capabilities* of a Level IIA nursery and the additional capability to provide mechanical ventilation for brief durations (<24 hours) or continuous positive airway pressure

Level III (Subspecialty) Neonatal Intensive Care Unit (NICU): Level III units subdivided into three categories:

3. ***Level III A NICU*** has the capability to
   - Provide comprehensive care for infants born at >28 weeks gestation and weighing >1000 g
   - Provide sustained life support limited to conventional mechanical ventilation
   - Perform minor surgical procedures such as placement of central venous catheters or inguinal hernia repair

4. ***Level III B NICU*** has the capability to provide
   - Comprehensive care for extremely low birth weight infants (≤1000 g and ≤28 weeks gestation)
   - Advanced respiratory support such as high-frequency ventilation and inhaled nitric oxide
   - Prompt and on-site access to a full range of paediatric medical subspecialties
   - Advanced imaging, with interpretation on an urgent basis, including computed tomography, magnetic resonance imaging, and echocardiography Paediatric surgical specialists and paediatric anaesthesiologists on- site or at a closely related institution to perform major surgeries such as ligation of patent ductus arteriosus and repair of abdominal wall defects, necrotising enterocolitis with bowel perforation, trachea-oesophageal fistula and/or oesophageal atresia and myelomeningocele

5. ***Level III C NICU*** has the capabilities of a Level III B NICU and which is located within an institution that has the capability to provide extracorporeal membrane oxygenation (ECMO) and surgical repair of complex congenital cardiac malformation that requires cardiopulmonary bypass.

Appendix 2 Data Definitions

DATA DEFINITIONS AND CRITERIA

Centre Name*:* Name of participating hospital

***Date of Admission (dd/mm/yy*)**: Date of first admission to the participating site

State if it is a new case, or a readmission and to specify the referring centre (*Referral from :*) if relevant.

Case Status:

'New case': First time admission to the NNU concerned will be considered as a new case.

'Readmission': Subsequent admission of the same baby to the same NNU within 44 weeks postconceptional age.

'Previously admitted to another SDP': Case transferred from SDP hospital to another SDP hospital for first time.

SECTION 1: Patient Particulars

1. ***Name of mother***: Name as in hospital record
2. ***Name of baby (optional)***: Name as in hospital record, if relevant
3. ***RN of baby****:* Registration Number at participating hospital. If the baby dies in Labour room and has no RN, then use the mother's RN.
4. ***Mother's I/C Number****:* MyKad number or Other ID document no. If "Other" please specify type of document.
5. ***a) Date of Birth****:* dd/mm/yy ***b) Time of Birth*:** To state 24-hour format (mandatory for death cases) Estimate time of death if patient died at home and time accurately not known as in home delivery
6. ***Ethnic group***: Malay / Chinese / Indian / Orang Asli / Bumiputra Sabah / Bumiputra Sarawak / Other Malaysian/ Non-citizen (specific country). If Bumiputra Sabah or Bumiputra Sarawak please specify the indigenous group.
7. ***Maternal Age****:* Age in completed years.
8. ***GPA***: Gravida, Para, Abortion (of current pregnancy before delivery of this child). To state number of ectopic pregnancies (Ectopic pregnancy also considered as an abortion). Multiple pregnancy considered as ONE para (e.g. twins)
9. ***Maternal Diabetes:*** State 'yes' or 'no' if mother had diabetes (regardless of whether it is gestational or pre-gestational) State 'unknown' if so
10. ***Maternal Hypertension:*** State 'yes' or 'no' if mother had hypertension (regardless of whether it is chronic or pregnancy induced) State 'unknown' if so

11. ***Maternal Chorioamnionitis:*** State 'yes' or 'no' if mother had chorioamnionitis. State 'unknown' if so.
12. ***Maternal Eclampsia:*** State 'yes' or 'no'. State 'unknown' if so.
13. ***Maternal Anaemia:*** State 'yes', 'no' or 'unknown'. Mother's Hb level < 11 g/dL or noted to have anaemia of pregnancy by O&G.
14. ***Maternal abruptio placenta:*** State 'yes' or 'no'.
15. ***Maternal bleeding placenta praevia:*** State 'yes' or 'no'.
16. ***Cord prolapse:*** State 'yes' or 'no'.

SECTION 2: Birth History

17. ***Antenatal steroids****:* Corticosteroids given antenatal via any route to the mother at a time likely to enhance fetal lung maturation. Excludes steroids given for other reasons. State 'yes' if this has been given (regardless of number of doses or when it was given) or 'no' if this has not been given. If yes, state whether ONE or TWO doses given. State 'unknown' if so

18. ***Intrapartum antibiotics****:* Antibiotic treatment is provided to the mother within the period mother is in labour, with the intent of preventing infection of the fetus. This includes the prophylactic use of parenteral penicillin or ampicillin. State 'Yes' if systematic antibiotics (enteral or parenteral) were given to mothers in the 24 hours prior to delivery. State 'unknown' if so

19. ***Birth weight (grams)****:* The weight of the baby immediately following delivery recorded in grams to the nearest gram and measured within the first hour of life.

20. **a)** ***Gestation (weeks)****:* Best estimate of gestational age at birth given in full weeks. Preferences among estimates should be: 1) obstetric estimate according to delivering obstetrician. (Ultrasound date selected if done earlier than 25 weeks and there is a discrepancy with the Last Menstrual Period (LMP) dates. Otherwise, use LMP dates. 2) New expanded Ballard scoring. If there is no definite estimate but baby referred to as term baby, enter 40. Preferably insert the exact gestation for term infants – i.e. ranging from 37-41 weeks

    b) ***Gestational age based on:*** LMP, Ultrasound, Neonatal assessment or unknown – mandatory if patient died.

21. ***Growth status****:* based on Intrauterine Growth Curves (Composite Male / Female) chart. SGA <10th centile; AGA 10-90th centile; LGA >90th centile.

22. ***Gender***: Indicate Male, Female or Ambiguous/Indeterminate.

***23. Place of birth**:*

Inborn – born in the same hospital as the participating site. If born within the wards of participating hospital also considered as inborn. (unless in ambulance – born before arrival BBA as outborn)

Outborn – Born in another place (includes BBA) and transferred after birth to NNU of the participating site. Includes those born in hospital compound but not wards.

- Home
- Health Clinic
- Government Hospital with specialist – General/District
- Government Hospital without specialist
- University Hospital
- Private Hospital/maternity home<50 beds with/without specialist
- Private Hospital/maternity home>50 beds
- Alternative Birthing Centre (ABC) – Urban/Rural
- Enroute / During transport
- Others _ _(please specify)
- Unknown

***24. Multiplicity**:* To indicate as singleton, twins, triplets or others i.e. quadruplets, etc. If the baby is other than singleton, specify birth order e.g. if baby is twin 1 – fill in "01". For triplet three, fill "03". This together with mother's IC no. will act as unique identifier.

***25. Final Mode of Delivery**:* Tick as relevant. All caesarians are considered as such without differentiation into upper or lower segment. For breech presentation in caesarian sections, tick Caesarian only.
Tick as 'emergency' if there is a reason for the Caesarian section that has an emergency indication, not whether it is listed as 'semi emergency' or 'emergency' in the OT list.

