Very Low Birth Weight Infants in the Republic of Ireland

Annual Report 2020

NATIONAL PERINATAL EPIDEMIOLOGY CENTRE

NICORE Ireland

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Contents

List of Acronyms

CLD	Chronic Lung Disease
HSE	Health Service Executive
KPI	Key Performance Indicator
MCA	Major Congenital Anomaly
NEC	Necrotising Enterocolitis
NICU	Neonatal Intensive Care Unit
NICORE	Neonatal Intensive Care Outcomes Research and Evaluation
NPEC	National Perinatal Epidemiology Centre
NOCA	National Office for Clinical Audit
PVL	Cystic Periventricular Leukomalacia
PIH	Periventricular-intraventricular haemorrhage
VLBW	Very Low Birth Weight
VON	Vermont Oxford Network
ROI	Republic of Ireland
RR	Relative Risk
ROP	Retinopathy of Prematurity
SCBU	Special Care Baby Unit
SMR	Standard Mortality/Morbidity Ratios

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Acknowledgements

Welcome to the seventh Very Low Birth Weight Infants in the Republic of Ireland (ROI) Annual Report, produced by the Neonatal Intensive Care Outcomes Research and Evaluation (NICORE) ROI group and facilitated by the National Perinatal Epidemiology Centre (NPEC). This report focuses on all babies born ≤1500g and/or ≤29 weeks gestation in the Republic of Ireland for the calendar year 2020 and compares outcomes to the preceding five years.

Of note, in this year's report is the reduction in the number of VLBW infants born in the Republic of Ireland in 2020. In total, 497 VLBW infants were born, a 19% reduction from a peak of 622 infants in 2015. The corresponding decrease in the number of livebirths in Ireland over the same time-period was 19% (from 65,536 births in 2015 to 55,959 in 2020). This is the third year running that we have noticed a decrease in the number of VLBW infants born.

Serial VLBW audits since 2014 have identified specific areas that warrant further investigation. While, we have previously carried out a three-year review of the mortality risk among our VLBW infants, this needs to be repeated now that we have an additional 4 years of data. Higher than expected rates of pneumothorax have also been identified. This year, we are dedicating considerable time and resources to undertaking a more detailed analysis of six years of data focusing specifically on morality and pneumothorax which we hope to publish shortly. It is hoped such analysis will lead to recommendations that can be implemented nationally and result in improved outcomes for our VLBW infants.

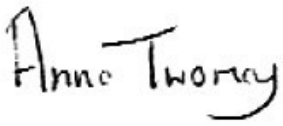
We are delighted to have a public/patient representative from the INHA (Irish Neonatal Health Alliance) comment on our report again this year prior to its publication. It is important that our families and the public are afforded such an opportunity. Such PPI (public and patient involvement) ensures that we continue to ask the right questions and in a way that the public can understand. We hope that this collaboration continues into the future.

We continue to make slow progress on a national VLBW neurodevelopmental follow-up programme. The National Women and Infants' Health Programme have funded three 0.5 whole time equivalent (half-time) additional clinical psychology posts to carry out this important work but recruitment and retention for these posts remain an ongoing issue. We aspire to report on neurodevelopmental outcomes in the coming years.

This report would not be possible without the many neonatal nurses, paediatricians and administration staff who have supported the data collection process and we gratefully acknowledge the commitment of all those individuals. We thank the team at Vermont Oxford Network who continue to whole-heartedly support this initiative by working closely with the NPEC on data collection and statistical analysis. We thank the National Office of Clinical Audit (NOCA) for their continuing support to NPEC in ensuring that recommendations arising from national clinical audit are reviewed and actioned: this report, similar to previous reports, is endorsed by NOCA (Appendix A). We extend our sincere thanks to the NPEC, led by Professor Richard Greene,

for its continued support of the ROI's participation in VON, specifically by financing the annual membership fee on behalf of all 20 centres and for providing the logistical support required to oversee this project. To our fellow members of the NICORE ROI group, we appreciate their support of this project from the onset. The membership of NICORE ROI is listed in Appendix B.

This initiative of the ROI neonatal community to review its outcomes of care at both local and national levels demonstrates its commitment to improving outcomes for all VLBW infants in the ROI and their families. By continuing to assess the outcomes of care, learning from the data and working together, we have great potential to improve the outcomes of VLBW infants in Ireland.



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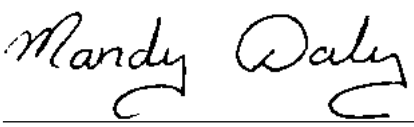
Message from our public representative

It is encouraging to note the reduction in some of the parameters around Very Low Birth Weights in Ireland in the 2020 Annual Report, in comparison to previous reports.

The benefits of gathering this invaluable data serves to steer and guide the focus of healthcare providers and policymakers towards those areas that require additional resources and attention; improvements which will ultimately improve outcomes for Very Low Birth Weight Babies and their families.



Mandy C. Daly
Public/Patient Representative
VLBW infant audit
Director of Advocacy & Policy Making
Irish Neonatal Health Alliance (INHA)

The Impact to date of the Very Low Birth Weight Infant Audits

- Data has now been collected on over 3,500 Very Low Birth Weight (VLBW) infants born in the ROI during the years 2014 to 2020. Ireland is one of very few countries worldwide that continues to review VLBW outcomes at a national level.

- Based on data provided by the VLBW Infant audits, the Clinical Programme in Neonatology, the Neonatal Clinical Advisory Group, the Faculty of Paediatrics, the Institute of Obstetrics and Gynaecology and The National Women and Infants' Health Programme published a consensus guideline in 2020 on the Perinatal Management of Extreme Preterm Birth at the Threshold of Viability. This document recommended a change in the threshold of foetal viability from 24+0 weeks to 23+0 weeks.[1] This national guideline provides greater clarity and consistency to the perinatal and neonatal management of extremely preterm infants in this country. In 2020, 70% of infants born at 23 weeks were offered resuscitation in the Delivery Room (DR) as compared to 43% in 2014.

- The Model of Care for Neonatal Services,[2] published in 2015, recommended that infants born at <28 weeks gestation should ideally be delivered in a tertiary neonatal centre. This recommendation was further supported by the findings of the 2018 NICORE Report on the Mortality Risk among Very Low Birth Weight Infants born in the Republic of Ireland 2014-2018.[3] By combining three years of data from the VLBW audits, this latter report found that ROI infants born at 24-27 weeks gestation in a tertiary unit did not experience higher than expected mortality. However, ROI infants born in non-tertiary units had a 70% higher mortality risk, most of which arose from infants born in peripheral units. In 2020, 20% of infants born between 23 and 27 weeks of gestation were delivered outside tertiary neonatal centres and this percentage has remained unchanged since 2014. This fact needs to be highlighted at a national level and the reasons as to why infants of this gestational age are not being delivered in tertiary centres need to be examined and potential solutions considered. Preliminary discussions have occurred with the National Women and Infants Health Programme (NWIHP) to see if delivery of very premature infants outside tertiary centres could be added as a metric to the Irish Maternity Indicator System.[4]

- Serial audits have shown that ROI VLBW infants continue to have higher than expected (but not statistically significant) mortality rates when compared to VON infants. They also have higher than expected rates of pneumothorax. To look at possible reasons for these findings, NICORE and NPEC are undertaking a more detailed, in-depth analyses of six years of data, focusing specifically on mortality and pneumothorax. This will be published as a separate report later this year.

- The importance of collecting data on neurodevelopmental outcomes to 2 years of age, especially in our extremely preterm population, has been highlighted. The NWIHP has funded additional clinical psychology posts to assist with this endeavour.

Executive Summary

1. A total of 495 very low birth weight (VLBW) infants were born in the Republic of Ireland (ROI) in 2020. Two additional infants were born outside of the ROI but transferred to the ROI within 48h of birth. Both of these infants were born in Northern Ireland. This brings the total number of infants included in this report to 497. Of these, 15 infants had a birthweight >1500g but were ≤29 weeks 6 days gestation. There has been a 16% decrease in the number of VLBW infants born in the ROI since 2016 compared to a 12% decrease in the birth rate.

2. In all, 198 infants were born with a birth weight ≤1000g and 141 infants were born with a gestational age ≤26 weeks 6 days.

3. The crude survival rate for ROI VLBW infants in 2020 was 85% (n=420). This compares to a survival rate of 86% in the VON population.

4. Adjusting for the risk profile of the VLBW population, the risk of mortality was higher than expected in the VLBW ROI population in 2020 (SMR=1.10; 95% CI: 0.83, 1.37) but this was not statistically significant. This finding is consistent with previous years.

5. The risk of mortality excluding early deaths (deaths in the delivery room or deaths within 12 hours of admission to the NICU) in the VLBW ROI infants was also higher than expected in 2020 (SMR=1.01; CI 0.68, 1.33), but again, this finding was not statistically significant.

6. There was no significant difference in the risk of death or morbidity for ROI infants compared to VON infants in 2020 (SMR=0.98, 95% CI: 0.68, 1.33).

7. Again, adjusting for the risk profile of the VLBW population, Key Performance Indicators in the neonatal care of VLBW infants born in the ROI in 2020 compared to VON infants showed that:

a. ROI infants had higher rates of Pneumothorax (SMR=1.39, 95% CI: 90.92-1.86) in 2020, though not statistically significant. This has been reported every year (except one) since the commencement of this audit in 2014. To better understand this elevated risk of pneumothorax amongst ROI infants, further in-depth analysis using data gathered over the past 6 years is being carried out and will be made available in a separate publication with specific focus on this issue.

b. ROI infants had significantly lower rates of retinopathy of prematurity (SMR=0.65, 95% CI: 0.46, 0.85) similar to previous years.

c. There were no significant differences in risk of the following outcomes for ROI infants compared to VON infants:
- Late bacterial infection (SMR=0.83, 95% CI: 0.47, 1.18) as recorded in previous years;
- Coagulase negative *Staphylococcus* infection (SMR=0.72, 95% CI: 0.28, 1.17), in line with previous years;
- Nosocomial infection (SMR=0.83, 95% CI: 0.53, 1.12), similar to findings in previous years;
- Intra-ventricular haemorrhage (SMR=0.99, 95% CI: 0.80, 1.19), in line with the past years;
- Necrotizing enterocolitis (NEC) (SMR=1.02, 95% CI: 0.61, 1.44) in line with the past few years.

8. In 2020, of the 495 infants born in ROI, 74% (n=367) were born in tertiary neonatal centres; 16% (n=79) were born in regional neonatal centres; and 10% (n=49) were born in peripheral centres.

9. Of the infants born in ROI and between 23 and 27 weeks gestation (n=173), 141 (82%) were delivered in a tertiary neonatal centre; this represents a slight increase from the percentage reported in the previous three years. Additionally, 21 (12%) of these infants were born in a regional neonatal centre and 11 (6%) were born in a peripheral centre. The current Model of Care for Neonatal Services in Ireland recommends that infants born before 28 weeks should ideally be delivered at a tertiary neonatal Centre.[2]

10. For the past five years, of all the infants who delivered at 23-27 weeks gestation, approximately 9% were born in peripheral centres and 12% in regional centres. Over the same time period, peripheral centres transferred out 85% (73/86) of these infants for ongoing care within 48 hours of birth and regional centres transferred out 21% (24/117).

11. A total of 23 ROI infants died in the delivery room (5%). This was higher than the percentage of delivery room (DR) deaths recorded for the VON population (2.7%).

12. The ROI rate for major congenital anomaly (MCA) was 6% in 2020, the lowest since inception of the audit in 2014. This rate was similar to the rate of MCA in VON (6.4%). Fourteen (61%) of the 23 infants who died in the DR had a major congenital anomaly (MCA). Comparable data from VON are not available.

13. The 2018 report on mortality risk among VLBW infants between 2014-2016 recommended that resuscitation should be administered to all infants born at 23 weeks who present in a favourable condition.[3] In 2020, 70% of infants born at 23 weeks gestation were offered resuscitation compared to 75% in 2016. Of 23 DR deaths, 17 (74%) were born at less than 24 weeks gestation and 12 (65%) were less than 23 weeks gestation.

Background

The Vermont Oxford Network (VON) is a non-profit voluntary collaboration of health care professionals dedicated to improving the quality and safety of medical care for newborn infants and their families. More information on this Network can be found on their webpage: **https://public.vtoxford.org/**. Established in 1988, the Network is today comprised of more than 1400 Neonatal Intensive Care Units around the world (Figure I).

The Network maintains a database of information regarding the care and outcomes of high-risk newborn infants. The database provides unique, reliable and confidential data to participating units for use in quality management, process improvement, internal audit and peer review.

