

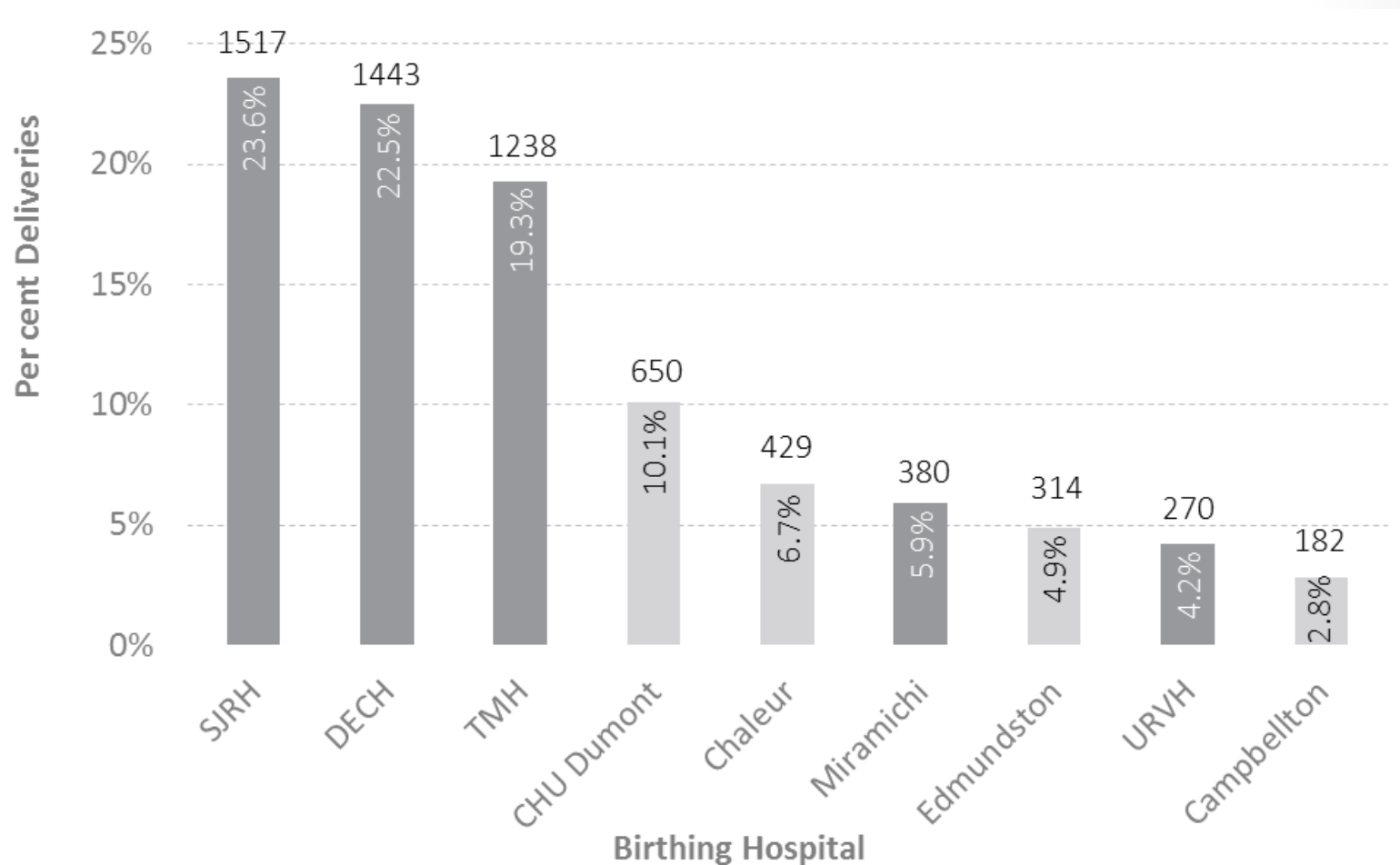
NICU Admissions

How are we doing in NB ?