26. Apgar Score at 1 min and 5 min: Numerical score of the condition of newborn at 1 min and 5 min after birth based on heart rate, colour, respiratory effort, muscle tone and reflex irritability. Enter the Apgar score at 1 min and 5 min as noted in the labour and delivery record. Score even if baby was intubated by 5 minutes of life. Tick 'unknown' if so, not because it was not scored once baby intubated. Apgar score can be '0' at 1 minute & 5 minutes.

27. Initial Resuscitation (mandatory for inborn babies only): Tick 'Yes' for all intervention that apply at birth for inborn cases only

a) Oxygen
b) CPAPA
c) Bag-mask ventilation
d) Endotracheal Tube Ventilation
e) Cardiac Compression
f) Adrenaline

28. Admission Temperature: Indicate the first temperature (axillary) on admission to one decimal point in degree Celsius. Mandatory field for admission to Neonatal Ward. Does not include babies who die in delivery room.

SECTION 3: Neonatal Events

29. Respiratory support: Tick 'Yes' if any respiratory support was given

a) CPAP – Continuous Positive Airway Pressure. Early CPAP – given during initial stabilization at birth

b) Conventional Ventilation – intermittent positive pressure ventilation through an endotracheal tube a conventional ventilator (IMV rate < 240/min) at any time after leaving the delivery room.

c) HFJ/ HFOV – High frequency ventilation

d) Nitric oxide – delivered as a gas via a ventilator at any time after leaving the delivery room.

30. Total number of days on ventilation support at your centre: Total number of days on conventional ventilation and high frequency ventilation. Do not include days on CPAP.

31. Surfactant: A dose of any type of exogenous surfactant was used to treat the baby. Indicate whether exogenous surfactant given or not. If 'yes' indicate whether given at < 1 hour, 1 -2 hours or > 2 hours postnatal age.

32. Parenteral Nutrition: Intravenous infusion of a nutrient solution consisting of a minimum of dextrose and protein but generally providing a complete nutrient infusion including electrolytes, calcium, phosphorus, zinc, trace elements, vitamins and fat. Nutrition given intravenously. Parenteral nutrition must include amino acids with or without fats, hence plain dextrose saline infusion in not parenteral nutrition.

SECTION 4: Problems / Diagnoses

Mandatory fields are included for some diagnoses/procedures that are very important in the care of VLBW and sick infants. Definitions of these conditions are as shown below (AFTER SECTION 5). Other diagnoses or problems not given in the list can be referred to 'WHO 1992 ICD-10; Volume 1 document' and to be written in the space provided under '*Others'.*

NA in the CRF means data is not applicable or not available. There should not be too many 'Not available' data

SECTION 5: Outcome

48a. Date of discharge/transfer/death*:* Enter the exact date

48b. Time of death: State as 24-hour format – used to auto calculate age at discharge. Mandatory for death cases – give best-estimated time if of death if exact time not known.

49. Weight (grams) and growth status on discharge/ death:

a) Weight in grams. For weight on death is the last weight taken when the baby was alive

b) Indicate growth status as per Intrauterine Growth Curves (Composite Male / Female)

50. Total Duration of hospital stay (Neonatal/Paeds Care): State to next complete day i.e. < 24 hours is 1 day and 10 days 6 hours is 11 days.

51. Outcome*:* Alive or Dead – Alive at discharge or died before discharge.

***If child alive, state Place of discharge to*:** Home, Other Non-Paeds Ward, Social Welfare home 'Still hospitalised as of 1st birthday' or 'Transferred to other hospitals'. If transferred to other hospitals, specify the name of hospital transferred to.

If a case is transferred to another hospital in the MNNR network, complete the CRF up to current status and send photocopy of the form with the baby to assist the referral hospital in obtaining the patient particulars and birth history. The referring hospital still need to key in the original form into the system. The referral centre will open and complete a new CRF and this will be analysed together with the CRF of the referring hospital.

Post- transfer disposition: **If the case is transferred to another hospital out of the NNR network,** the referring unit **must get the final 'outcome' of the baby** from the unit that the case was referred to. Click "still in the ward" if patient is still hospitalized in the non-NNR hospital at close out. **ROP findings after discharge can also be updated in the ROP section.**

If child died, tick 'Yes' or 'No' whether the infant died within 12 hours or less from the time of admission to the NICU.

Place of Death: Labour Room/OT, In Transit Neonatal Unit or others, specify.

SUPPLEMENTARY FORM

Filled whenever there is neonatal death in accordance to the Modified Wigglesworth Classification of Perinatal Mortality:

An additional data to that collected in the main CRF for neonatal deaths.

1. ***Centre' Name:*** State name of reporting hospitals
2. ***Name:*** State mother's name
3. ***RN of baby:*** RN at participating hospital. If the baby dies in Labour Room and has no RN, use mother's RN.
4. ***Mother's new IC number or passport:*** whichever applicable

Immediate Cause of Death (Modified Wigglesworth):

(Adapted *from Garis panduan Penggunaan Format PNM 1/97 (Pindaan 2000) bagi Melapor Kematian Perinatal*, Jun 2000, Bahagian Pembangunan Kesihatan Keluarga, Kementarian Kesihatan Malaysia)

*a. **Lethal Congenital Malformation (LCM)/defect***
Severe or lethal malformation that contribute to death. If 'Yes', tick specifically the cause of death.

*b. **Gestation***
< 37 or ≥ 37 weeks

*c. **Immaturity***
This includes only livebirths < 37 weeks gestation after excluding LCM. Tick immediate secondary cause of death e.g. severe IVH, pulmonary haemorrhage

*d. **Asphyxial conditions***
All term babies who died from birth asphyxia or meconium aspiration syndrome or PPHN

*e. **Infection***
This refers to term babies (. 37 weeks gestation) whose primary cause of death is an infection. Some examples include meningitis, group B streptococcal infection, intrauterine infections, etc.

*f. **Other specific causes***
Specify any course of death not included in the above classification. This includes kernicterus, haemorrhagic shock/inborn error of metabolism/pneumothorax/pulmonary haemorrhage.

*g. **Unknown***
Where cause of death is not known.

Readmission CRF

To be used for babies discharged well from any MNNR SDP hospital and then readmitted to same or another MNNR SDP hospital cohort within 44 weeks of corrected age. The aim is to audit reasons for readmission when bay was supposedly well enough to be discharged.