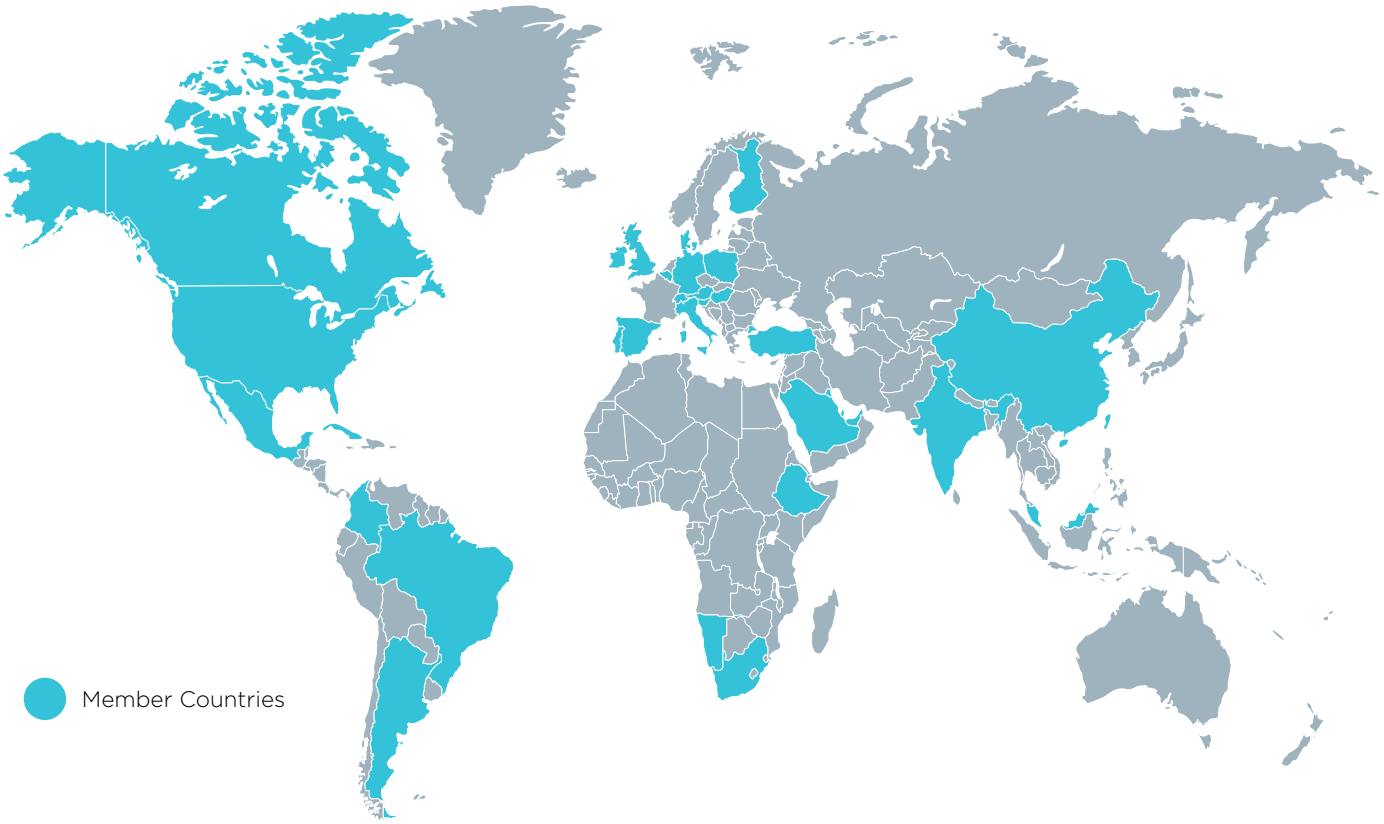


Figure I: Member countries of the Vermont Oxford Network.

In the Republic of Ireland (ROI), nine tertiary and regional neonatal centres had joined VON by 2003, followed by the remaining 10 centres in 2013. This was on foot of a joint initiative between the NICORE (Neonatal Intensive Care Outcomes Research and Evaluation) group and the National Perinatal Epidemiology Centre (NPEC). In 2014, all 19 neonatal centres in the ROI submitted data to VON, marking the first year for which a national dataset is available. The first annual report on all very low birth weight (VLBW) infants born in the ROI was subsequently published for the year 2014. In 2018, one of the two tertiary paediatric centres in the country joined VON. The current report represents the seventh year, 2020, of a complete ROI dataset.

Governance

For the ROI, data submitted to VON are controlled by NICORE (Neonatal Intensive Care Outcomes Research and Evaluation) ROI, a group of consultant neonatologists and paediatricians with formal representation from all 19 tertiary, regional and peripheral neonatal centres in the Republic. NICORE ROI is formally affiliated through a Memorandum of Understanding to the Faculty of Paediatrics, Royal College of Physicians of Ireland (RCPI). NICORE ROI is also formally affiliated to and functions in partnership with the National Perinatal Epidemiology Centre (NPEC) for the promotion and management of VON in the ROI.

NICORE ROI, incorporating all neonatal centres in the Republic, collaborates with the five neonatal centres in Northern Ireland (NI). This cross-border collaboration has been in existence since 2003 when only nine centres in the ROI were contributing data to VON. The collaborative group at that time was identified as NICORE Ireland. When all 19 centres in the ROI began submitting data to VON, the NICORE ROI group was created. Effectively, NICORE ROI is a subgroup of the parent group, NICORE Ireland. Figure 2 illustrates all units participating in VON in the island of Ireland according to the category of their Neonatal Units and the hospital group to which they are affiliated.

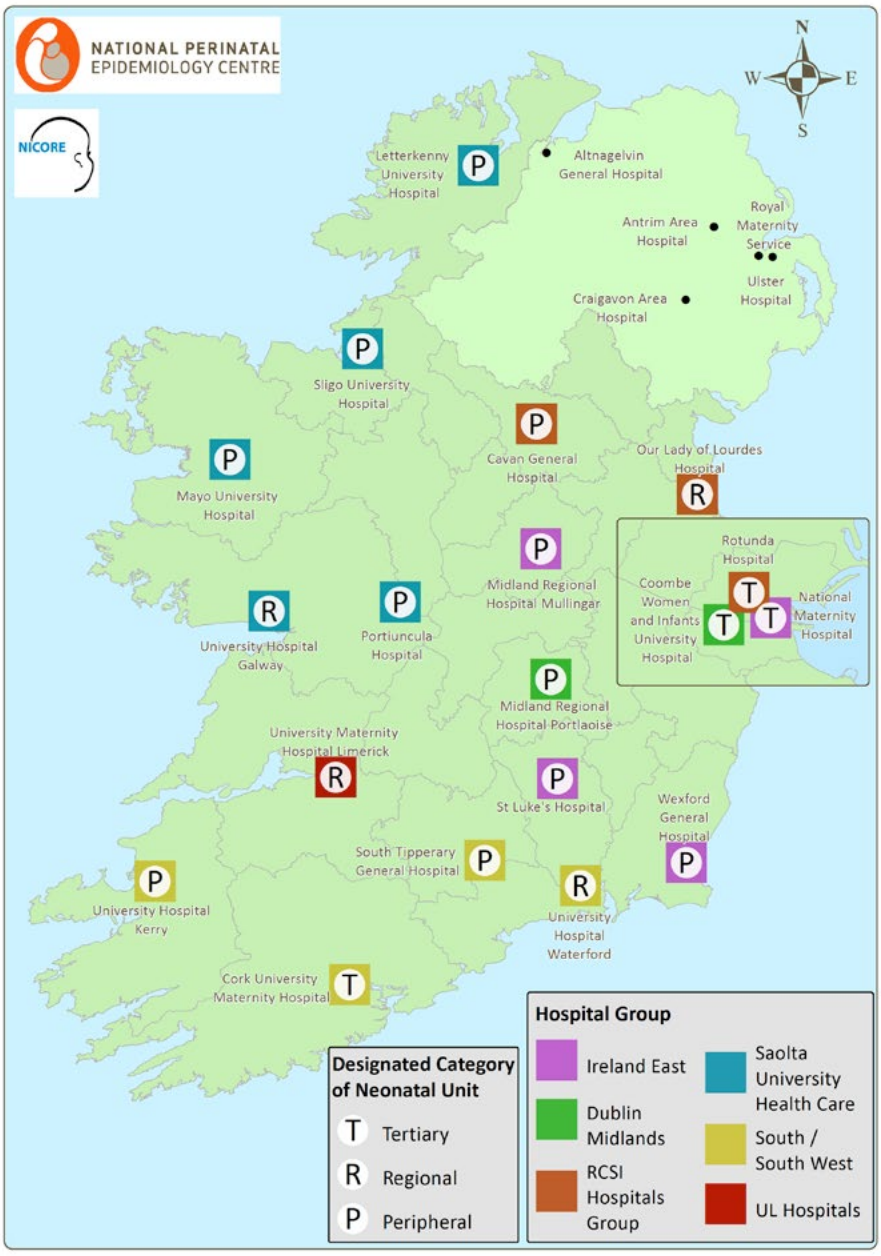


Figure II: Neonatal centres in the Republic of Ireland and Northern Ireland participating in the Vermont Oxford Network. ROI centres are classified according to category of Neonatal Units and the hospital group to which they are affiliated.

Methods

Data recording

In 2020, 19 neonatal centres and one tertiary paediatric centre participated in the VON's Very Low Birth Weight (VLBW) database. The following are the inclusion criteria for the data collected for VLBW infants:

Any **liveborn infant** who is **admitted to or dies in** any location in a participant neonatal centre **within 28 days of birth AND whose:**

- **birth weight is between 401 and 1500 grams**
  OR
- **gestational age is between 22 weeks 0 days and 29 weeks 6 days (inclusive)**

Anonymised data on VLBW infants born between 1st January and 31st December 2020 were submitted to VON's online database - eNICQ (Please see Appendix C for data collection forms). Figure III illustrates the flow of information involved.

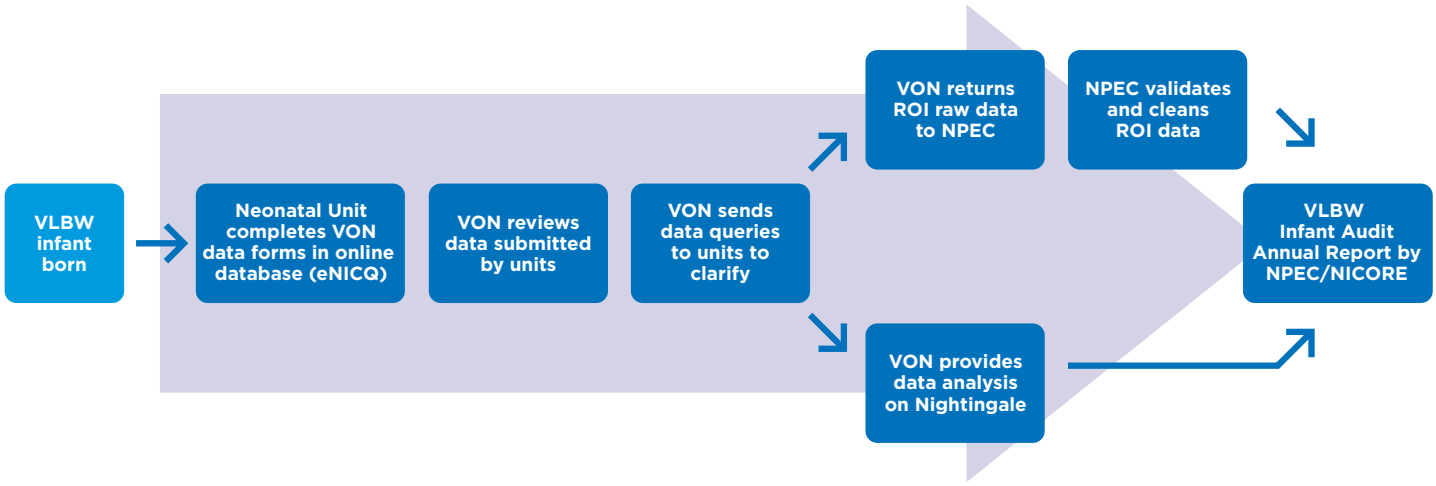


Figure III: Flow of information and data management in the VON data collection process.

On completion of all ROI submissions for 2020, VON forwarded a copy of the complete ROI dataset to the NPEC. The data presented in this report are based on the ROI dataset. Throughout the report, ROI data are compared to VON data, comprising data from all centres across the Network. The Network data, referred to as VON data, are obtained from *Nightingale*, VON's online data reporting system.

Case Ascertainment

The VON database allows the capture of a data record from the birth centre of all VLBW infants. It also allows the capture of a record from the first centre to which an infant was transferred, if applicable. In cases of infants who were treated in more than two centres, the VON database does not capture a record from the second transfer centre, and thus these infants have two records only, one from the birth centre and the other from the first transfer centre. On receipt of the ROI 2020 dataset from VON, NPEC undertakes a matching exercise to link data records associated with individual infants who are transferred (by matching the record of the unit in which the infant was born to the record of the unit to which the infant was transferred) in order to ensure that each infant is only counted once. When required, the NPEC clarifies and confirms data directly with the centres submitting data to ensure data accuracy.

Statistical analysis

Differences in proportions were assessed by the two-sample test of proportions. Pearson's chi-squared test (χ^2) was used to evaluate the association between outcomes and gestational age categories. Poisson regression was used to assess trend.

Robust comparison of VON key performance indicators (KPIs) between the ROI and VON requires that pertinent differences between the infant populations are taken into account. This is done through the calculation of standardised mortality/morbidity ratios (SMRs). Furher detail into this analyses methodology is outlined in section 4. Key Performance Indicators (page 20).

Reliability of conclusions based on small numbers

Population rates and percentages are subject to random variation. This variation may be substantial when the measure, such as a rate, has a small number of events in the numerator or denominator. Typically, rates based on large numbers provide stable estimates of the true, underlying rate. Conversely, rates based on small numbers may fluctuate dramatically from year to year, or differ considerably from one centre to another, even when differences are not meaningful. Meaningful analysis of differences in rates between geographic areas or over time requires that the random variation be quantified and that multiple years of data be incorporated. While it is correct to present rates, even if based on rare outcomes and small numbers (as this is what the data shows), caution should be exercised when drawing conclusions from rates and outcomes based on small numbers.

Definitions and terminology

Any Late Infection: Indicates whether the infant has either any late bacterial infection, coagulase negative infection and/or fungal infection after day 3 of life.

Any Intraventricular Haemorrhage (IVH): Indicates whether the infant has a grade 1, 2, 3 or 4 periventricular-intraventricular haemorrhage (PIH) on or before day 28.

Birth weight: Weight from the labour and delivery record. If this is unavailable, weight on admission to the neonatal unit or lastly, the weight obtained on autopsy (if the infant expired within 24 hours of birth).

Chronic Lung Disease (CLD): Based on an algorithm that was tested with hospital data and is more accurate than just oxygen dependency at 36 weeks gestational age. CLD is coded 'yes' if the infant is in your centre at 36 weeks postmenstrual age and 'oxygen at 36 weeks' is answered 'yes'. Infants are considered to 'be in your centre at 36 weeks' if they have not been discharged home on that date or if they have been transferred from your centre to another centre prior to the date of week 36 but have been readmitted to your centre before discharge home, death or first birthday or are not transferred a second time before 36 weeks.

If the infant is discharged home on or after 34 weeks postmenstrual age but before 36 weeks, then CLD is equal to the data from 'oxygen at discharge'. The latter is recorded as 'yes' for infants who went home and were on oxygen at the time of discharge. If the infant was transferred to another hospital on or after 34 weeks postmenstrual age but before the date of week 36, then CLD is equal to the information in 'oxygen at discharge' from the hospital where infant was transferred from. Again, the latter is recorded as 'yes' for infants who were transferred and were on oxygen at the time of discharge from the transferring centre.

If the infant is discharged home before 34 weeks postmenstrual age and is not on oxygen at the time of discharge, then CLD is coded as 'no'. If the infant is transferred before 34 weeks postmenstrual age and the infant is not on oxygen at discharge, then CLD is coded as 'no'. However, if the infant is discharged home or transferred to another hospital before 34 weeks postmenstrual age, and the infant is on oxygen at the time of discharge from our centre, then CLD is coded as 'unknown'.