Discharge from: specify name of hospital

Centre Name: hospital name as in MNNR

Date of admission: of this admission (dd/mm/yy)

Section 1: Patient particulars

1. ***Name of mother***: Name as in hospital record
2. ***Name of baby (optional)***: Name as in hospital record.
3. ***RN of baby****:* RN at participating hospital of last discharge.
4. ***a) Mother's I/C Number****:* MyKad number or Other ID document no. If "Other" please specify type of document.
   b) Baby's MyKid number: add if available
5. ***Date of Birth****:* dd/mm/yy
6. ***(a) Birth weight:*** (grams)
   (b) Gestation at birth**:** best estimate of gestational age given at full weeks

Section 2: Particulars of this admission

7. ***Date of first discharge:*** (dd/mm/yy) Date of discharge at the first admission after birth
8. ***Age at this readmission:*** auto-calculate from date of readmission & date of birth
9. ***Weight at this readmission:*** (grams)
10. ***Reason(s) for readmission:*** apnoea/fever/URTI/LRTI/confirmed sepsis/poor weight gain/cyanosis due to sucking/ swallowing coordination/jaundice/others; specify
11. ***Ventilated*** : Yes/No - If yes, fill in main CRF section 3&4

Section 5: Outcome

(Same as CRF Section 5 page 56) 48a - 51

DEFINITIONS OF CERTAIN SPECIFIED DIAGNOSES
(Modified from ICD 10)

Diagnosis	Definition
Respiratory	
Meconium aspiration syndrome	Tick 'yes' if all 5 criteria are satisfied: Presence of meconium stained amniotic fluid at birth a. Respiratory distress onset within 1 hour of birth. Respiratory distress defined as presence of one of the following signs: tachypnoea, grunting, nasal flaring, or intercostal retraction. b. PaO_2 < 50 mmHg in room air, central cyanosis in room air or requirement for supplemental O_2 to maintain a PaO_2 > 50 mmHg c. Abnormal CXR compatible with meconium aspiration: Findings may include coarse irregular or nodular pulmonary densities, areas of diminished aeration or consolidation alternating with area of hyperinflation, or generalized hyperinflation. d. Absence of culture proven early onset bacterial sepsis or pneumonia (i.e. negative blood culture within 72 hours of birth).
Pulmonary haemorrhage	Originating in the perinatal period (as diagnosed clinically by pink or red frothy liquid draining from mouth or arising from the trachea between the vocal cord or suctioned through the endotracheal tube. (Diagnosis may also be made on autopsy finding of haemorrhage in the lungs).
Pneumonia	Infection of the lungs acquired prepartum, intrapartum, at birth or after birth. (Diagnosed with / without cultures). Diagnosis made clinically and supported by CXR findings.
Transient Tachypnoea of Newborn	Benign disease of near-term, term or large premature infants with respiratory distress shortly after delivery resolving within 3 days.

Pulmonary Interstitial Emphysema	Dissection of air into the perivascular tissues of lung from alveolar overdistention or overdistention of smaller airways evident on CXR as linear or cast like lucencies with a history of requiring increasing ventilatory support.
Respiratory distress syndrome (RDS).	Defined as: within the first 24 hours of life, A. PaO_2 < 50mmHg in room air, central cyanosis in room air, or a requirement for supplemental O_2 to maintain a PaO_2 > 50mmHg AND B. A chest radiograph consistent with RDS (low lung volumes and reticulogranular appearance to lung fields, with or without air bronchograms)
Pneumothorax	Presence of extrapleural air diagnosed by chest radiograph or needle aspiration (thoracocentesis). For infants who had thoracic surgery and a chest tube placed at the time of surgery OR if free air was only present on a CXR taken immediately after thoracic surgery and was not treated with a chest tube, tick **'No'**. For infants who had thoracic surgery and then later developed extra pleural air diagnosed by CXR or needle thoracocentesis, tick **'Yes'**. **Indicate whether pneumothorax developed during CPAP, Conventional ventilation or HFV.**
Supplemental oxygen & BPD Tick "yes" if the baby received continuous oxygen concentration > 21% for at least 28 continuous days (note not "till 28 days of life"). Otherwise tick "no". For babies < 32 weeks – state if O_2 / any form of CPAP or ventilatory support required at Day 28 and 36 weeks corrected gestation For babies ≥ 32 weeks - state if O_2 / any form of CPAP or ventilatory support required at Day 28 and ≥ 56 postnatal days	Receipt of continuous enriched oxygen concentration > 21% by oxyhood, nasal cannula, nasal catheter, facemask or still requiring nCPAP or other forms of respiratory support by Day 28 and 36 weeks or day 56. 'Continuous' means that the patient is receiving oxygen throughout the time period and not just in brief episodes as needed i.e. during feeds. 'Blow-by' oxygen dose not counted unless it is the mode of oxygen administration used in a transport situation. Do not score oxygen given as part of a hyperoxia test.

Cardiovascular Persistent Pulmonary Hypertension (PPHN)	Definitive diagnosis of PPHN is made by echocardiography. In the absence of echo confirmation, pre and postductal pulse oxymetry difference of > 10% can be used. Preductal pulse oxymetry done on the right hand and post ductal pulse oxymetry done on lower limbs.
Patent ductus arteriosus (PDA)	Clinical evidence of left to right PDA shunt documented by continuous murmur, hyperdynamic precordium, bounding pulses, wide pulse pressure congestive heart failure, increased pulmonary vasculature or cardiomegaly by CXR, and/or increased O_2 requirement or ECHO evidence of PDA with documentation of left to right ductal shunting. If ticked 'Yes', indicate whether ECHO was done and whether treatment (indomethacine/ibuprofen for > 24 hours or ligation) was given or not.
Necrotising enterocolitis (NEC) (Stage 2 and above) If 'yes' and managed surgically, tick 'Surgical Treatment' NEC present before admission to your centre? (applies to outborn babies)	***Definition for NEC stage 2 and above :*** 1 Diagnosis at surgery or post mortem, or 2 **Radiological diagnosis, a clinical history plus** • pneumatosis intestinalis, or • portal vein gas, 3 Clinical diagnosis, a clinical history plus abdominal wall cellulitis and palpable abdominal mass. NEC according to Bell's criteria stage 2 or higher **Stage 1:** Suspect (History of perinatal stress, systemic signs of ill health i.e. temperature instability, lethargy, apnoea, GIT manifestations i.e. poor feeding, increased volume of gastric aspirate, vomiting, mild abdominal distension, faecal occult blood with no anal fissure). **Stage 2:** Confirmed (Any features of stage 1 plus persistent occult or gastrointestinal bleeding, marked abdominal distension, abdominal radiograph, intestinal distension, bowel wall oedema, unchanging bowel loops, pneumatosis intestinalis, portal vein gas).

	Stage 3: Advanced (Any features of stages 1 or 2 plus: deterioration in vital signs, evidence of shock or severe sepsis, or marked gastrointestinal haemorrhage, or abdominal radiograph shows any features of stage 2 plus pneumoperitoneum).
Retinopathy of prematurity (ROP) Maximum stage of ROP in left/right eye as defined by the International Committee on ROP (ICROP). Score according to the grade of ROP assigned on an eye exam done by an ophthalmologist (e.g. threshold). If there is no explicit grade listed, then score according to the descriptions given by the ICROP. (e.g. threshold). Tick 'Yes' if a retinal exam was done. State exact date of first screening and post conceptional age at screening. Specify only the worst stage**. Also tick if PLUS disease present** State if laser, cryotherapy or vitrectomy was done. If screening was not done, state 'No' and indicates whether an appointment for retinal examination was given. State "date of appointment" or "date of first screening" section and postconceptional age will be autocalculated ROP present prior to admission? (applies to outborn babies) To trace back the outcome of ROP screening on first screening if done after Tick "Not applicable" if does not fulfill criteria	Criteria for screening for ROP are for babies with birth weight < or equal 1500 grams OR gestational < 32 weeks, as well as all preterm babies whose clinical course places them at increased risk for ROP as determined by the attending doctor. If an indirect ophthalmologic examination was performed at any time, enter the worst stage documented: No ROP : No Evidence of ROP Stage 1 : Demarcation Line Prethreshold ROP ("Prethresh") Threshold ROP ("Thresh") Stage 4 : Partial Retinal Detachment Stage 5 : Total retinal detachment PLUS disease : dilated veins and tortuous arteries, papillary rigidity (must also include stages other than No ROP)

Intraventricular haemorrhage (IVH) Tick 'Yes' if IVH is seen and enter the worst grade before or on 28 days of life. State if VP shunt/reservoir was inserted Tick 'No; if no IVH before or day 28 Tick 'Not Applicable' for term infant Tick "Ultrasound not done" if it was not done.	If ultrasound of brain done, enter the worst grade: **Grade 1:** Subependymal germinal matrix (GM) haemorrhage only **Grade 2:** IVH without ventricular dilation **Grade 3:** IVH with ventricular dilation **Grade 4:** IVH with parenchymal involvement
Seizures	Clinical evidence of subtle seizures, or of focal or multifocal, clonic or tonic seizures, confirmed by 2 or more clinicians or diagnosed by EEG. Used synonymously with fits or convulsions.
CLABSI	Central line defined as: (1) Umbilical catheters. (2) Percutaneously inserted central catheters. (3) Surgically placed Broviac catheter that terminates at or close to the heart or in one of the great vessels. Aorta, superior vena cava, brachiocephalic veins, internal jugular veins, subclavian veins, inferior vena cava, external iliac veins and common femoral veins are considered great vessels for this study. CLABSI defined as clinical sepsis with positive blood culture in patient with **ALL** of the following: a. central line in place for at least 48 hours, or within 48 hours after removal b. no other apparent source of infection c. two positive cultures of the same organism from different sites if the organism is a common skin organism (to differentiate from skin contaminant)
Confirmed sepsis Tick 'Yes'if there is evidence of confirmed sepsis. Do not include presumed or clinical sepsis. State whether the onset of first confirmed sepsis was On or before 72 hours of life OR after 72 hours of life.	***Confirmed sepsis*** Clinical evidence of sepsis plus blood culture-proven infection. For CONS: Place a tick if the infant has ALL 3 of the following: 1. CONS is recovered from a blood culture obtained from either a central line, or a peripheral blood sample and /or recovered from infants CSF AND

State the organism cultured: • Group B streptococcus • MRSA • CONS (see definition) • Staphylococcus aureus • Klebsiella • Pseudomonas • Acinetobacter • Fungal (see definition) • Others, specify • ESBL organisms	2. Signs of generalized infection (such as apnoea, temperature instability, feeding intolerance, worsening respiratory distress or haemodynamic instability) AND 3. Treatment with 5 or more days of IV antibiotics after the above cultures were obtained. If the patient died, was discharged, or transferred prior to completion of 5 days or more of IV antibiotics, this condition would still be met if the intention were to treat for 5 or more days. Do not place a tick if any or all of the above are not true. <u>For FUNGAL infection</u>: Place a tick only if a fungus recovered from a blood culture obtained from either a central line or peripheral blood sample after day 3 of life.
Neonatal meningitis Tick 'yes' (if CSF biochem or cytology suggestive even if CSF C&S is negative) or 'no' If yes, State if CSF Culture positive **- Yes / No** State the organism cultured: • Group B streptococcus • MRSA • CONS (see definition) • Staphylococcus aureus • Klebsiella • Pseudomonas • Acinetobacter • Fungal (see definition) • Others, specify • ESBL organisms	Signs of clinical sepsis and evidence of meningeal infection as shown in cerebrospinal fluid findings (i.e. cytology, biochemistry or microbiologic findings).

Hypoxic ischaemic encephalopathy (HIE) **Applies only to gestation >=36 weeks**	HIE requires the presence of all 3 of the following criteria: 1. Presence of a clinically recognized encephalopathy within 72 hours of birth. Encephalopathy is defined as the presence of 3 or more of the following findings within 72 hours after birth: a. Abnormal level of consciousness: hyperalertness, lethargy, stupor or coma b. Abnormal muscle tone: hypertonia, hypotonia or flaccidity c. Abnormal deep tendon reflexes: increased, depressed or absent d. Seizures: subtle, multifocal or focal clonic e. Abnormal Moro reflex: exaggerated, incomplete or absent f. Abnormal suck: weak or absent g. Abnormal respiratory pattern: periodic, ataxic or apnoeic h. Oculomotor or papillary abnormalities: skew deviation, absent or reduced Doll's eye or fixed unreactive pupils **AND** 2. Three or more supporting findings from the following list: a. Arterial cord pH<7.00 b. Apgar score at 5 minutes of 5 or less c. Evidence of multi-organ system dysfunction – dysfunction of one or more of the following systems within 72 hours of birth d. Evidence of foetal distress on antepartum monitoring: persistent late decelerations, reversal of end-diastolic flow on Doppler flow studies of the umbilical artery or a biophysical profile of 2 or less e. Evidence of CT, MRI, technetium or ultrasound brain scan performed within 7 days of birth of diffuse or multifocal ischaemia or of cerebral oedema. f. Abnormal EEG: low amplitude and frequency, periodic, paroxysmal or isoelectric. **AND**

HIE severity If the infants diagnosed with HIE, record the worst stage observed during the first 7 days following birth based on the infant's level of consciousness and response to arousal maneuvers such as persistent gentle shaking, pinching, shining a light or ringing of a bell: Tick "none" if there is no HIE Tick '"Mild, Moderate, Severe " according to the definition	3. The absence of an infectious cause, a congenital malformation of the brain or an inborn error of metabolism, which could explain the encephalopathy. *HIE severity* a. Mild (normal or hyperalert) – infants in this category are alert or hyperalert with either a normal or exaggerated response to arousal. b. Moderate (lethargic or stupor) – infants in this category are arousable but have a diminished response to arousal maneuvers c. Severe (deep stupor or coma) – infants in this category are not arousable in response to arousal maneuvers
Major Congenital Abnormalities Tick 'Yes ' if major congenital anomaly is present even if it is an isolated one (i.e. only one abnormality) If Yes, state: 1. 'Known Syndrome', 2. 'Not a Recognised Syndrome' 3. 'Isolated major abnormality' If the syndrome is known, tick the specify syndromes or specify it. Types of Abnormalities: **Tick all major abnormalities found for recognisable syndrome, non-recognisable ones or isolated major congenital abnormality** E.g. in Down Syndrome, Tick all the congenital anomalies found in patient. Please specify if there are abnormalities not listed.	A major congenital abnormality is defined as any abnormality of prenatal origin that if uncorrected or uncorrectable, significantly impairs normal physical or social function or reduce normal life expectancy Any abnormalities of prenatal origin that are present at birth, and do not have surgical, medical or cosmetic importance at the time of examination during the newborn period is a minor congenital abnormality and NOT included in this registry. Examples include isolated findings such as 'low-set ears', sacral dimple or single transverse palmar crease".