Chronic Lung Disease (CLD) < 33 weeks gestation: The same algorithm applied as above but only includes infants < 33 weeks gestation.

Coagulase Negative Infection: Coagulase negative *Staphylococcus* recovered from a blood culture obtained from either a central line or a peripheral blood sample, and/or recovered from cerebrospinal fluid obtained by lumbar puncture, ventricular tap or ventricular drain after day 3 of life AND one or more signs of generalized infection AND treatment with 5 or more days of intravenous antibiotics.

Cystic Periventricular Leukomalacia (PVL): Evidence of cystic periventricular leukomalacia on a cranial ultrasound, CT, or MRI scan obtained at any time prior to discharge.

Death or morbidity: Indicates if an infant died or was known to have one or more of the following key morbidities: severe intraventricular haemorrhage (IVH), chronic lung disease (CLD) in infants <33 weeks, necrotising enterocolitis (NEC), pneumothorax, any late infection or cystic periventricular leukomalacia (PVL).

Died in the delivery room: Death of a live born baby who was never admitted to the NICU, and died in the delivery room or at any other location in your hospital within 12 hours after birth.

Fungal Infection: Fungus recovered from a blood culture obtained from either a central line or a peripheral blood sample after day 3 of life.

Gestational age: The best estimate of gestational age in weeks and days using the following hierarchy:

- obstetric measures based on last menstrual period, obstetrical parameters, and prenatal ultrasound as recorded in the maternal chart.

- neonatologist's estimate based on physical criteria, neurologic examination, combined physical and gestational ages exam (Ballard or Dubowitz), or examination of the lens.

Inborn: Infant delivered at the hospital submitting the VON data.

Key Performance Indicators (KPIs): VON reports on a number of Key Performance Indicators (KPIs) which allow the ROI to compare its outcomes to VON as a whole. Further information on this is available on section 4 of the report (4. Key Performance Indicators) on page 20.

Late Bacterial Infection: Bacterial pathogen recovered from blood and/or cerebrospinal fluid culture obtained after day 3 of life.

Mortality: Indicates whether the infant died.

Mortality excluding early deaths: Death excluding those who died in the Delivery Room or within 12 hours of admission to the NICU.

Necrotising Enterocolitis (NEC): NEC diagnosed at surgery, at post-mortem examination or "clinically and radiographically". To be diagnosed "clinically and radiographically", there has to be at least one of the following clinical signs present: bilious gastric aspirate or emesis; abdominal distension; occult or gross blood in stool AND at least one of the following radiographic findings present: pneumatosis intestinalis, hepato-biliary air, pneumoperitoneum.

Nosocomial Infection: Indicates whether the infant has either late bacterial infection and/or coagulase negative *Staphylococcal* infection diagnosed after day 3 of life.

Outborn: Infant delivered outside the hospital submitting the VON data. Any infant requiring ambulance transfer is considered outborn.

Pneumothorax: Extra-pleural air diagnosed by chest radiograph or needle aspiration (thoracentesis).

Retinopathy of Prematurity (ROP): potentially blinding eye disorder that primarily affects premature infants. For the purpose of this report, ROP indicates whether the infant has stage 1, 2, 3, 4 or 5 of this condition.

Resuscitation: Defined, for the purposes of this report, as the administration of any positive pressure breaths via a face mask ventilation and/or via an endotracheal tube in the delivery room or in the initial resuscitation area.

Severe Intraventricular Haemorrhage (IVH): Indicates whether the infant has a grade 3 or 4 periventricular-intraventricular haemorrhage (PIH) on or before day 28.

Severe Retinopathy of Prematurity (ROP): Indicates whether the infant has stage 3, 4 or 5 ROP.

Survival without Specified Morbidities: Indicates whether the infant survived with none of the following key morbidities: Severe IVH, CLD Infants <33 Weeks, NEC, Pneumothorax, Any Late Infection, or PVL.

Main findings

1. Overview

A total of 497 VLBW infants were reported to VON in Ireland in 2020. Worldwide, 59,450 VLBW infants were reported to the VON Network in 2020.

Overall, there has been a 16% decrease in the number of very low birth weight infants recorded in Ireland since 2016 (Table 1.1). The corresponding decrease in the number of livebirths in Ireland over the same time period was of the order of 12% (from n=63,897 in 2016 to n=55,959 in 2020).[5]

Table 1.1 outlines the gestational age of VLBW infants reported in 2020. As in previous years, the highest proportion of infants were born in the 27-29 weeks gestation category (39%, n=192). A total of 32 (6%) infants were born with a gestation below 24 weeks and 31 (6%) infants were born with a gestation of more than 32 weeks. In total, 6% (32 of 497) of VLBW infants born in 2020 had a major congenital anomaly (MCA).

Table 1.1: Number of cases reported to VON in 2016–2020 in Ireland, according to gestational age

Gestational age	All cases					No. of cases with MCA				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
<24 weeks	48	38	44	44	32	3	1	1	3	4
24–26 weeks	134	125	138	104	109	12	12	10	8	4
27–29 weeks	217	240	198	202	192	20	19	16	12	9
30–32 weeks	152	172	126	118	133	15	11	10	10	10
>32 weeks	42	37	31	37	31	4	8	8	4	5
Total	**593**	**612**	**537**	**505**	**497**	**54**	**51**	**45**	**37**	**32**

Note: MCA=Major Congenital Anomaly. MCA was unknown for 2 infants in 2017.

Table 1.2 outlines the birthweights of VLBW infants born in 2020. A total of 20 infants (4%) weighed ≤500g, of whom two were ≤401g (the lowest birthweight recorded was 350g). The majority of infants (36%; n=178) were born with a birthweight >1250g, 15 of whom had a birthweight >1500g.

Table 1.2: Number of cases reported to VON in 2016–2019 in Ireland, according to birth weight

Birth weight (g)	All cases					No. of cases with MCA				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
<501	21	23	24	26	20	1	2	0	4	1
501–750	104	93	97	89	77	14	8	8	5	4
751–1000	125	122	118	97	101	11	12	8	7	5
1001–1250	152	157	132	122	121	14	12	12	10	11
1250–1500	173	206	147	158	163	11	15	13	8	9
>1500	18	10	19	13	15	3	2	4	3	2
Total	**594**	**606**	**537**	**505**	**497**	**54**	**51**	**45**	**37**	**32**

Note: MCA=Major Congenital Anomaly; MCA was unknown for 2 infants in 2017.

2. Infant Characteristics

Table 2.1 outlines the characteristics of VLBW infants born in 2020.

ROI infants were similar to all VON infants with respect to infant sex, chorioamnionitis, caesarean section, major congenital anomaly and small for gestational age. In previous years there was a higher prevalence of major congenital anomaly among ROI infants but, for the first time since inception of this audit, this was not noted for 2020. As with previous years a slightly higher proportion of ROI infants received prenatal care. The prevalence of maternal hypertension was significantly lower among the mothers of ROI infants whereas multiple gestation and the provision of antenatal steroids and antenatal magnesium sulphate were significantly higher in the ROI group.

Table 2.1: Infant characteristics in the Republic of Ireland and VON, 2020

Characteristic	Republic of Ireland			VON		p-value
	Cases	N	%	N	%	
Male	257	497	51.7	59450	50.6	0.622
Prenatal Care	485	496	97.8	59223	95.4	0.012
Chorioamnionitis	62	490	12.7	58721	12.4	0.867
Maternal Hypertension	108	496	21.8	59024	36.5	<0.001
Antenatal Steroids	449	495	90.7	59133	83.8	<0.001
C-Section	365	496	73.6	59465	73.0	0.768
Antenatal Magnesium Sulphate	371	491	74.6	58725	62.7	<0.001
Multiple Gestation	155	497	31.2	59484	24.0	<0.001
Major Congenital Anomaly (MCA)	32	497	6.4	59451	6.0	0.681
Small for Gestational Age (SGA)	99	489	20.2	58707	20.7	0.807

Note: N represents the total number of very low birth weight babies (VLBW) in Ireland. For Ireland the % is based on the cases as the numerator and the total, N, as the denominator. In January 2019, a change in Irish legislation legalised termination of pregnancy (TOP) in the Republic of Ireland. Abortion is permitted in early pregnancy, when there is a risk to the life or of serious harm to the health of the pregnant woman and for a condition likely to lead to the death of a foetus either before or within 28 days of birth (Section 9 of the Health (Regulation of Termination of Pregnancy) Act 2018).

3. Survival

In 2020, 85% of the VLBW infants born in the ROI survived to discharge home or first birthday, which was similar to the 86% of all VON infants who survived (Table 3.1). During the previous three years, the crude survival rate of 82% in the ROI was lower than the survival rate of 85-86% among the VON infants.

In 2020, 58% of ROI infants survived without the specified morbidities of severe IVH, chronic lung disease in infants born <33 weeks of gestation, NEC, pneumothorax, any late infection or cystic PVL. A similar proportion of VON infants survived without these specified morbidities, as has been the case in previous years (Table 3.1).

Table 3.1: Survival of ROI and VON infants, including those with congenital anomalies, 2020

Measure	Year	Republic of Ireland			VON		p-value
		Cases	N	%	N	%	
Survival*	2016	496	593	83.7	64052	85.4	0.356
	2017	501	611	82.0	63202	85.5	0.005
	2018	435	530	81.8	62021	85.4	0.031
	2019	412	505	81.6	63617	85.0	0.032
	2020	420	497	84.5	59258	85.5	0.533
Survival without specified morbidities**	2016	333	593	56.2	64042	56.7	0.740
	2017	343	605	56.6	63092	56.7	0.878
	2018	284	527	53.8	61816	56.7	0.195
	2019	279	503	55.5	63489	56.3	0.709
	2020	284	490	58.0	59234	55.8	0.338

* Defined as an infant who survives to discharge home or to first birthday.

** Defined as survival without any of the following morbidities of severe IVH, chronic lung disease in infants <33 weeks gestation, NEC, pneumothorax, any late infection or cystic PVL.

Survival to discharge of VLBW infants by gestational age and birthweight is reported in Tables 3.2 and 3.3 respectively for the years 2016 through to 2020.

Survival to discharge increases with advancing gestational age until 30 weeks gestation, above which there was a slight variation away from this pattern. This finding is consistent with previous years (Table 3.2). Survival of ROI infants born at 23 weeks gestation was 25% (5 infants of a total of 20 infants).

Table 3.2: Survival to discharge by gestational age breakdown for ROI infants, including those with congenital anomalies, 2016-2020

Number of survivors/Number of liveborn infants (%)					
Gestational Age	**2016 (N=593)**	**2017 (N= 612)**	**2018 (N=530*)**	**2019 (N=505)**	**2020 (N=497)**
<22 weeks	0/2 (0%)	0/6 (0%)	0/5 (0%)	0/2 (0%)	0/4 (0%)
22 weeks	0/19 (0%)	0/16 (0%)	0/12 (0%)	0/13 (0%)	0/8 (0%)
23 weeks	10/27 (37%)	7/15 (47%)	9/27 (33%)	10/29 (34%)	5/20 (25%)
24 weeks	25/45 (56%)	21/37 (57%)	20/39 (51%)	16/28 (57%)	27/34 (79%)
25 weeks	39/50 (78%)	27/50 (54%)	32*/41 (78%)	23/35 (66%)	28/36 (78%)
26 weeks	34/39 (87%)	31/39 (79%)	50*/54 (93%)	36/41 (88%)	29/39 (74%)
27 weeks	47/49 (96%)	60/69 (87%)	46*/52 (88%)	50/60 (83%)	39/46 (85%)
28 weeks	77/83 (93%)	83/88 (94%)	65*/69 (94%)	49/54 (91%)	56/60 (93%)
29 weeks	80/85 (94%)	74/83 (89%)	70/75 (93%)	84/88 (95%)	82/86 (95%)
30 weeks	62/66 (94%)	84/87 (97%)	51/53 (96%)	57/60 (95%)	43/45 (96%)
31 weeks	49/50 (98%)	52/54 (96%)	31/34 (91%)	28/30 (93%)	49/52 (94%)
32 weeks	34/36 (94%)	28/31 (90%)	36/39 (92%)	25/28 (89%)	34/36 (94%)
>32 weeks	39/42 (93%)	34/37 (92%)	25*/30 (83%)	34/37 (92%)	28/31 (90%)
Total	**496/593 (84%)**	**501/612 (82%)**	**435/530 (82%)**	**412/505 (82%)**	**420/497(85%)**

*Seven infants in 2018 did not have information on survival to discharge: one infant born at 25 weeks; three infants born at 26 weeks; one infant born at 27 weeks; one infant born at 28 weeks and one infant born at 35 weeks. Hence the denominator is 530.

Table 3.3: Survival to discharge by birth weight for ROI infants, including those with congenital anomalies, 2016-2020

Number of survivors/Number of liveborn infants (%)					
Birth Weight	**2016 (N=593)**	**2017 (N= 612)**	**2018 (N=530*)**	**2019 (N=505)**	**2020 (N=497)**
<501g	6/21 (29%)	3/23 (13%)	2/23* (9%)	5/26 (19%)	4/20 (20%)
501-600g	12/33 (36%)	16/39 (41%)	19/32* (59%)	13/25 (52%)	14/31 (45%)
601-700g	32/51 (63%)	23/33 (70%)	24/42 (57%)	31/54 (57%)	23/31 (74%)
701-800g	35/49 (71%)	29/43 (67%)	27/39* (69%)	17/23 (74%)	31/36 (86%)
801-900g	40/47 (85%)	35/47 (75%)	37/44 (84%)	27/34 (79%)	37/43 (86%)
901-1000g	45/49 (92%)	48/53 (91%)	51/54 (94%)	44/50 (88%)	32/37 (86%)
1001-1100g	51/54 (94%)	55/64 (86%)	41/46 (89%)	35/38 (92%)	42/49 (86%)
1101-1200g	62/67 (93%)	60/64 (94%)	47/50 (94%)	54/61 (89%)	41/45 (91%)
1201-1300g	61/63 (97%)	65/69 (94%)	51/53* (96%)	46/47 (98%)	60/63 (95%)
1301-1400g	62/64 (97%)	74/80 (93%)	56/60 (93%)	56/60 (93%)	52/54 (96%)
>1400g	90/95 (95%)	93/97 (96%)	80/87 (92%)	84/87 (97%)	84/88 (95%)
Total	**496/593 (84%)**	**501/612 (82%)**	**435/530 (82%)**	**412/505 (82%)**	**420/497 (85%)**

*Seven infants in 2018 did not have information on survival to discharge: one infant <501g; one infant 501-600g; three infants 701-800g; two infants 1201-1300g. Hence the denominator is 530.