Malaysian National Neonatal Registry

2-7, Medical Academies of Malaysia
210 Jln Tun Razak
50400 Kuala Lumpur

Telephone: 016– 270 4505
03- 4023 4505
Fax : 03- 4023 4505

i. Hospital:					
ii. Month:		iii. Year:			
iv. Total Births:		v. Live Births:		vi. Still Births:	

SECTION 1: DELIVERIES VERSUS BIRTH WEIGHT

Birth Weight (grams)	No. of Still Births	No. of Live Births	No. Admitted to Neonatal Unit	No. who died in delivery room
< 500				
500				
501 - 600				
601 - 700				
701 - 800				
801 - 900				
901 - 999				
1000				
1001 - 1250				
1251 - 1499				
1500				
1501 - 2000				
2001 - 2500				
> 2500				
TOTAL				

SECTION 2: BIRTH VERSUS GESTATION WEEKS

Gestation (weeks)	No. of Still Births	No. of Live Births	No. Admitted to Neonatal Unit	No. who died in delivery room
<22				
22-24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37-40				
> 40				
TOTAL				

SECTION 3: BIRTH VERSUS MODE OF DELIVERY

Mode of Delivery	No. of Still Births	No. of Live Births	No. Admitted to Neonatal Unit	No. who died in delivery room
SVD				
Breech				
Forceps				
Ventouse				
LSCS Elective				
LSCS Emergency				
TOTAL :				

SECTION 4: BIRTHS VERSUS ETHNIC GROUP

Ethnic Group	No. of Still Births	No. of Live Births	No. Admitted to Neonatal Unit	No. who died in delivery room
Malay				
Chinese				
Indian				
Orang Asli				
Bumiputera Sabah specify ethnic group: _____				
Bumiputera Sarawak specify ethnic group: _____				
Foreigner				
Other Malaysian: _____				
TOTAL :				

1. Remarks:	
2. Name of Site Coordinator:	
3. Chop:	
4. Date:	☐☐ / ☐☐ / ☐☐

i. Birth census should be sent together with the tracking forms and the completed CRFs of discharges for the month by the end of the following month.

ii. Sample of tracking form are as follows

MALAYSIAN NATIONAL NEONATAL REGISTRY (CRF 2015)

Centre Name:	◯ New Case ◯ Readmission ◯ Transfer from another SDP Hospital or IJN:	**MNNR No. (Office use):** ☐☐☐☐☐☐ **Centre:**
Date of Admission: ☐☐☐ (dd/mm/yy)		

Admitted to neonatal ward: ◯ Yes → (Proceed to complete all sections in this CRF) ◯ No → (Proceed to complete [Sections 1,2,4(No.47) and 5])

☐ Abandoned baby → (if box is ticked, item # 1,4a, 6-16 not mandatory)

Instruction: Where check boxes ☐ are provided, check (√) one or more boxes. Where radio buttons ◯ are provided (√) one box only.

SECTION 1 : PATIENT PARTICULARS & MATERNAL HISTORY

***1. Name of mother:**	
2. Name of baby (Optional):	
***3. RN of baby:**	
***4a. Mother's I/C number:**	MyKad: ☐☐☐☐☐☐ - ☐☐ - ☐☐☐☐ Other ID document No: Specify document type (if others): ◯ Passport ◯ Armed Force ID ◯ Driver's License ◯ Old IC ◯ Hospital RN ◯ Father's I/C ◯ Work Permit number ◯ Police ID Card ◯ Immigration permit ◯ Other, specify:.....
4b. Baby's MyKid number:	☐☐☐☐☐☐ - ☐☐ - ☐☐☐☐
***5a. Date of birth of baby:** (dd/mm/yy)	☐☐ / ☐☐ / ☐☐☐☐ **5b. Time of birth:** (24– hour format) (enter the best estimated time of birth if the exact time unknown) ☐☐☐☐
***6. Ethnic group of Mother:**	◯ Malay ◯ Indian ◯ Bumiputra Sabah, specify:..... ◯ Other, Malaysian ◯ Chinese ◯ Orang Asli ◯ Bumiputra Sarawak, specify..... ◯ Non-citizen, specify country.....
***7. Maternal age:**	☐☐
***8. GPA:** (current pregnancy before delivery of this child)	*Gravida: ☐☐ *Parity: ☐☐ *Abortion: ☐☐

***9. Maternal diabetes (including gestational diabetes):**	◯ Yes	◯ No	◯ Unknown
***10. Maternal hypertension, chronic pregnancy included:**	◯ Yes	◯ No	◯ Unknown
***11. Maternal Eclampsia:**	◯ Yes	◯ No	◯ Unknown
***12. Maternal Chorioamnionitis:**	◯ Yes	◯ No	◯ Unknown
***13. Maternal Anaemia:**	◯ Yes	◯ No	◯ Unknown
***14. Maternal abruption placenta:**	◯ Yes	◯ No	◯ Unknown
***15. Maternal Bleeding placenta praevia:**	◯ Yes	◯ No	◯ Unknown
***16. Cord prolapse:**	◯ Yes	◯ No	◯ Unknown

SECTION 2 : BIRTH HISTORY

***17. Antenatal steroid:**	◯ Yes → ◯ 1 dose ◯ 2 doses ◯ No ◯ Unknown
***18. Intrapartum antibiotic:**	◯ Yes ◯ No ◯ Unknown
***19. Birth weight:**	☐☐☐☐ (grams)
***20a. Gestation:**	☐☐ (weeks) ***20b. Gestational age based on: (if patient died)** ◯ LMP ◯ Ultrasound ◯ Neonatal assessment ◯ Unknown
***21. Growth status:**	◯ SGA ◯ AGA ◯ LGA
***22. Gender:**	◯ Male ◯ Female ◯ Ambiguous/ Indeterminate
***23. Place of birth:**	◯ Inborn ◯ Outborn → ◯ Home ◯ Health Clinic ◯ Private Hospital ◯ Government hospital with specialist ◯ District ◯ General ◯ Government hospital without specialist ◯ University hospital ◯ Enroute/ during transport ◯ Maternity home with specialist ◯ Maternity home without specialist ◯ Alternative Birthing centre (ABC) ◯ Urban ◯ Rural ◯ Others/specify ..... ◯ Unknown
***24. Multiplicity:**	◯ Singleton ◯ Twin ◯ Triplet ◯ Other, specify: ..... Specify birth order if not a singleton: ☐☐
***25. Final Mode of delivery:**	◯ Vaginal delivery → ◯ SVD ◯ Breech ◯ Instrumental → ☐ Vacuum ☐ Forceps ◯ Caesarean section → ◯ Elective ◯ Emergency ◯ Others, specify:..... ◯ Unknown

SECTION 2 : BIRTH HISTORY (continue)

*26. Apgar score at 1 min and 5 min (0-10)	a) Score at 1 min:	☐ Unknown		b) Score at 5 min: (Please score even if the baby is intubated)	☐ Unknown
27. Initial resuscitation: (applicable for inborn only)	a) Oxygen:	◯ Yes	◯ No	d) Endotracheal tube vent:	◯ Yes ◯ No
	b) CPAP :	◯ Yes	◯ No	e) Cardiac compression:	◯ Yes ◯ No
	c) Bag and mask ventilation:	◯ Yes	◯ No	f) Adrenaline:	◯ Yes ◯ No
*28. Admission temperature: (mandatory if admitted to Neonatal ward)		☐☐ . ☐ (°C)			

SECTION 3: NEONATAL EVENT

*29. Respiratory support:

If < 12 hours = state 0.5 days

If > 12 to 24 hours = state 1 day

If > 24 hours = state to next completed days

Complete entry a) to d) for each type of respiratory support given

◯ Yes → ◯ No

a) CPAP done?	◯ Yes ◯ No	
	→ i) Early CPAP during initial stabilization at birth:	◯ Yes ◯ No
	ii) Total duration of CPAP at your centre:	☐☐ . ☐ Day(s)
b) Conventional ventilation:	◯ Yes ◯ No	
	→ i) Total duration of Conventional ventilation at your centre:	☐☐ . ☐ Day(s)
c) HFJV/HFOV:	◯ Yes ◯ No	
	→ i) Total duration of HFJV//HFOV at your centre:	☐☐ . ☐ Day(s)
d) Nitric Oxide:	◯ Yes ◯ No	
	→ i) Total duration of Nitric Oxide at your centre:	☐☐ . ☐ Day(s)

*30. Total number of days on ventilation support at your centre:	☐☐☐ . ☐ (autocalculate)
*31. Surfactant:	◯ Yes → ◯ < 1 hr ◯ 1-2 hrs ◯ > 2 hrs ; ◯ No
*32. Parenteral nutrition:	◯ Yes ◯ No

SECTION 4: PROBLEMS/ DIAGNOSES

33. Respiratory: ☐ Meconium aspiration syndrome ☐ Pulmonary ☐ Pneumonia ☐ Transient tachypnoea of newborn ☐ Pulmonary interstitial emphysema

*34. RDS: ◯ Yes ◯ No

*35. Pneumothorax: ◯ Yes → ◯ No

Pneumothorax developed during:	◯ Spontaneous ◯ CPAP ◯ CMV ◯ HFV

*36. Supplemental oxygen and BPD:

a) Is baby on > 21% oxygen continuously for 28 days or more? ◯ Yes ◯ No

b) If Yes

(i) for < 32 weeks GA, baby still on oxygen / CPAP / ventilator support at 36 weeks corrected age?	◯ Yes ◯ No
(ii) for >= 32 weeks GA, baby still on oxygen / CPAP / ventilator support at day 56 of life?	◯ Yes ◯ No

*37. Cardiovascular — PPHN: ◯ Yes ◯ No ◯ Unknown

*38. PDA: ◯ Yes → ◯ No

a) ECHO done:	◯ Yes ◯ No
b) Indomethacin/Ibuprofen:	◯ Yes ◯ No
c) Ligation:	◯ Yes ◯ No

*39. NEC (stage 2 and above): ◯ Yes → ◯ No

a) surgical treatment:	◯ Yes ◯ No
b) NEC present before admission to your centre: (for outborn baby only)	◯ Yes ◯ No

*40. ROP Retinal Exam Done: ◯ Yes → (If yes, worst stage of ROP):

a) Date of first screening:	☐☐ / ☐☐ / ☐☐
b) Post conceptional age at 1st screening:	☐☐ (autocalculate)
c) ◯ No ◯ Stage 1 ◯ Prethresh ◯ Thresh ◯ Stage 4 ◯ Stage 5 ☐ PLUS disease	
d) Laser Therapy:	◯ Yes ◯ No
e) Cryotherapy:	◯ Yes ◯ No
f) Vitrectomy/AntiVEGF:	◯ Yes ◯ No
g) ROP present prior to admission? (for outborn baby only)	◯ Yes ◯ No

◯ No → Appointment given: ◯ Yes ◯ No; Date of appointment: ☐☐ / ☐☐ / ☐☐

◯ Not Applicable

SECTION 4: PROBLEMS/ DIAGNOSES (continue)

***41. IVH:**
- ○ Yes — *If yes, worst grade:* → ○ Grade 1 ○ Grade 2 ○ Grade 3 ○ Grade 4
  - ☐ VP shunt/ reservoir insertion
- ○ No
- ○ Not applicable (term infant)
- ○ Ultrasound not done

***42. Seizures :** ○ Yes ○ No

***43. CLABSI:** ○ Yes ○ No

***44. Confirmed sepsis:**
(Blood culture positive only)

○ Yes ○ No

☐ ≤ 72 hours of life

II) **Type of organism:** (can tick more than one)

☐ Group B Streptococcus	☐ Staphylococcus aureus	☐ Acinetobacter	☐ ESBL organisms
☐ MRSA	☐ Klebsiella	☐ Fungal	☐ E.Coli
☐ CONS	☐ Pseudomonas	☐ Others, specify:	

☐ > 72 hours of life

II) **Type of organism:** (can tick more than one)

☐ Group B Streptococcus	☐ Staphylococcus aureus	☐ Acinetobacter	☐ ESBL organisms
☐ MRSA	☐ Klebsiella	☐ Fungal	☐ E.Coli
☐ CONS	☐ Pseudomonas	☐ Others, specify:	

***45. Neonatal meningitis:** ○ Yes ○ No

CSF Culture positive : ○ Yes ○ No

II) **If Yes, type of organism:** (can tick more than one)

☐ Group B Streptococcus	☐ Staphylococcus aureus	☐ Acinetobacter	☐ ESBL organisms
☐ MRSA	☐ Klebsiella	☐ Fungal	☐ E.Coli
☐ CONS	☐ Pseudomonas	☐ Others, specify:	

***46. HIE:**
(Only for ≥ 36 weeks GA) ○ None ○ Mild ○ Moderate ○ Severe

***47. Congenital anomalies:**

***47a. Major congenital anomalies:** ○ Yes ○ No

- ○ Syndrome (known)
  - ☐ Down
  - ☐ Edward
  - ☐ Patau
  - ☐ Others, specify (Refer to ICD 10):
- ○ Not a recognized syndrome
- ○ Isolated major abnormality

***47b. Types of abnormalities (check all that are present. Applies to all including 'known syndromes', 'not a recognized syndrome' or 'isolated major abnormality')**

- ☐ CVS →
  - ○ Cyanotic ○ Acyanotic
  - ☐ ECHO done
- ☐ CNS →
  - ○ Hydrocephalus
  - ○ Hydrancephaly
  - ○ Holoprosencephaly
  - ○ Others (Refer to ICD 10):_____
- ☐ Neural Tube Defect →
  - ○ Spina bifina
  - ○ Anencephaly
  - ○ Encephalocoele
  - ○ Others (Refer to ICD 10):_____