The proportion of infants who survived to discharge without specified morbidities since 2016 is outlined Table 3.4. This rate is seen to increase with advancing gestational age.

Table 3.4: Survival without specified morbidities[1] of infants according to gestational age at birth of ROI infants reported to VON, 2016-2020

Number of survivors without morbidities/ Number of liveborn infants (%)					
Gestational Age	**2016 (N=592*)**	**2017 (N= 605*)**	**2018 (N=529*)**	**2019 (N=503*)**	**2020 (n=497)**
≤ 22 weeks	0/21 (0%)	0/22 (0%)	0/17(0%)	0/15 (0%)	0/12 (0%)
23 weeks	2/27 (7%)	1/15 (7%)	0/27 (0%)	2/29 (7%)	1/20 (5%)
24-27 weeks	59/182 (32%)	57/190 (30%)	69/186 (37%)	56/162 (35%)	51/152 (34%)
28-31 weeks	202/284 (71%)	226/310 (73%)	158/230 (69%)	166/232 (72%)	173/240 (72%)
≥32 weeks	70/78 (90%)	59/68 (87%)	57/69 (83%)	55/65 (85%)	59/66 (89%)
Total	**333/592* (56%)**	**343/605* (57%)**	**284/529* (54%)**	**279/503* (55%)**	**284/490* (58%)**

Note: Figures include infants with congenital anomalies.

[1]Specified Morbidities include severe IVH, chronic lung disease in infants <33 weeks gestation, NEC, pneumothorax, any late infection and/or cystic PVL.

*Data on survival without specified morbidities: Unknown for 1 infant born in 2016 at 24-27 weeks gestation; Unknown for 7 infants born in 2017: 5 infants born at 24-27 weeks gestation and 2 infants born at 28-31 weeks; Unknown for 8 infants born in 2018: 5 infants born at 24-27 weeks gestation, 2 infants born at 28-31 weeks and 1 born at >32 weeks. Unknown for 2 infants born in 2019 at 24-27 weeks gestation. Unknown for 7 infants in 2020: 3 infants born at 24-27 weeks gestation 3 infants born at 28-31 weeks and 1 infant born ≥32weeks.

Table 3.5 Survival to discharge according to birth weight for SGA and AGA ROI infants, 2016-2020

Gestational Age	**SGA**		**AGA**	
	N	**Survived**	**N**	**Survived**
≤ 22 weeks	4	0 (0%)	64	0 (0%)
23 weeks	4	0 (0%)	113	40 (35%)
24 weeks	9	1 (11%)	174	107 (61%)
25 weeks	13	7 (54%)	197	142 (72%)
26 weeks	25	17 (68%)	187	163 (87%)
27 weeks	35	25 (71%)	241	217 (90%)
28 weeks	33	28 (85%)	317	299 (94%)
29 weeks	38	33 (87%)	380	358 (94%)
30-31 weeks	110	102 (93%)	420	403 (96%)
≥ 32 weeks	289	263 (91%)	58	54 (93%)
Total	**560**	**476 (85%)**	**2151**	**1783 (83%)**

Note: SGA – Small for gestational age; AGA – Appropriate for gestational age.

The proportion of infants surviving to discharge who were born small for gestational age (SGA) is shown in Table 3.5. The survival rate of infants who were SGA at birth increased with higher gestational ages. All of the infants born at 23 weeks of gestation and who survived were born appropriate for gestational age (AGA). None of the infants born at this gestation and who were SGA have survived.

4. Key Performance Indicators

VON reports on a number of Key Performance Indicators (KPIs). This allows the ROI to compare its outcomes to the Vermont Oxford Network. Such comparisons allow for the benchmarking of ROI performance and the identification of areas for improvement.

The KPIs are listed below and relevant definitions are outlined above in the Definitions and Terminology section on page 12.

1. Mortality
2. Mortality Excluding Early Deaths
3. Death or Morbidity
4. CLD
5. Pneumothorax
6. Late Bacterial Infection
7. Coagulase Negative Infection
8. Nosocomial Infection
9. Fungal Infection
10. Any Late Infection
11. Any IVH
12. Severe IVH
13. ROP
14. Severe ROP
15. Cystic PVL
16. Necrotising Enterocolitis

For each KPI, the number and percentage of ROI infants that experienced the outcome in 2020 is reported and illustrated in the following charts alongside the equivalent figures for all infants recorded in the VON database. The reporting of the KPIs in numbers and percentages for ROI and VON infants is provided for descriptive purposes. Observed differences in KPIs may be related to the medical care provided but may also be due to differences between the ROI and VON infant populations. Robust comparison of KPIs between the ROI and VON requires that pertinent differences between the infant populations are taken into account. This is done through the calculation of standardised mortality/morbidity ratios (SMRs).

Standard Mortality/Morbidity Ratios (SMRs)

Based on all VON data for infants with birth weights 501-1500g, VON uses multivariable logistic regression models for each KPI to quantify the risk of the outcome based on the following infant characteristics: gestational age, SGA, multiple gestation, Apgar score at 1 min, gender, vaginal birth, location (inborn or outborn) and birth defect severity. Coefficients from these regression models are provided to NPEC to allow the calculation of SMRs for each KPI.

SMRs are calculated for ROI babies with birth weights between 501-1500g, and for whom complete data are available for the infant characteristics used in the regression models and for each of the KPIs analysed.

For each KPI, the coefficients are applied to the data of eligible ROI infants to estimate the risk of the outcome for each infant. Summing these individual risk estimates gives the total number of infants that would be expected to experience the outcome, i.e. the expected number, taking into account the risk profile of the ROI infants.

To obtain the SMR for each KPI, the number of eligible ROI infants that actually experienced the outcome, i.e. the observed number of cases, is divided by the expected number of cases (SMR = Observed/Expected).

SMR values equal or close to one indicate that there is little or no difference between the observed and expected number of infants that experienced the outcome, i.e. the number observed is to be expected given the risk profile of the ROI infant population. SMRs greater than one indicate that more infants experience the outcome than expected given the risk profile of the ROI infants. SMRs less than one indicate that fewer cases are observed among ROI infants than expected.

A 95% confidence interval is calculated for each SMR so that inferences can be made about whether the SMR indicates if the difference between observed and expected is statistically significant. If the 95% confidence interval does not include the value of 1, it may be inferred that the difference between the numbers of observed and expected cases is statistically significant, i.e. there is more or fewer cases among the ROI infants than expected given the risk profile.

For each KPI, the absolute difference between the observed and expected number of cases and the 95% confidence interval for this difference is also reported in order to provide statements in terms of the actual number of infants affected.

SMRs for Key Performance Indicators in 2020

For each key performance indicator, Table 4.1 displays the SMR, its 95% confidence interval, the difference between the observed and expected number of cases and the 95% confidence interval for this difference.
In 2020, the observed risk among ROI infants was significantly lower than the expected risk with respect to retinopathy of prematurity (SMR 0.65; 95% CI: 0.46, 0.85). There were no significant differences for the other key performance indicators.

Table 4.1: Risk-Adjusted Standardised Mortality/Morbidity Ratios for Key Performance Indicators, Republic of Ireland, 2020

Outcome	O	E	SMR	(95% CI)	O-E	(95% CI)
Mortality	59	54	1.10	(0.83, 1.37)	5	(-9, 20)
Mortality excluding early death	36	36	1.01	(0.68, 1.33)	0	(-12, 12)
Death or Morbidity	182	185	0.98	(0.84, 1.13)	-3	(-30, 24)
Chronic Lung Disease	96	81	1.18	(0.97, 1.40)	15	(-3, 33)
Pneumothorax	24	17	1.39	(0.92, 1.86)	7	(-1, 15)
Late Bacterial Infection	25	30	0.83	(0.47, 1.18)	-5	(-16, 5)
Coagulase Negative Infection	14	19	0.72	(0.28, 1.17)	-5	(-14, 3)
Nosocomial Infection	37	45	0.83	(0.53, 1.12)	-8	(-21, 5)
Fungal Infection	1	3	0.29	(0, 1.36)	-2	(-6, 1)
Any Late Infection	39	47	0.83	(0.55, 1.12)	-8	(-21, 6)
Intraventricular Haemorrhage	101	102	0.99	(0.80, 1.19)	-1	(-20, 19)
Severe Intraventricular Haemorrhage	27	28	0.98	(0.61, 1.35)	-1	(-11, 10)
Retinopathy of Prematurity*	68	104	0.65	(0.46, 0.85)	-36	(-56, -16)
Severe Retinopathy of Prematurity	13	18	0.71	(0.25, 1.16)	-5	(-14, 3)
Cystic Periventricular Leukomalacia	5	11	0.46	(0, 1.05)	-6	(-12, 1)
Necrotising Enterocolitis	23	23	1.02	(0.61, 1.44)	0	(-9, 10)

"O" refers to the number of observed cases with the outcome and "E" to the expected number with the outcome of ROI infants with birth weights 501-1500g. 95% confidence intervals (CIs) are provided for the SMR and the difference in observed and expected cases.

*Indicates a statistically significant difference.

Key Performance Indicators and Gestational Age

Table 4.2 outlines the rates for each KPI according to gestational age (for all infants born ≥23 weeks of gestations). There was a decrease in the risk of all KPIs with advancing gestational age. Details on KPIs for infants born at 23 weeks are included however, conclusions cannot be drawn considering the small numbers recorded.

Table 4.2 Risk for each Key Performance Indicator (KPI) according to gestational age categories of VLBW infants born in the ROI, 2020

Outcomes	23 weeks	24-27 weeks	28-31 weeks	>=32 weeks	Total
Mortality	15 (75%)	32 (21%)	13 (5%)	5 (7%)	50 (11%)
Mortality excluding early death	5 (25%)	26 (18%)	9 (4%)	1 (2%)	36 (8%)
Death or Morbidity	19 (95%)	101 (66%)	67 (28%)	7 (11%)	175 (38%)
Chronic Lung Disease	4 (20%)	53 (50%)	41 (18%)	2 (3%)	96 (25%)
Pneumothorax	7 (47%)	9 (6%)	10 (4%)	0 (0%)	19 (4%)
Late Bacterial Infection	1 (5%)	21 (15%)	6 (3%)	0 (0%)	27 (6%)
Coagulase Negative Infection	2 (10%)	7 (5%)	6 (3%)	0 (0%)	13 (3%)
Nosocomial Infection	3 (15%)	26 (18%)	12 (5%)	0 (0%)	38 (9%)
Fungal Infection	0 (0%)	1 (1%)	0 (0%)	0 (0%)	1 (0%)
Any Late Infection	3 (15%)	28 (20%)	12 (5%)	0 (0%)	40 (9%)
Intraventricular Haemorrhage	7 (35%)	61 (42%)	38 (16%)	5 (9%)	104 (24%)
Severe Intraventricular Haemorrhage	5 (25%)	17 (12%)	5 (2%)	0 (0%)	22 (5%)
Retinopathy of Prematurity	5 (25%)	48 (40%)	19 (9%)	1 (2%)	68 (17%)
Severe Retinopathy of Prematurity	1 (5%)	11 (9%)	1 (0%)	0 (0%)	12 (3%)
Cystic Periventricular Leukomalacia	0 (0%)	2 (1%)	3 (1%)	1 (2%)	6 (1%)
Necrotising Enterocolitis	1 (5%)	20 (13%)	4 (2%)	0 (0%)	24 (5%)

Time trends in relative risk

For each KPI, Table 4.3 provides the annual SMRs for the years 2016 to 2020 for ROI infants with birth weights 501-1500g. For the vast majority of KPIs, the SMRs were not statistically significant, indicating that the observed and expected numbers of cases were similar.

Two exceptions to this are for pneumothorax and for retinopathy of prematurity. With regards to pneumothorax, there has been an excess of cases each year and the excess was statistically significant in 2017, 2018 and 2019.

The opposite has been observed for retinopathy of prematurity, with fewer than expected cases observed each year. This was statistically significant in 2016, 2017, 2019 and 2020 and for severe retinopathy of prematurity in 2018.

There is evidence of improvement over time with respect to necrotising enterocolitis. There was a statistically significant excess of cases in 2014. Smaller excesses were observed in subsequent years but the number of cases observed in 2020 was almost identical to the expected number.

Table 4.3: Standardised Mortality/Morbidity Ratios for Key Performance Indicators, Republic of Ireland, 2016-2020.

Outcomes	2016 SMR (95% CI)	2017 SMR (95% CI)	2018 SMR (95% CI)	2019 SMR (95% CI)	2020 SMR (95% CI)
Mortality	1.10 (0.87, 1.34)	1.19 (0.96, 1.42)	1.11 (0.87, 1.36)	1.21 (0.94, 1.47)	1.10 (0.83, 1.37)
Mortality excluding early death	1.12 (0.84, 1.41)	1.20 (0.93, 1.48)	1.12 (0.83, 1.41)	1.14 (0.82, 1.47)	1.01 (0.68, 1.33)
Death or Morbidity	1.02 (0.89, 1.15)	1.01 (0.89, 1.14)	1.01 (0.88, 1.15)	1.04 (0.90, 1.19)	0.98 (0.84, 1.13)
Chronic Lung Disease	0.95 (0.75, 1.15)	1.12 (0.93, 1.31)	0.97 (0.77, 1.17)	0.99 (0.77, 1.21)	1.18 (0.97, 1.40)
Pneumothorax	1.40 (0.98, 1.82)	1.69 (1.29, 2.10)*	1.56 (1.13, 1.98)*	1.97 (1.51, 2.44)*	1.39 (0.92, 1.86)
Late Bacterial Infection	1.12 (0.81, 1.43)	0.89 (0.59, 1.18)	0.88 (0.56, 1.20)	0.95 (0.60, 1.30)	0.83 (0.47, 1.18)
Coagulase Negative Infection	1.13 (0.74, 1.52)	1.16 (0.80, 1.53)	1.20 (0.80, 1.61)	0.98 (0.53, 1.44)	0.72 (0.28, 1.17)
Nosocomial Infection	1.17 (0.91, 1.43)	1.04 (0.80, 1.29)	0.97 (0.71, 1.24)	1.01 (0.72, 1.31)	0.83 (0.53, 1.12)
Fungal Infection	0.25 (0.73, 1.24)	0.84 (0.06, 1.74)	0.23 (0, 1.17)	0.58 (0, 1.64)	0.29 (0, 1.36)
Any Late Infection	1.13 (0.88, 1.39)	1.03 (0.78, 1.27)	0.96 (0.70, 1.22)	1.02 (0.74, 1.31)	0.83 (0.55, 1.12)
Intraventricular Haemorrhage	1.06 (0.87, 1.24)	0.98 (0.81, 1.15)	0.99 (0.80, 1.17)	0.90 (0.71, 1.10)	0.99 (0.80, 1.19)
Severe Intraventricular Haemorrhage	1.32 (0.98, 1.67)	0.90 (0.59, 1.22)	0.90 (0.57, 1.23)	0.86 (0.50, 1.21)	0.98 (0.61, 1.35)
Retinopathy of Prematurity	0.62 (0.45, 0.80)*	0.72 (0.54, 0.89)*	0.85 (0.67, 1.04)	0.67 (0.47, 0.87)*	0.65 (0.46, 0.85)*
Severe Retinopathy of Prematurity	0.54 (0.10, 0.97)	0.98 (0.55, 1.42)	0.39 (0, 0.83)*	0.68 (0.19, 1.17)	0.71 (0.25, 1.16)
Cystic Periventricular Leukomalacia	0.56 (0, 1.11)	0.66 (0.15, 1.16)	0.88 (0.32, 1.43)	0.45 (0, 1.04)	0.46 (0, 1.05)
Necrotising Enterocolitis	1.39 (1.01, 1.78)*	1.22 (0.86, 1.59)	1.22 (0.83, 1.61)	1.05 (0.63, 1.47)	1.02 (0.61, 1.44)

*indicates a statistically significant difference.

5. Survival according to Gestational Age Category and Location of Birth

There are 19 neonatal centres in the ROI that are affiliated with an Obstetric Service. These are classified as tertiary, regional or peripheral neonatal centres based on the number of births per annum in the affiliated obstetric centre and the level of neonatal consultant cover in the neonatal centre. There are four designated tertiary neonatal centres, four designated regional neonatal centres and eleven designated peripheral neonatal centres (Table 5.1). Each of the tertiary centres deliver more than 7,000 infants per annum and all provide 24-hour consultant neonatology cover. The regional centres have dedicated neonatal intensive care units (NICUs) but deliver less than 7,000 infants yearly and/or do not have 24-hour consultant neonatology cover. In 2020, one of these four centres delivered 4,000-5,000 infants, two centres delivered 2,000-3,000 infants and the fourth centre delivered fewer than 2,000 infants (Table 5.1). Peripheral centres do not have dedicated NICUs nor do they have dedicated consultant neonatology cover. They do have designated areas that care for newborn infants (i.e. Special Care Baby Units (SCBUs)) and these infants are under the care of general paediatricians. In 2020, all peripheral centres delivered fewer than 2,000 infants.

Table 5.1: Number of live births and stillbirths weighing greater than or equal to 500g in maternity centres in 2020

Hospital	Number of births
Designated Tertiary Neonatal Centres	
National Maternity Hospital	> 7,000
Coombe Women & Infants University Hospital	> 7,000
Rotunda Hospital	> 7,000
Cork University Maternity Hospital	> 7,000
Designated Regional Neonatal Centres	
University Maternity Hospital Limerick	4,000 – 5,000
Our Lady of Lourdes Hospital Drogheda	2,000 – 3,000
Galway University Hospital	2,000 – 3,000
University Hospital Waterford	< 2,000
Designated Peripheral Neonatal Centres	
Midland Regional Hospital Mullingar	< 2,000
Portiuncula Hospital Ballinasloe	< 2,000
Wexford General Hospital	< 2,000
Midland Regional Hospital Portlaoise	< 2,000
St Luke's Hospital Kilkenny	< 2,000
Cavan General Hospital	< 2,000
Mayo University Hospital	< 2,000
Letterkenny University Hospital	< 2,000
University Hospital Kerry	< 2,000
Sligo University Hospital	< 2,000
South Tipperary General Hospital	< 2,000

Source: Annual Clinical Reports of hospitals and hospital groups; and communication with individual hospitals.

Of the 497 VLBW included in this year's report, 495 were born in the ROI. For these 495 infants, we had complete data both on location of birth (i.e. tertiary, regional, peripheral) and survival.

In 2020, 367 infants (74%) were born in one of the four tertiary neonatal centres, 79 (16%) were born in one of the four regional neonatal centres and the remaining 49 infants (10%) were born in one of eleven peripheral centres (Table 5.2). This compares to 78% (n=392), 15% (n=76) and 7% (n=37) born in tertiary, regional and peripheral centres in 2019.[6]

Resuscitation in the delivery room is defined as the need for administration of positive pressure breaths either via a face mask and/or an endotracheal tube. Of the 344 infants who received resuscitation in the DR, 343 survived to admission to a NICU/SCBU but one infant died in the DR. Of these 343 admitted, 290 survived to discharge and 53 infants died (data not shown in table).

Table 5.2: Survival of ROI Infants (n=495*) by category of neonatal centre, 2020

	Tertiary Centres n (%)	Regional Centres n (%)	Peripheral Centres n (%)	Total
Liveborn infants	367 (74%)	79 (16%)	49 (10%)	495
Received resuscitation in the delivery room	264/367 (72%)	46/79 (58%)	34/49 (69%)	344/495 (70%)
Admitted to a NICU/SCBU	355/367 (97%)	70/79 (89%)	47/49 (96%)	472/495 (95%)
Transferred to another neonatal centre within 48 hours of birth	7/367 (2%)	8/79 (10%)	38/49 (78%)	53/495 (11%)
Survived to discharge	309/367 (84%)	65/79 (82%)	44/49 (90%)	418/495 (84%)

*2 infants were born outside of the Irish Maternity services and were not included in this table. Both infants received resuscitation, were transferred within 48 of being born and survived to discharge.

Table 5.3 reports on the number of infants of each gestational age category who were born in tertiary, regional or peripheral centres and the number of these infants that were offered resuscitation at birth.

The 2018 report on mortality risk among VLBW infants between 2014-2016,[3] recommended that all infants born at 23 weeks gestation, presenting in a favourable condition, should be offered resuscitation. In 2020, 70% of infants born at 23 weeks gestation (n=14) were resuscitated at birth.

Table 5.3: Number of ROI infants (n=495*) born in each category of neonatal centre who were administrated resuscitation according to gestational age, 2020

Gestational Age	No. receiving resuscitation/ No. born (% of liveborn)			
	Tertiary Centres	Regional Centres	Peripheral Centres	Total
≤ 22 weeks	0/6 (0%)	0/5 (0%)	1/1 (100%)	1/12 (8%)
23 weeks	12/16 (75%)	0/2 (0%)	2/2 (100%)	14/20 (70%)
24-27 weeks	111/125 (89%)	15/19 (79%)	9/9 (100%)	135/153* (88%)
28-31 weeks	118/173 (68%)	25/40 (63%)	21/30 (70%)	164/243 (67%)
≥32 weeks	23/47 (49%)	6/13 (46%)	1/7 (14%)	30/67 (45%)
Total	**264/367 (72%)**	**46/79 (58%)**	**34/49 (69%)**	**344/495* (69%)**

*2 infants were born in a hospital outside of the ROI, and were not included in this table.

Despite the guidance from the Model of Care for Neonatal Services,[2] published in 2015, stating that infants born <28 weeks should ideally be delivered in a tertiary neonatal centre, only 82% (n=141) of infants born between 23 and 27 weeks gestation (n=173) in 2020 were delivered in a tertiary neonatal centre. This figure has remained mostly unchanged since 2017.[6]

A total of 26 (14%) infants delivered at <28 weeks were born in a regional neonatal centre and 12 (6%) were born in a peripheral centre in 2020.

Table 5.4: Number of liveborn infants in ROI according to type of centre, number of infants born at 23-27 gestation weeks and number transferred within 48h of delivery, 2016-2020

Type of neonatal centre	2016	2017	2018	2019	2020	Total
	n all liveborn infants					
Tertiary	427	432	380	392	367	1998
Regional	112	109	112	76	79	488
Peripheral	55	65	45	37	49	251
Total	**594**	**606**	**537**	**505**	**495***	**2737**
	n (%) infants who were born 23-27 weeks gestation					
Tertiary	178(84.8%)	166(80.2%)	179(82.1%)	155 (80.3%)	141 (81.5%)	819 (81.8%)
Regional	26(12.4%)	27(13%)	25(11.5%)	21 (10.9%)	21 (12.1%)	120 (12%)
Peripheral	6(2.9%)	14(6.8%)	14(6.4%)	17 (8.8%)	11 (6.4%)	62 (6.2%)
Total	**210**	**207**	**218**	**193**	**173**	**1001 (100%)**
	n (%) infants born 23-27 weeks who were transferred within 48h					
Tertiary	9 (5%)	0 (0%)	11 (6%)	0 (0%)	5 (3.5%)	25 (3%)
Regional	7 (26%)	6 (23%)	5 (20%)	1 (5%)	5 (21%)	24 (20%)
Peripheral	6 (100%)	10 (71%)	11 (79%)	13 (76%)	11 (11%)	51 (82%)
Total	**27 (10%)**	**16 (8%)**	**27 (17%)**	**14 (8%)**	**21 (12%)**	**105 (10%)**

* Two infants born outside of the Irish Maternity services and transferred to an Irish neonatal centre withing 48h. These are not included in this table.

As outlined in Table 5.4, the number of infants born at 23-27 weeks in non-tertiary centres increased from 15% in 2016 to 20% in 2017 remaining around 18% in the years that followed, including in 2020. Over the past years, approximately 9% of all the infants born at 23-27 weeks gestation were born in peripheral centres and 12% were born in regional centres. Since 2016, peripheral centres transferred out 82% (51/62) of these infants for ongoing care within 48 hours of birth and regional centres transferred out 20% (24/120).

In 2020, admission to NICU/SCBU was recorded for 472 infants, of which 355 (75% of total admissions) were born at tertiary centres, 70 (15%) at regional centres and 47 (10%) at peripheral centres (2 infants were born outside of the Irish Maternity services and are not included in these values, Table 5.2). Some of these infants were subsequently transferred out of their birth hospital to another neonatal and/or paediatric centre within 48 hours of birth. In total, 53 (11%) of the 495 infants born in ROI were transferred within 48 hours (two additional infants were born outside of the Irish Maternity services and transferred to an Irish neonatal centre within 48h). The need for transfer was higher for infants born in peripheral units as 38 of 49 infants (78%) were transferred within 48h (Table 5.5). Peripheral units generally only provide care for infants ≥32 weeks gestation while regional centres provide care for infants ≥28 weeks gestation.

Table 5.5: Number of infants born in each category of neonatal centre, and number transferred within 48 hours, according to gestational age, 2020

No. transferred within 48 hours/ No. born (%)			
Gestational Age	**Tertiary Centres**	**Regional Centres**	**Peripheral Centres**
≤ 22 weeks	0/6 (0%)	0/5 (0%)	0/1 (0%)
23 weeks	0/16 (0%)	0/2 (0%)	2/2 (100%)
24-27 weeks	5/125 (4%)	5/19 (26%)	9/9 (100%)
28-31 weeks	2/173 (1%)	2/40 (5%)	25/30 (83%)
≥32 weeks	0/47 (0%)	1/13 (8%)	2/7 (29%)
Total	**7/367 (2%)**	**8/79 (10%)**	**38/49 (78%)**

Note: Two additional infants, not included in this table, were born outside of the Irish Maternity services born at 24-27weeks and transferred within 48h to neonatal centre unit.

Summary for Peripheral Centres

Of the 42 infants born at <32weeks gestation in peripheral centres, 1 died in the DR (one infant at ≤22 weeks). A further 36 were transferred to another centre within 48 hours of birth: 25 to a tertiary neonatal centre, 11 to regional centres. The remaining five infants were managed in a peripheral centre and these infants were born at 28-31 weeks. Please refer to tables 5.5-5.11 for further detail.

Summary for Regional Centres

A total of 79 VLBW Infants were born in Regional Centres in 2020. Of these 79 infants, 66 were born at <32 weeks gestation of which 26 infants were born <28 weeks gestation.

Seven infants born in regional centres at ≤23weeks gestation (five infants born at 22 weeks and two born at 23 weeks) died in the DR (Table 5.6 and 5.8). Of the remaining 72 infants, 70 were admitted to the NICU and two infants died in the delivery room (one born at 24-27weeks gestation and one born at 28-31 weeks). Only eight of these infants were transferred to another centre within 48 hours of life (five infants born at 24-27 weeks two infants born at 28-31 weeks and one infant born at >= 32 weeks gestation). The rest were managed in the regional centre: 13 infants born at 24-27 weeks, 37 infants born 28-31 weeks gestation and 12 infants born >=32 weeks.

Summary for Tertiary Centres

Seven infants born in a tertiary centre were transferred within 48 hours of birth, five of these infants were 24-27 weeks gestation and two ≥28 weeks gestation. Four infants were transferred to a paediatric hospital, two infants to another tertiary centre and one infant was transferred to another general hospital (not a neonatal centre) in Ireland.

Summary of Infants born at the cusp of viability

All infants born in ROI in 2020, at ≤22 weeks of gestation died in the delivery room, and 15 of 20 (75%) infants born at 23 weeks survived to admission in NICU (Table 5.6 and 5.8).

Survival of Infants born at ≤ 22 weeks gestation according to Location of Birth

Table 5.6 outlines the survival of infants born at ≤ 22 weeks gestation in 2020. Only one of these infants was resuscitated in the delivery room (DR) but that infant did not survive to admission to the NICU. One of these infants (born in tertiary centres) had an MCA.

Table 5.6: Survival of ROI Infants born at ≤ 22 weeks gestation by location of birth, 2020, n=12

	Tertiary Centres n (%)	Regional Centres n (%)	Peripheral Centres n (%)	Total
Liveborn infants	6	5	1	12
Received resuscitation in the delivery room	0 (0%)	0 (0%)	1 (100%)	1 (8%)
Admitted to a NICU/SCBU	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Transferred to another neonatal centre within 48 hours of birth	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Survived to discharge	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 5.7 outlines the trend in survival of ROI infants born at ≤22 weeks gestation for the past 5 years. There has been no reported survival at ≤22 weeks gestation since 2014, the first year of this annual report.