☐ Skeletal dysplasia
☐ Respiratory
☐ GIT
☐ Hydrops
☐ Renal
☐ Cleft
○ Lip ○ Palate ○ Lip and Palate

☐ Others, specify (Refer to ICD10):

☐ None of the above

SECTION 5: OUTCOME

*48a. Date of discharge / transfer/ death: (dd/mm/yy)	☐☐ / ☐☐ / ☐☐	48b. Time of Death: (24 hour format) (mandatory for death cases) ☐☐☐☐ (enter the best estimated time of death if the exact time is unknown)
*49. Weight and growth status on discharge:	a) Weight: ☐☐☐☐ (grams)	
	b) Growth status: ○ SGA ○ AGA ○ LGA	
*50. Total duration of hospital stay (neonatal/ peads care):	☐☐☐ (in completed days) (autocalculate)	

*51. Outcome:

○ Alive →

Place discharged to:

- ○ Home
- ○ Social welfare home
- ○ Other non Paeds ward
- ○ Still hospitalized as of 1st birthday
- ○ Transfer to other hospitals →

a) Name of hospital:

b) Reason for transfer:
○ Growth/ stepdown care ○ Acute medical/ diagnostic services ○ Social/ Logistic reason
○ Lack of NICU bed ○ Surgery ○ Other, specify: .....
○ Chronic/ Palliative care

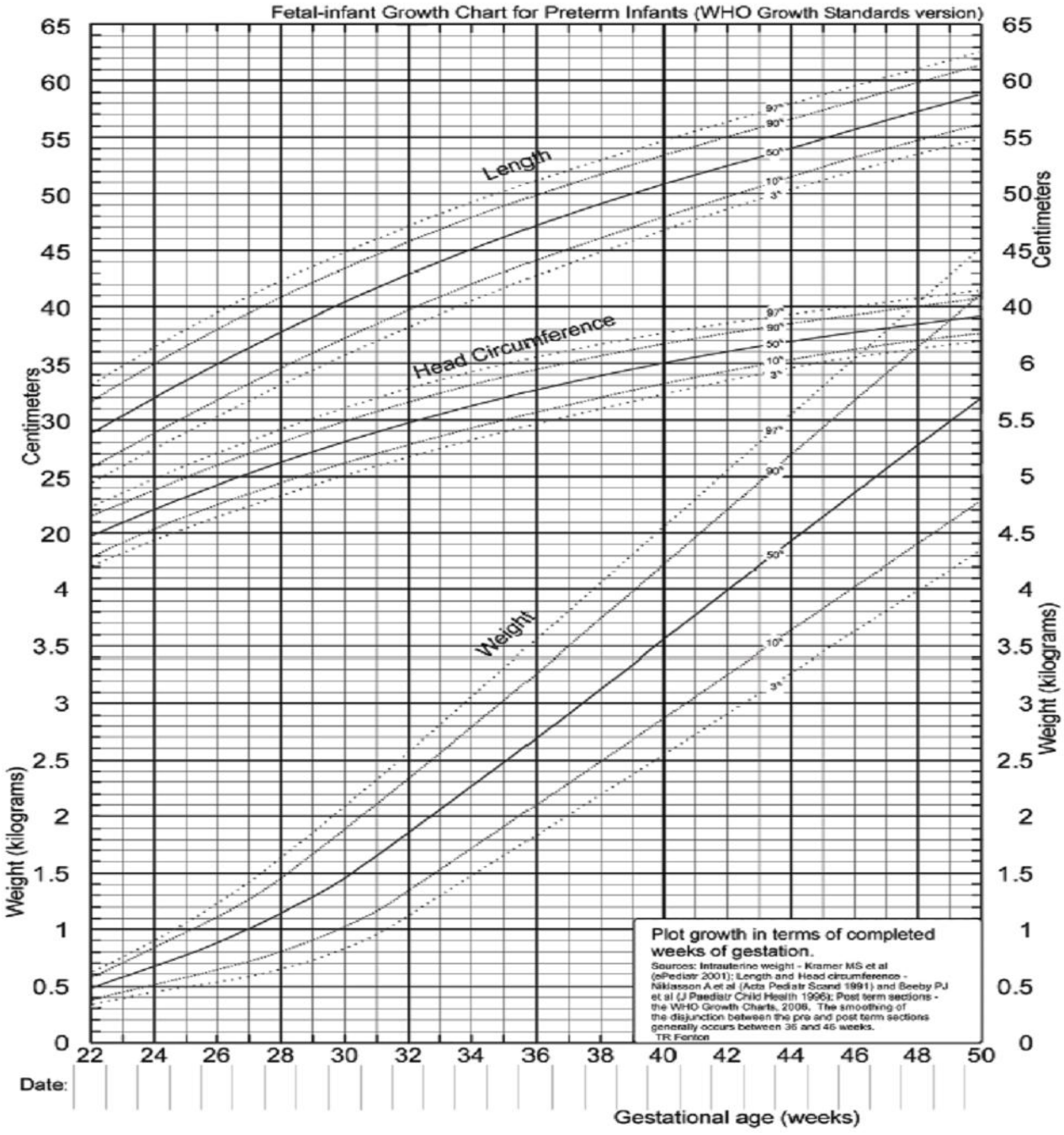
c) Post transfer disposition: (Please fill this section if place transferred is not part of the NNR Network)
○ Home ○ Transferred again to another hospital
○ Death ○ Readmitted to your hospital
○ Still in ward

○ Dead →

Place of death:
○ Labour room/OT ○ Neonatal unit
○ In transit ○ Others, specify: .....

☐☐☐

Name : _____ Signature:_____ Date: (dd/mm/yy)


Fetal-infant Growth Chart for Preterm Infants (WHO Growth Standards version)
Length
Head Circumference
Weight
97th
90th
50th
10th
3rd
Centimeters
Weight (kilograms)
Plot growth in terms of completed weeks of gestation.
Sources: Intrauterine weight - Kramer MS et al (ePediatr 2001); Length and Head circumference - Niklasson A et al (Acta Pediatr Scand 1991) and Beeby PJ et al (J Paediatr Child Health 1996); Post term sections - the WHO Growth Charts, 2006. The smoothing of the disjunction between the pre and post term sections generally occurs between 36 and 46 weeks.
TR Fenton
Date:
Gestational age (weeks)

MALAYSIAN NATIONAL NEONATAL REGISTRY

Supplementary Form

Instruction:
1) For term babies please fill in according to the most pertinent underlying cause of death.
2) For preterm babies please fill in according to the most immediate cause of death.

1. Centre Name :				Office use: Centre:	/
2. Name :		3. RN :			
4. Mother's I/C Number :	New IC :		Passport :		

Immediate cause of death (Modified Wigglesworth): Tick relevant button to reach correct classification

NEONATAL DEATH

Note: LCM = Lethal Congenital Malformation

(Is there any LCM?)

○ LCM present

a) Lethal congenital malformation/defect, sepecify:

- ○ Neural tube defects
  - ○ Anencephaly
  - ○ Encephalocoele
  - ○ Others, specify ..... (Refer to ICD 10):
- ○ CVS
  - ○ Complex/ cyanotic heart disease
  - ○ Acyanotic
- ○ CNS
  - ○ Hydrocephalus
  - ○ Hydrancephaly
  - ○ Holoprosencephaly
  - ○ Others, specify ..... (Refer to ICD 10):
- ○ Recognisable syndrome
  - ○ Down
  - ○ Edward
  - ○ Patau
  - ○ Others, specify ..... (Refer to ICD 10):
- ○ Not recognisable syndrome
- ○ Skeletal dysplasia
- ○ Respiratory (eg. lung hypoplasia)
- ○ GIT
- ○ Hydrops foetalis
- ○ Renal
- ○ Others, specify:

.....

○ LCM absent

b) (is gestation <37 weeks?)

○ Yes

c) Gestation <37 weeks conditions associated with immaturity

- ○ IVH
- ○ Septicaemia
- ○ PDA in failure
- ○ Pulmonary hemorrhage
- ○ NEC
- ○ Pneumonia
- ○ PIE / BPD
- ○ Pneumothorax
- ○ Extreme prematurity
- ○ Acute intrapartum event

○ No

Gestation ≥ 37 weeks
(Did the baby have an asphyxial condition?)

○ d) Asphyxial condition absent (Did the baby die from infection?)

○ Asphyxial condition present

○ e) Infection present

- ○ Group B streptococcal septicaemia
- ○ Meningitis
- ○ Congenital pneumonia
- ○ Congenital Infection
- ○ Others, specify

.....

○ Infection absent (Are there any other specific causes of death?)

○ f) Otherspecificcauses:

- ○ Kernicterus/severe neonatal jaundice
- ○ Haemorrhagic disease of newborn/Vitamin K deficiency
- ○ Intracranial bleed / SAH
- ○ Pneumothorax
- ○ Pulmonary hemorrhage
- ○ IEM
- ○ MAS
- ○ Surgical, specify: .....
- ○ Others, specify: .....

○ Unknown causes

Name : _____ Signature : _____ Date : ☐☐☐ (dd/mm/yy)

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MALAYSIAN NATIONAL NEONATAL REGISTRY (READMISSION FORM)

Centre Name:_____

Date of Admission: ☐☐☐ (dd/mm/yy)

MNNR No. (Office use): ☐☐☐☐ / ☐☐☐☐

SECTION 1 : PATIENT PARTICULARS & MATERNAL HISTORY

*1. Name of mother:	
2. Name of baby (Optional):	
*3. RN of baby:	
*4a. Mother's I/C number:	MyKad: ☐☐☐☐☐☐ - ☐☐ - ☐☐☐☐ Other ID document No: ☐☐☐☐☐☐☐☐☐☐☐☐ Specify document type (if others): ◯Passport ◯Armed Force ID ◯Driver's License ◯Old IC ◯Hospital RN ◯Father's I/C ◯Work Permit number ◯Police ID Card ◯Immigration permit ◯Other, specify:.....
4b. Baby's MyKid number:	☐☐☐☐☐☐ - ☐☐ - ☐☐☐☐
*5. Date of birth of baby: (dd/mm/yy)	☐☐ / ☐☐ / ☐☐☐☐
*6a. Birth weight:	☐☐☐☐ (grams) *6b. Gestation at birth: ☐☐ (weeks)

SECTION 2 : PARTICULARS OF THIS ADMISSION

*7. Date of first discharge: (dd/mm/yy)	☐☐ / ☐☐ / ☐☐☐☐
*8. Age at readmission:	☐☐☐ (days) (autocalculate)
*9. Weight at this readmission:	☐☐☐☐ (grams)
*10. Reason for readmission:	☐ Apnoea ☐ Aspiration ☐ Cardiac surgery ☐ Confirmed sepsis ☐ Cyanosis due to sucking / swallowing incoordination ☐ Fever ☐ Hernia operation ☐ Jaundice ☐ Nearer to home ☐ LRTI ☐ Poor weight gain ☐ Post-op care ☐ ROP laser ☐ Step down care ☐ URTI ☐ Others, Specify:.....
*11. Ventilated:	◯ Yes (fill in main CRF section 3&4) ◯ No

SECTION 5: OUTCOME

*48a. Date of discharge / transfer/ death: (dd/mm/yy)	☐☐ / ☐☐ / ☐☐	48b. Time of Death: (24 hour format) (mandatory for death cases) ☐☐☐☐ (enter the best estimated time of death if the exact time is unknown)
*49. Weight and growth status on discharge: a) Weight:	☐☐☐☐ (grams)	
b) Growth status:	◯ SGA ◯ AGA ◯ LGA	
*50. Total duration of hospital stay (neonatal/ peads care):	☐☐☐ (in completed days) (autocalculate)	

*51. Outcome:

◯ Alive →

Place discharged to:

- ◯ Home
- ◯ Social welfare home
- ◯ Other non Paeds ward
- ◯ Still hospitalized as of 1st birthday
- ◯ Transfer to other hospitals →

a) Name of hospital:	
b) Reason for transfer:	◯ Growth/ stepdown care ◯ Acute medical/ diagnostic services ◯ Social/ Logistic reason ◯ Lack of NICU bed ◯ Other, specify: ◯ Chronic/ Palliative care ◯ Surgery .....
c) Post transfer disposition: (Please fill this section if place transferred is not part of the NNR Network)	◯ Home ◯ Transferred again to another hospital ◯ Death ◯ Readmitted to your hospital ◯ Still in ward

◯ Dead →

Place of death:	◯ Labour room / OT ◯ Neonatal unit ◯ In transit ◯ Others, specify: .....

Name : _____ **Signature:**_____ **Date:** ☐☐☐ (dd/mm/yy)

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Appendix 5 Presentations

POSTER, ABSTRACT AND PAPER PRESENTIONS

1. Neoh SH. *Survival of VLBW Babies in MNNR 2015.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, January 2017

2. Boo NY. *NEC Outcome and Risk Factors.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, January 2017

3. Boo NY. *Monitoring Nosocomial Infection in NICU.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, January 2017

4. Chee SC. *CLD & Early CPAP.*Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, January 2017

5. Ang EL. *Causes of Death in Pre-term Infants*. Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, January 2017

6. Sharifah Huda. *Nosocomial Infection & Outcome.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, January 2017

7. Cheah IGS. *Benchmarking of the NICU Outcome 2015.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, January 2017

8. Soo TL. *Congenital Anomalies & Outcome.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, January 2017

9. Wong AC. *Retinopathy of Prematurity.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, January 2017

10. Jimmy LKF. *MAS and Other Respiratory Morbidity in Term Infants.* Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, January 2017

11. Zuraidah Latif. IVH in Babies < 32 weeks Gestational Age. Presented at the MNNR SDP Meeting, Selayang Hospital, Selangor, Malaysia, January 2017