Table 5.7: Survival of infants born at ≤22 weeks gestation, 2016-2020

	2016 n (%)	2017 n (%)	2018 n (%)	2019 n (%)	2020 n (%)
Liveborn infants	21	22	17	15	12
Received resuscitation in the delivery room	1 (5%)	2 (9%)	1 (6%)	1 (7%)	1 (8%)
Admitted to a NICU/SCBU	1 (5%)	2 (9%)	1 (6%)	0 (0%)	0 (0%)
Survived to discharge	0	0	0	0	0

Survival of Infants born at 23 weeks (23+0 to 23+6) gestation according to Location of Birth

Table 5.8 outlines the survival of infants born at 23 weeks gestation in 2020. The majority of these were born in tertiary centres (n=16, 80%), two (10%) were born in regional centres and two (10%) were born in peripheral centres. Fourteen of these infants (70%) were resuscitated in the delivery room and all of these survived to admission to the NICU. One infant was not offered resuscitation at birth but was admitted to the NICU for comfort care. There were five DR deaths of which three had an MCA.

Of note, of the four infants at this gestational age who were born outside a tertiary neonatal centre, two infants survived to admission to a NICU/SCBU. These two infants, were subsequently transferred within 48 hours of birth to a tertiary neonatal centre. Five of the 20 VLBW infants born at 23 weeks gestation survived to discharge.

Table 5.8: Survival of ROI Infants born at 23 weeks gestation by location of birth, 2020, n=20

	Tertiary Centres n (%)	Regional Centres n (%)	Peripheral Centres n (%)	Total
Liveborn infants	16	2	2	20
Received resuscitation in the delivery room	12 (75%)	0 (0%)	2 (100%)	14 (70%)
Admitted to a NICU/SCBU	13* (81%)	0 (0%)	2 (100%)	15 (75%)
Transferred to another neonatal centre within 48 hours of birth	0(0%)	0 (0%)	2/2 (100%)	2 (10%)
Survived to discharge among liveborns	3/16 (19%)	0/2 (0%)	2/2 (100%)	5/20 (25%)
Survived to discharge among infants receiving resuscitation	3/12 (25%)	0 (0%)	2/2 (100%)	5/14 (25%)
Survived to discharge among infants admitted to NICU/SCBU	3/13 (23%)	0 (0%)	2/2 (100%)	5/15 (25%)

*One infant was not offered resuscitation at birth but was admitted to the NICU for comfort care.

Table 5.9 outlines the trend in survival of ROI infants born at 23 weeks gestation for the past 5 years. There was a decrease in the number of infants offered resuscitation in the DR from a figure of 89% in 2018 to 70% in 2020. Overall survival to discharge home was the lowest recorded since 2015 (30%) with 25% in 2020. The lowest survival rate for these infants was recorded in 2014, the first year of this audit, with a value of 19%.

Table 5.9: Survival of infants born at 23 weeks gestation, 2016-2020

	2016 n (%)	2017 n (%)	2018 n (%)	2019 n (%)	2020 n (%)
Liveborn infants	27	15	27	29	20
Received resuscitation in the delivery room	20 (74%)	13 (87%)	24 (89%)	24 (83%)	14 (70%)
Admitted to a NICU/SCBU	20 (74%)	13 (87%)	22 (81%)	23 (79%)	15 (75%)
Survived to discharge	10 (37%)	7 (47%)	9 (33%)	10 (35%)	5 (25%)

Survival of Infants born at 24–27 weeks gestation according to Location of Birth

Table 5.10 outlines the survival of infants born at 24-27 weeks gestation in 2020. Overall, there were 153 infants born at 24-27 weeks gestation of whom 125 (82%) were born in tertiary neonatal centres, 19 (12%) in regional centres and 9 (6%) in peripheral centres. Two additional infants were born outside of the Irish Maternity services and transferred to a neonatal unit in the ROI. As these infants were not delivered within the maternity services in ROI, we have excluded them from our analysis of survival according to Location of Birth. Of these 153 infants, 135 (88%) were offered resuscitation in the delivery room and all of these infants survived to admission to a NICU/SCBU. Of the 18 infants who did not receive resuscitation in the DR (14 infants born in tertiary centres and four infants in regional centres), two infants died in the DR (one in a tertiary centre and one in a regional centre) and one of the infants had an associated MCA. The remaining 16 infants (two infants born at 24 weeks, three infants born at 25 weeks, three at 26 weeks and the eight at 27 weeks) were admitted to the NICU/SCBU and subsequently survived to discharge. In total, there were two DR deaths of which one had an MCA.

With regards to the need for resuscitation with advancing gestational age, of the 34 infants born at 24 weeks, all but three required resuscitation in the DR. One of these infants had an MCA and did not survive to admission to NICU. Of those born at 25 weeks (n=36), three (6%) did not require resuscitation, at 26 weeks, the figure was 3/39 (8%) and at 27 weeks, the figure was 9/46 (20%).

Nineteen of the 153 infants admitted to NICU (12% of those liveborn at 24-27 weeks gestation) were transferred from their hospital of birth within 48 hours of being born (Table 5.10). Nine of these infants were born in peripheral centres, and five infants were born in a regional centre. All were transferred to tertiary neonatal centres within 48 hours of birth, with the exception of one who was transferred from a peripheral to a regional centre. Three infants did not survive to discharge. Therefore, all the nine infants of 24-27 weeks gestation who were born in peripheral centres, were admitted to the NICU/SCBU and all were transferred to another centre within 48 hours of birth. Of the 19 infants born at 24-27 weeks gestation in a regional centre, 18 were admitted to the NICU and five of these infants were transferred within 48 hours of birth.

In total, 121 (80%) infants born at 24-27 weeks gestation survived to discharge.

Table 5.10: Survival of ROI Infants born at 24-27 weeks of gestation by location of birth, 2020

	Tertiary Centres n (%)	Regional Centres n (%)	Peripheral Centres n (%)	Total
Liveborn infants	125	19	9	153
Received resuscitation in the delivery room	111 (89%)	15 (79%)	9 (100%)	135 (88%)
Admitted to a NICU/SCBU	124 (99%)	18 (95%)	9 (100%)	151 (99%)
Transferred to another neonatal centre within 48 hours of birth	5/125 (4%)	5/19 (26%)	9/9 (100%)	19/153 (12%)
Survived to discharge among liveborns	100/125 (80%)	15/19 (79%)	6/9 (67%)	121/153 (79%)
Survived to discharge among infants receiving resuscitation	87/111 (78%)	12/15 (80%)	6/9 (67%)	105/135 (78%)
Survived to discharge among infants admitted to NICU/SCBU	100/124 (81%)	15/18 (83%)	6/9 (67%)	121/151 (80%)

Note: Two infants (both born at 24-27 weeks gestation) were born outside the ROI maternity services and are not included in the above table.

Survival of Infants born at 28–31 weeks gestation according to Location of Birth

Table 5.11 outlines the survival of infants born at 28-31 weeks gestation in 2020. Overall, there were 243 infants born at 28-31 weeks gestation of which 173 (71%) were born in tertiary neonatal centres, 40 (16%) in regional centres and 30 (12%) in peripheral centres. Of these 243 infants, 164 (67%) received resuscitation in the delivery room and all of these infants survived to admission to a NICU/SCBU. A total of 79 infants did not receive resuscitation in the DR and 77 survived to admission to an NICU/SCBU. Both of the DR deaths had an MCA.

Of the 241 infants born at this gestational age who were admitted to a NICU/SCBU, 29 infants (12% of the total 243 born) were subsequently transferred within 48 hours. Twenty five of 30 infants of this gestational age who were born in peripheral centres and who survived to admission to NICU/SCBU, were transferred within 48 hours of birth. The remaining five infants were managed locally and were of the following gestational age: one infant 29 weeks, two infants 30 weeks and two infants 31 weeks gestation.

One infant of this gestational age group was transferred between tertiary neonatal centres and one was transferred from a tertiary centre to a paediatric hospital. Two infants were born in regional centres (both at 30 weeks gestation) and were transferred to peripheral centres within 48h of birth.

A total of 230 (95%) infants born at 28-31 weeks gestation survived to discharge.

Table 5.11: Survival of ROI Infants born at 28-31 weeks gestation by location of birth, 2020

	Tertiary Centres n (%)	Regional Centres n (%)	Peripheral Centres n (%)	Total
Liveborn infants	173	40	30	243
Received resuscitation in the delivery room	118 (68%)	25 (63%)	21 (70%)	164 (67%)
Admitted to a NICU/SCBU	172 (99%)	39 (98%)	30 (100%)	241 (99%)
Transferred to another neonatal centre within 48 hours of birth	2/173 (1%)	2/40 (5%)	25/30 (83%)	29/243 (12%)
Survived to discharge among liveborns	163/173 (94%)	37/40 (93%)	30/30 (100%)	230/243 (95%)
Survived to discharge among infants receiving resuscitation	109/118 (92%)	23/25 (92%)	21/21 (100%)	153/164 (93%)
Survived to discharge among infants admitted to NICU/SCBU	163/172 (95%)	37/39 (95%)	30/30 (100%)	230/241 (95%)

Survival of Infants born at ≥ 32 weeks gestation according to Location of Birth.

Table 5.12 outlines the survival of infants born at ≥32 weeks gestation in 2020. In total, there were 67 infants born at ≥32 weeks gestation in 2020. A total of 30 (45%) infants required resuscitation in the delivery room and all survived to admission to a NICU/SCBU. The other 37 infants born at ≥32 weeks gestation did not receive resuscitation in the DR. Two of these infants died in the DR, both had an MCA.

None of the infants born in a tertiary centre were transferred within 48 hours of birth. One infant born in a regional centre was transferred to a peripheral centre within 48h of birth for preparation for discharge home. Two of the seven infants born in Peripheral units were transferred within 48h to tertiary centres, both of these have survived to discharge. The survival rate for infants born at ≥32weeks gestation was 93%.

Table 5.12: Survival of ROI Infants born at or greater than 32 weeks gestation by category of neonatal centre, 2020

	Tertiary Centres n (%)	Regional Centres n (%)	Peripheral Centres n (%)	Total
Liveborn infants	47	13	7	67
Received resuscitation in the delivery room	23 (49%)	6 (46%)	1 (14%)	30 (45%)
Admitted to a NICU/SCBU	46 (98%)	13 (100%)	6 (86%)	65 (97%)
Transferred to another neonatal centre within 48 hours of birth	0/47 (0%)	1/13 (8%)	2/7 (29%)	3/67 (4%)
Survived to discharge among liveborns	43/47 (91%)	13/13 (100%)	6/7 (86%)	62/67 (93%)
Survived to discharge among infants receiving resuscitation	21/23 (91%)	6/6 (100%)	1/1 (100%)	28/30 (93%)
Survived to discharge among infants admitted to NICU/SCBU	43/46 (93%)	13/13 (100%)	6/6 (100%)	62/65 (95%)

5.2. Mortality and Delivery Room (DR) Deaths

In 2020, 16% (n=77) of VLBW babies born in the ROI died (15% for VON infants). The timing of these deaths is outlined in Table 6.1 and Figure 6.1. A higher proportion of ROI infants died in the DR in 2020, when compared to VON. This is also clearly shown in Figure 6.1 where the value for DR in ROI is markedly above the recorded for VON.

Table 6.1: Mortality amongst Republic of Ireland and VON infants, 2020

	Republic of Ireland			VON		p-value
	Cases	N	%	N	%	
Died in DR	23	497	4.6	59488	2.7	0.008
Died within 12 Hours	10	497	2.0	57847	1.6	0.469
Mortality Excl. Early Deaths	44	497	8.9	59258	10.8	0.163
Total Mortality	77	497	15.5	56824	14.5	0.533

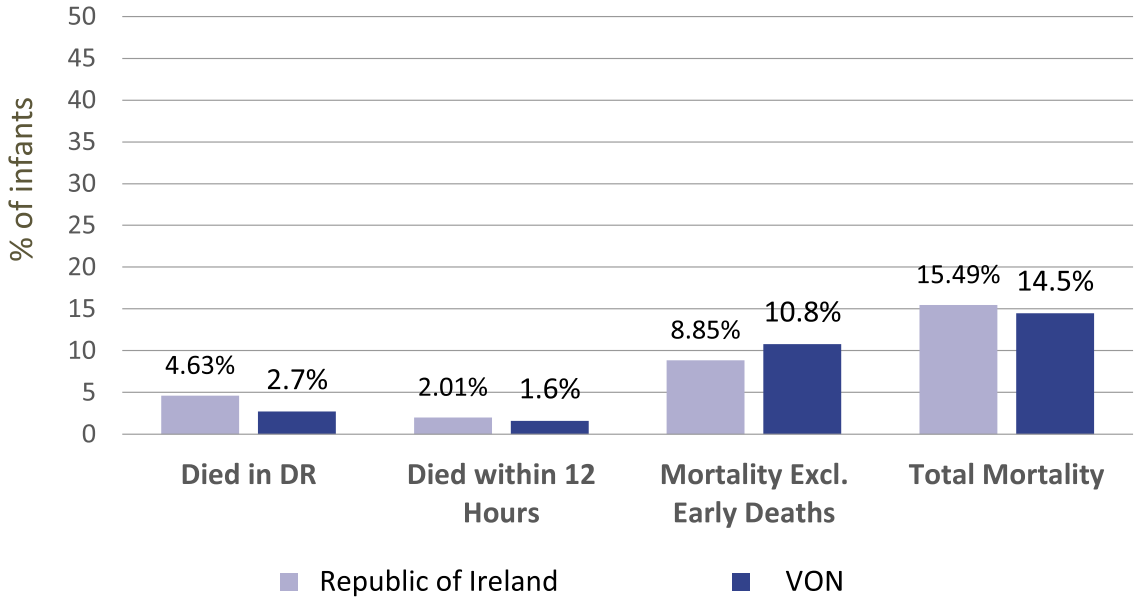


Figure 6.1 – Percentage of VLBW infant mortalities in ROI and VON, 2020

As highlighted in Table 6.2, the percentage of DR deaths has declined slightly in ROI in the past years, possibly reflecting the increase in the number of infants of 23 weeks who are now offered resuscitation in the DR. It is worth noting that termination of pregnancy (TOP) was legalised in the Republic of Ireland in January 2019. Abortion is now permitted for conditions likely to lead to the death of a foetus either before or within 28 days of birth (Section 9 of the Health (Regulation of Termination of Pregnancy) Act 2018). It is possible that this new legislation may impact on the number of DR deaths reported. This trend will be monitored over the coming years.

Table 6.2 Percentage of mortalities in ROI 2015-2019

	2016	2017	2018	2019	2020
DR Deaths	5.9%	6.1%	5.6%	7.5%	4.6%
Deaths within 12 hours	1.4%	1.4%	1.6%	1.7%	2.0%
Mortality excluding Early Deaths (within 12h of birth)	9.1%	10.6%	10.9%	11.5%	8.9%
Total Mortality*	16.0%	18.0%	18.0%	18.0%	15.5%

*Percentage based on the total number of infants who were liveborn.

Deaths in the Delivery Room

In 2020, 5% (n=23) ROI infants died in the DR (VON =3%), as shown above (Table 6.1, Figure 6.1).

Of the 23 infants who died in the delivery room in 2020, nine (39%) had a major congenital anomaly (Table 6.3). A further 11 (48% of total delivery room deaths) were in infants without a major congenital anomaly born at less than 23 weeks gestation (one infant born at 20 weeks, three infants at 21 weeks and seven infants born at 22 weeks). These factors may have impacted on the slightly higher delivery room death rate recorded in the ROI population when comparing to VON.

Table 6.3: Deaths in the delivery room, by gestational age category and presence of major congenital anomaly, 2020

Gestational Age Category	Major Congenital Anomaly		
	Absent	Present	Total
≤ 22 weeks	11	1	12
23 weeks	2	3	5
24-27 weeks	1	1	2
28-31 weeks	0	2	2
≥ 32 weeks	0	2	2
Total	**14**	**9**	**23**

All the 12 ROI infants born at <=22 weeks gestation died in the DR (Table 6.4); only one of these infants had an major congenital anomaly (Table 6.3). The VON network reported an overall survival rate for infants of 3.4% for infants born at <22 weeks and 19.8% for infants born at 22 weeks gestation.

Table 6.4: Deaths in the delivery room, by gestational age category in ROI and VON, 2020

Gestational Age Category	No. of DR deaths/ No. of liveborn infants (%)	
	ROI	VON
< 22 weeks	4/4 (100%)	87.1%
22 weeks	8/8 (100%)	47.6%
23 weeks	5/20 (25%)	10.4%
24-27 weeks	2/155 (1.3%)	1.8%
28-31 weeks	2/243 (0.8%)	0.5%
≥ 32 weeks	2/67 (3%)	1.0%
Total	**23/497 (4.6%)**	**2.7%**

Table 6.5 reports the number of DR deaths in infants with or without major congenital anomalies (MCA). In the past 5 years, 29% (47/163) of all DR deaths were in infants with MCAs.

Table 6.5: Deaths in the delivery room, in infants with and without major congenital anomaly, 2016-2020

	2016	2017	2018	2019	2020
DR Deaths	35	37	30	38	23
DR Deaths of infants without MCA	27 (77%)	28 (77%)	23 (77%)	24 (63%)	14 (61%)
DR Deaths of infants with an MCA	8 (23%)	9 (24%)	7 (23%)	14 (37%)	9 (39%)

The ROI DR death rate, while higher than VON, has declined slightly (from 5.9% in 2016 to 4.6% in 2020). The absolute number of infants without MCA who died in the DR has decreased from 27 (in 2016) to 14 possibly reflecting the increased resuscitation of infants born at 23 weeks gestation. The absolute numbers of infants with an MCA who died in the DR remains unchanged (8 infants in 2016 and 9 infants in 2020). It is too early to comment on the impact, if any, of the new abortion legislation on these figures. Additional years of data will be required before any firm conclusions can be drawn.

In Summary

- In 2020, the overall survival rate of VLBW infants born in Ireland was 84.8% (420 infants of a total of 495). These values are slightly higher than the previous years and represent the highest reported rate since 2014, the start of this audit.

- Similar to previous years, a higher proportion of ROI infants died in the delivery room (5%, n=23) when compared to VON (3%).

- The mortality risk in 2020 was consistent with the risk observed in the previous five years. It was 10% higher than expected after adjusting for the risk profile of the ROI population (SMR=1.10; 95% CI 0.83, 1.37). The findings were similar when mortality excluding early deaths was considered (SMR=1.01; CI 0.68, 1.33). Neither of these findings were statistically significant.

- The risk of ROP among VLBW infants in ROI continues to be lower than expected, lower by a third in 2020 (SMR=0.65; CI 0.46, 0.85).

- ROI infants continue to show a higher than expected risk of pneumothorax (SMR=1.39; 95% CI 0.92, 1.86). However, this year, the finding was not statistically significant. Every year since 2014, excluding the year 2016, ROI infants have demonstrated a statistically significant increased risk of pneumothorax. To better understand this elevated risk of pneumothorax amongst ROI infants, further in-depth analysis using data gathered over the past 7 years is being carried out and will be made available in a separate publication with a specific focus on this issue.

- A statistically significant decrease in most KPIs was observed with higher gestational ages. This denotes a lower risk of mortality, morbidity and specific outcomes (as measured by the KPIs) for infants born with higher gestational ages. Pneumothorax and cystic periventricular leukomalacia did not significantly decrease with advancing gestational ages.

- A steady increase in the number of infants born at 23 weeks who were resuscitated in the delivery room was noticed between 2014 and 2018 (from 42% in 2014 (n=9/21) to 89% in 2018 (n=24/27)). A slight reduction was recorded in the past two years: 83% in 2019 (n=24/29) and 70% (n=14/20) in 2020. Despite the initial increase in the proportion of these infants who survive to discharge (from 19% in 2014, to a peak of 47% in 2017), in 2020 this has declined to 25%.

- One in five of the VLBW infants born between 23-27 weeks of gestation (n=32 of 173, 18%) were not delivered in a tertiary neonatal centre in 2020. This proportion has remained virtually unchanged since 2014 despite Model of Care for Neonatal Services in Ireland recommending that infants born before 28 weeks of gestation ideally be delivered at a tertiary neonatal centre. This figure, while an improvement from the 76% born in tertiary centres reported in 2017 and the 80% reported in 2019, indicates the need for further work in this area.

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NOCA National Office of Clinical Audit

The National Office of Clinical Audit (NOCA) was established in 2012 to create sustainable clinical audit programmes at a national level. NOCA enables those who manage and deliver healthcare to improve the quality of care through national clinical audit.

The NPEC aligns its audit governance structures to the NOCA audit governance standards for audit governance committees, monitoring and escalation of outliers and national reporting.

Appendix A: Endorsement by the National Office of Clinical Audit (NOCA)

Dr. Anne Twomey
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Dr. Brendan Paul Murphy
Consultant Neonatologist
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30/09/2022

Dear Drs Twomey and Murphy,

I wish to acknowledge receipt of the Very Low Birth Weight Infants in the Republic of Ireland Annual Report 2020. Following the presentation to the NOCA Quality Assurance Committee on the 30th September, 2022 we are delighted to endorse this report.

On behalf of the NOCA Governance Board, I wish to congratulate you, your committee and healthcare professionals in participating maternity units on this report. The report itself provides assurance on the care provided to very low birth weight infants and highlights areas for improvement and more research. The value of this audit to parents and to healthcare professionals is clearly illustrated.

Please accept this as formal endorsement from the NOCA Governance Board.

Yours sincerely,

Dr Brian Creedon
Clinical Director
National Office of Clinical Audit

Appendix B: VON unit leads and co-ordinators and contributors 2020

Neonatal Unit	Leads	Co-ordinators
Cavan General Hospital	Dr Hamza Abdalla	Ms Evelyn McAdam
Coombe Women and Infants University Hospital	Dr John Kelleher	Ms Julie Sloan
Cork University Maternity Hospital	Dr Brendan Paul Murphy	
Kerry University Hospital	Dr Daniel Onyekwere	Ms Margaret Kelly
Letterkenny University Hospital	Dr Matthew Thomas	Ms Kate Greenough
Mayo University Hospital	Dr Hilary Stokes	
Midland Regional Hospital Mullingar	Dr Michael O'Grady	Ms Geraldine Kavanagh
Midland Regional Hospital Portlaoise	Dr Rizwan Gul	Ms Anne Blanche
National Maternity Hospital (NMH)	Dr Anne Twomey	Mr John Geoghegan
Our Lady of Lourdes, Drogheda	Dr Emma Gordon	Ms Claire Shannon
Portiuncula Hospital	Dr Paula Cahill	
Rotunda Hospital	Dr David Corcoran	Ms Kathy Conway
Sligo University Hospital	Dr Ghia Harrison	Ms Madeleine Munelly Ms Niamh McGarvey
South Tipperary General Hospital	Dr John Walsh	
St. Luke's Hospital, Kilkenny	Dr David Waldron	
University Maternity Hospital, Limerick	Dr Niazy Al-Assaf	Ms Elizabeth Reidy
University Hospital Galway	Dr Donough O'Donovan	
University Hospital Waterford	Dr Robert Kernan	Dr Shammaz Saeed
Wexford General Hospital	Dr Muhammad Azam	Dr Naeem Aziz Shori

Condolences: In November 2021, Claire Shannon sadly passed away. Claire's expertise and contribution to the NPEC audits in recent years was highly valued and appreciated. The NPEC would like to offer sincere condolences to her family, friends and colleagues in Our Lady's of Lourdes Hospital. May she rest in peace.

Appendix C: Vermont Oxford Network Data Collection Forms, 2020

General Data Items - *For Infants Born in 2020 at VLBW Centers*

Center Number: _____ Patient ID Number: ☐☐☐☐☐ MRN: _____

VERMONT OXFORD NETWORK
eNICQ PATIENT DATA BOOKLET FOR INFANTS BORN IN 2020

This booklet contains protected health care information and must NOT be submitted to Vermont Oxford Network (VON). VON only accepts protected health care information in cases where members have both voluntarily elected to send this information to VON and have signed an appropriate Business Associate Agreement with VON.

This booklet is designed for you to use to collect data that will later be entered by your center into eNICQ, the VON data submission tool.

Contents:

PATIENT IDENTIFICATION WORKSHEET

Patient's Name: _____

Mother's Name: _____

Date of Birth: ____/____/____ (MM DD YYYY)

Date of Admission: ____/____/____ (MM DD YYYY)

- For inborn infants, the date of admission is the Date of Birth
- For outborn infants, the date of admission is the date the infant was admitted to your hospital

Date of Day 28: ____/____/____ (MM DD YYYY)

For Date of Day 28 use the *Day 28 Calculation Charts*: https://vtoxford.zendesk.com/hc/en-us/articles/360038542193-2020-Calculation-Charts-Date-of-Day-28

Date of Week 36: ____/____/____ (MM DD YYYY)

For Date of Week 36 use the *Week 36 Calculator:* https://public.vtoxford.org/week-36-calculator/

PLEASE DO NOT SUBMIT THIS WORKSHEET

Protected Health Care Information

General Data Items - *For Infants Born in 2020 at VLBW Centers*

VON Vermont Oxford NETWORK

Center Number: _____ **Patient ID Number:** ☐☐☐☐☐ **MRN:** _____

Patient ID number: _____ (this is the VON Network ID – it is auto-generated by eNICQ)

Medical Record Number: _____

Date of Birth: _____/_____/_____
MM DD YYYY

Died in Delivery Room: ☐ Yes ☐ No (If *Yes*, complete Delivery Room Death data booklet, not this booklet)

Location of Birth: ☐ Inborn ☐ Outborn

Patient's First Name: _____

Patient's Last Name: _____

Mother's First Name: _____

Mother's Last Name: _____

If Location of Birth is Outborn, Date of Admission: _____/_____/_____
MM DD YYYY

Birth Weight: _____ **grams**

Gestational Age, Weeks: _____ **Gestational Age, Days (0-6):** _____

If Location of Birth is Outborn, Transfer Code of Center from which Infant Transferred: _____
(List available at https://public.vtoxford.org/transfer-codes/)

Head Circumference at Birth (in cm to nearest 10th)**:** ☐☐.☐

Maternal Ethnicity/Race (Answer both Ethnicity and Race):

Ethnicity of Mother: ☐ Hispanic ☐ Not Hispanic

Race of Mother: ☐ Black or African American ☐ White ☐ Asian
☐ American Indian or Alaska Native ☐ Native Hawaiian or Other Pacific Islander ☐ Other

Prenatal Care: ☐ Yes ☐ No

Antenatal Steroids: ☐ Yes ☐ No

Antenatal Magnesium Sulfate: ☐ Yes ☐ No

Chorioamnionitis: ☐ Yes ☐ No

Maternal Hypertension, Chronic or Pregnancy-Induced: ☐ Yes ☐ No

Maternal Diabetes ☐ Yes ☐ No

Mode of Delivery: ☐ Vaginal ☐ Cesarean Section

Sex of Infant: ☐ Male ☐ Female ☐ Unknown

Multiple Gestation: ☐ Yes ☐ No **If *Yes*, Number of Infants Delivered:** ____

Congenital Infection: ☐ Yes ☐ No

Congenital Infection, Organism(s): _____ _____ _____
(If *Congenital Infection* is *Yes*, enter up to 3 Congenital Infection descriptions from Manual of Operations, Part 2 – Appendix E)

PLEASE DO NOT SUBMIT THIS BOOKLET - Protected Health Care Information

General Data Items - *For Infants Born in 2020 at VLBW Centers*

Vermont Oxford Network

Center Number: _____ **Patient ID Number:** ☐☐☐☐☐ **MRN:** _____

APGAR Scores:	**1 minute** _____	**5 minutes** _____	
Initial Resuscitation:	**Oxygen:**	☐ Yes	☐ No
	Face Mask Vent:	☐ Yes	☐ No
	Laryngeal Mask Airway:	☐ Yes	☐ No
	Endotracheal Tube Vent:	☐ Yes	☐ No
	Epinephrine:	☐ Yes	☐ No
	Cardiac Compression:	☐ Yes	☐ No
	Nasal Vent:	☐ Yes	☐ No
	Nasal CPAP:	☐ Yes	☐ No

Temperature Measured within the First Hour after Admission to Your NICU: ☐ Yes ☐ No ☐ N/A

If *Yes*, Temperature Within the First Hour after Admission to Your NICU: ☐☐.☐
(In degrees *centigrade* to nearest 10th)

Died within 12 Hours of Admission to Your NICU: ☐ Yes ☐ No

Bacterial Sepsis and/or Meningitis on or before Day 3: ☐ Yes ☐ No

Bacterial Sepsis and/or Meningitis on or before Day 3, Pathogen(s): _____ _____ _____
(If *Bacterial Sepsis and/or Meningitis* is *Yes*, enter up to 3 Bacterial Pathogen descriptions from Manual of Operations, Part 2 – Appendix B)

Oxygen on Day 28: ☐ Yes ☐ No ☐ N/A (See Manual of Operations, Part 2 for N/A criteria)

Periventricular-Intraventricular Hemorrhage (PIH):

Cranial Imaging (US/CT/MRI) on or before Day 28: ☐ Yes ☐ No

If *Yes*, Worst Grade of PIH (0-4): _____

If PIH Grade 1-4, Where PIH First Occurred: ☐ Your Hospital ☐ Other Hospital

Respiratory Support (at any time after leaving the delivery room/initial resuscitation area):

Oxygen after Initial Resuscitation:	☐ Yes	☐ No
Conventional Ventilation after Initial Resuscitation:	☐ Yes	☐ No
High Frequency Ventilation after Initial Resuscitation:	☐ Yes	☐ No
High Flow Nasal Cannula after Initial Resuscitation:	☐ Yes	☐ No
Nasal Ventilation after Initial Resuscitation:	☐ Yes	☐ No
Nasal CPAP after Initial Resuscitation:	☐ Yes	☐ No

Nasal CPAP or Nasal Vent before or without ever having received ETT Vent: ☐ Yes ☐ No ☐ N/A

Surfactant during Initial Resuscitation: ☐ Yes ☐ No

Surfactant at Any Time: ☐ Yes ☐ No (*Surfactant at Any Time* must be *Yes* if *Surfactant During Initial Resuscitation* is *Yes*)

If *Yes*, Age at First Dose of Surfactant: Hours _____ Minutes (0-59) _____

Inhaled Nitric Oxide: ☐ Yes ☐ No

If *Yes*, Inhaled Nitric Oxide, Where Given: ☐ Your Hospital ☐ Other Hospital ☐ Both

General Data Items - *For Infants Born in 2020 at VLBW Centers*

Vermont Oxford Network

Center Number: _____ **Patient ID Number:** ☐☐☐☐☐ **MRN:** _____

Respiratory Support at 36 Weeks (See Manual of Operations, Part 2 for N/A criteria):

Oxygen at 36 Weeks:	☐ Yes	☐ No	☐ N/A
Conventional Ventilation at 36 Weeks:	☐ Yes	☐ No	☐ N/A
High Frequency Ventilation at 36 Weeks:	☐ Yes	☐ No	☐ N/A
High Flow Nasal Cannula at 36 Weeks:	☐ Yes	☐ No	☐ N/A
Nasal Ventilation at 36 Weeks:	☐ Yes	☐ No	☐ N/A
Nasal CPAP at 36 Weeks:	☐ Yes	☐ No	☐ N/A

Steroids for CLD: ☐ Yes ☐ No

If *Yes*, Steroids for CLD, Where Given: ☐ Your Hospital ☐ Other Hospital ☐ Both

Indomethacin for Any Reason: ☐ Yes ☐ No

Ibuprofen for PDA: ☐ Yes ☐ No

Acetaminophen (Paracetamol) for PDA: ☐ Yes ☐ No

Probiotics: ☐ Yes ☐ No

Treatment of ROP with Anti-VEGF Drug: ☐ Yes ☐ No

Caffeine for Any Reason: ☐ Yes ☐ No

Intramuscular Vitamin A for Any Reason: ☐ Yes ☐ No

ROP Surgery: ☐ Yes ☐ No

If *Yes*, ROP Surgery, Where Done: ☐ Your Hospital ☐ Other Hospital ☐ Both

Surgery or Interventional Catheterization for Closure of PDA: ☐ Yes ☐ No
(*If Yes*, a Surgery Code, Location of Surgery, and an answer to Surgical Site Infection are required below)

Surgery for NEC, Suspected NEC, or Bowel Perforation: ☐ Yes ☐ No
(*If Yes*, a Surgery Code, Location of Surgery, and an answer to Surgical Site Infection are required below)

Other Surgery: ☐ Yes ☐ No
(*If Yes*, a Surgery Code, Location of Surgery, and an answer to Surgical Site Infection are required below)

If *Yes* to *Surgery for Closure of PDA, Surgery for NEC*, or *Other Surgery*, enter up to 10 Surgery Codes, Locations of Surgery, and check Yes or No for Surgical Site Infection following Surgery at Your Hospital:
See Manual of Operations, Part 2 – Appendix D for Surgery Codes.
If *Surgery for NEC* is *Yes*, one or more of the following codes is required: S302, S303, S307, S308, S309, S333. Indicate *Location of Surgery* for each surgery code. If a surgical site infection is present, indicate "Yes" for the one surgical code that resulted in the surgical site infection.

Surgery Code 1: _____	☐ Your Hospital	☐ Other Hospital	☐ Both	Surgical Site Infection:	☐ Yes	☐ No
Surgery Code 2: _____	☐ Your Hospital	☐ Other Hospital	☐ Both	Surgical Site Infection:	☐ Yes	☐ No
Surgery Code 3: _____	☐ Your Hospital	☐ Other Hospital	☐ Both	Surgical Site Infection:	☐ Yes	☐ No
Surgery Code 4: _____	☐ Your Hospital	☐ Other Hospital	☐ Both	Surgical Site Infection:	☐ Yes	☐ No
Surgery Code 5: _____	☐ Your Hospital	☐ Other Hospital	☐ Both	Surgical Site Infection:	☐ Yes	☐ No
Surgery Code 6: _____	☐ Your Hospital	☐ Other Hospital	☐ Both	Surgical Site Infection:	☐ Yes	☐ No
Surgery Code 7: _____	☐ Your Hospital	☐ Other Hospital	☐ Both	Surgical Site Infection:	☐ Yes	☐ No
Surgery Code 8: _____	☐ Your Hospital	☐ Other Hospital	☐ Both	Surgical Site Infection:	☐ Yes	☐ No
Surgery Code 9: _____	☐ Your Hospital	☐ Other Hospital	☐ Both	Surgical Site Infection:	☐ Yes	☐ No
Surgery Code 10: _____	☐ Your Hospital	☐ Other Hospital	☐ Both	Surgical Site Infection:	☐ Yes	☐ No

Include description for Surgery Codes S100,S200,S300,S400,S500,S600,S700,S800,S900,S1000, and S1001:

_____

_____

PLEASE DO NOT SUBMIT THIS BOOKLET - Protected Health Care Information

General Data Items - *For Infants Born in 2020 at VLBW Centers*

Vermont Oxford Network

Center Number: _____ **Patient ID Number:** ☐☐☐☐☐ **MRN:** _____

Respiratory Distress Syndrome: ☐ Yes ☐ No

Pneumothorax: ☐ Yes ☐ No

If *Yes*, Pneumothorax, Where Occurred: ☐ Your Hospital ☐ Other Hospital ☐ Both

Patent Ductus Arteriosus: ☐ Yes ☐ No

Necrotizing Enterocolitis: ☐ Yes ☐ No

If *Yes*, NEC, Where Occurred: ☐ Your Hospital ☐ Other Hospital ☐ Both

Focal Intestinal Perforation: ☐ Yes ☐ No

If *Yes*, Focal Intestinal Perforation, Where Occurred: ☐ Your Hospital ☐ Other Hospital ☐ Both

Sepsis and/or Meningitis, Late (after day 3 of life) (See Manual of Operations, Part 2 for N/A criteria):

Bacterial Sepsis and/or Meningitis after Day 3: ☐ Yes ☐ No ☐ N/A

If *Yes*, Bacterial Sepsis and/or Meningitis after Day 3, Where Occurred:
☐ Your Hospital ☐ Outside Your Hospital ☐ Both

Bacterial Sepsis and/or Meningitis after Day 3, Pathogen(s): _____ _____ _____
(If *Bacterial Sepsis and/or Meningitis* is *Yes*, enter up to 3 Bacterial Pathogen descriptions from Manual of Operations, Part 2, Appendix B)

Coagulase Negative Staph Infection after Day 3: ☐ Yes ☐ No ☐ N/A

If *Yes*, Coagulase Negative Staphylococcal Infection after Day 3, Where Occurred:
☐ Your Hospital ☐ Outside Your Hospital ☐ Both

Fungal Infection after Day 3: ☐ Yes ☐ No ☐ N/A

Fungal Infection after Day 3, Where Occurred: ☐ Your Hospital ☐ Outside Your Hospital ☐ Both

Cystic Periventricular Leukomalacia: ☐ Yes ☐ No ☐ N/A (See Manual of Operations, Part 2 for N/A criteria)

ROP, Retinal Examination ☐ Yes ☐ No

If *Yes*, Worst Stage of ROP (0-5): _____

Congenital Anomaly: ☐ Yes ☐ No

If *Yes*, enter up to 5 Congenital Anomaly Codes: _____ _____ _____ _____ _____
See Manual of Operations, Part 2 – Appendix C for Congenital Anomaly Codes.

If *Yes*, as needed, include description(s) for Codes 100, 504, 601, 605, 901, 902, 903, 904, & 907:

_____

_____

Is this infant still hospitalized at your center? ☐ Yes ☐ No

PLEASE DO NOT SUBMIT THIS BOOKLET - Protected Health Care Information

General Data Items - *For Infants Born in 2020 at VLBW Centers*

Vermont Oxford Network

Center Number: _____ **Patient ID Number:** ☐☐☐☐☐ **MRN:** _____

Enteral Feeding at Discharge:
- ☐ None
- ☐ Human Milk Only
- ☐ Formula Only
- ☐ Human milk in combination with either fortifier or formula

Oxygen, Respiratory Support, and Monitor at Discharge:

Oxygen at Discharge:	☐ Yes	☐ No
Conventional Ventilation at Discharge:	☐ Yes	☐ No
High Frequency Ventilation at Discharge:	☐ Yes	☐ No
High Flow Nasal Cannula at Discharge:	☐ Yes	☐ No
Nasal Ventilation at Discharge:	☐ Yes	☐ No
Nasal CPAP at Discharge:	☐ Yes	☐ No
Monitor at Discharge:	☐ Yes	☐ No

Initial Disposition (check only one):
- ☐ **Home**
- ☐ **Died**
- ☐ **Transferred to another Hospital** (When this Disposition is chosen, also complete Transfer & Readmission Data Items)
- ☐ **Still Hospitalized as of First Birthday**

Date of Initial Disposition: _____/_____/_____ (Not required when Initial Disposition is *Still Hospitalized as of First Birthday*)
MM DD YYYY

Weight at Initial Disposition: _____ grams

Head Circumference at Initial Disposition (in cm to nearest 10th): ☐☐.☐ **(For infants which have not transferred, infant record is now complete)**

If an infant is transferred to another hospital, complete Data Items *Reason for Transfer, Transfer Code of Center to which Infant Transferred, Post Transfer Disposition, and the Data Items that follow your Post Transfer Disposition choice*). *Post Transfer Disposition* refers to the infant's disposition upon leaving the "transferred to" hospital.

If Transferred, Reason for Transfer: ☐ Growth/Discharge Planning ☐ Medical/Diagnostic Services ☐ Surgery ☐ ECMO ☐ Chronic Care ☐ Other

Transfer Code of Center to which Infant Transferred: _____
(List available at https://public.vtoxford.org/transfer-codes/)

Is This Infant Still Hospitalized at Another Center? ☐ **Yes** ☐ **No**

PLEASE DO NOT SUBMIT THIS BOOKLET - Protected Health Care Information

General Data Items - *For Infants Born in 2020 at VLBW Centers*

Center Number: _____ **Patient ID Number: ☐☐☐☐☐** **MRN: _____**

Choose one of the five Post Transfer Disposition options below and complete the Data Item(s) that follow your choice

Post Transfer Disposition:

1. ☐ **Home**
   Date of Final Discharge: ____/_____/____ **(infant record is now complete)**
2. ☐ **Died**
   Date of Final Discharge: ____/_____/____ **(infant record is now complete)**
   MM DD YYYY
3. ☐ **Transferred Again to Another Hospital (2nd Transfer)**
   Ultimate Disposition:
   - ☐ **Home**
     Date of Final Discharge: ____/_____/____ **(infant record is now complete)**
     MM DD YYYY
   - ☐ **Died**
     Date of Final Discharge: ____/_____/____ **(infant record is now complete)**
     MM DD YYYY
   - ☐ **Still Hospitalized as of First Birthday** **(infant record is now complete)**
4. ☐ **Readmitted to Any Location in Your Hospital**
   When infants are readmitted to your center, continue to update Data Items *Bacterial Sepsis and/or Meningitis on or before Day 3* through *Nasal CPAP or Nasal Ventilation before or without ever having received ETT Ventilation* and Data Items *Surfactant at Any Time* through *Monitor at Discharge* based on all events at both hospitals until the date of Disposition after Readmission.

   Disposition after Readmission:
   - ☐ **Home**
     Weight at Disposition after Readmission: ____ grams
     Date of Final Discharge: ____/_____/____ **(infant record is now complete)**
     MM DD YYYY
   - ☐ **Died**
     Weight at Disposition after Readmission: ____ grams
     Date of Final Discharge: ____/_____/____ **(infant record is now complete)**
     MM DD YYYY
   - ☐ **Still Hospitalized as of First Birthday**
     Weight at Disposition after Readmission: ____ grams **(infant record is now complete)**
   - ☐ **Transferred Again to Another Hospital**
     Weight at Disposition after Readmission: ____ grams
     Ultimate Disposition:
     - ☐ **Still Hospitalized as of First Birthday** **(infant record is now complete)**
     - ☐ **Home**
       Date of Final Discharge: ____/_____/____ **(infant record is now complete)**
       MM DD YYYY
     - ☐ **Died**
       Date of Final Discharge: ____/_____/____ **(infant record is now complete)**
       MM DD YYYY
5. ☐ **Still Hospitalized as of First Birthday** **(infant record is now complete)**

NATIONAL PERINATAL
EPIDEMIOLOGY CENTRE

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