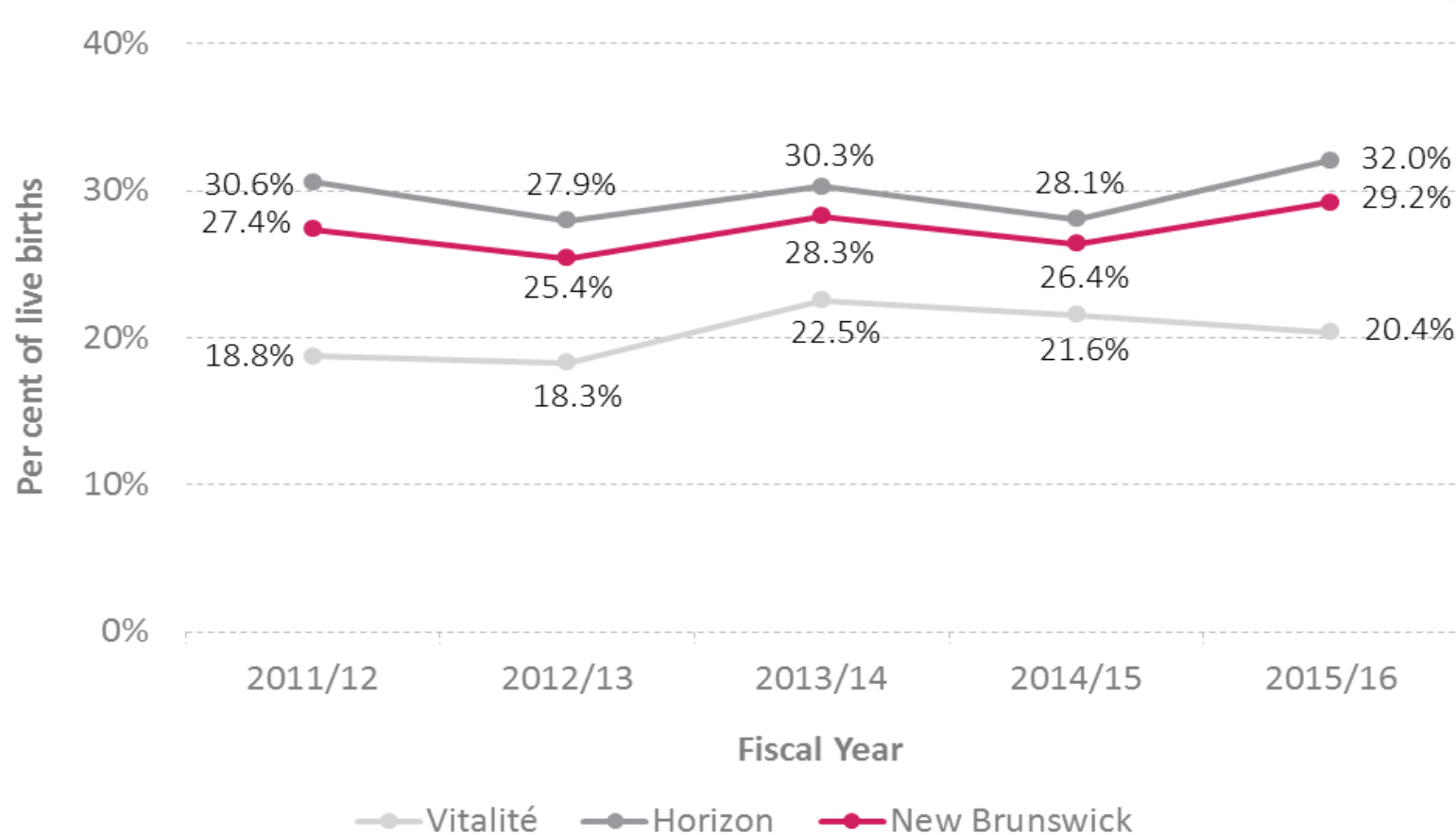
Dr Marc Blayney MB. BCh. BAO. FRCPC

Monday 28th May 2018

NB Births -2016



NICU Admissions



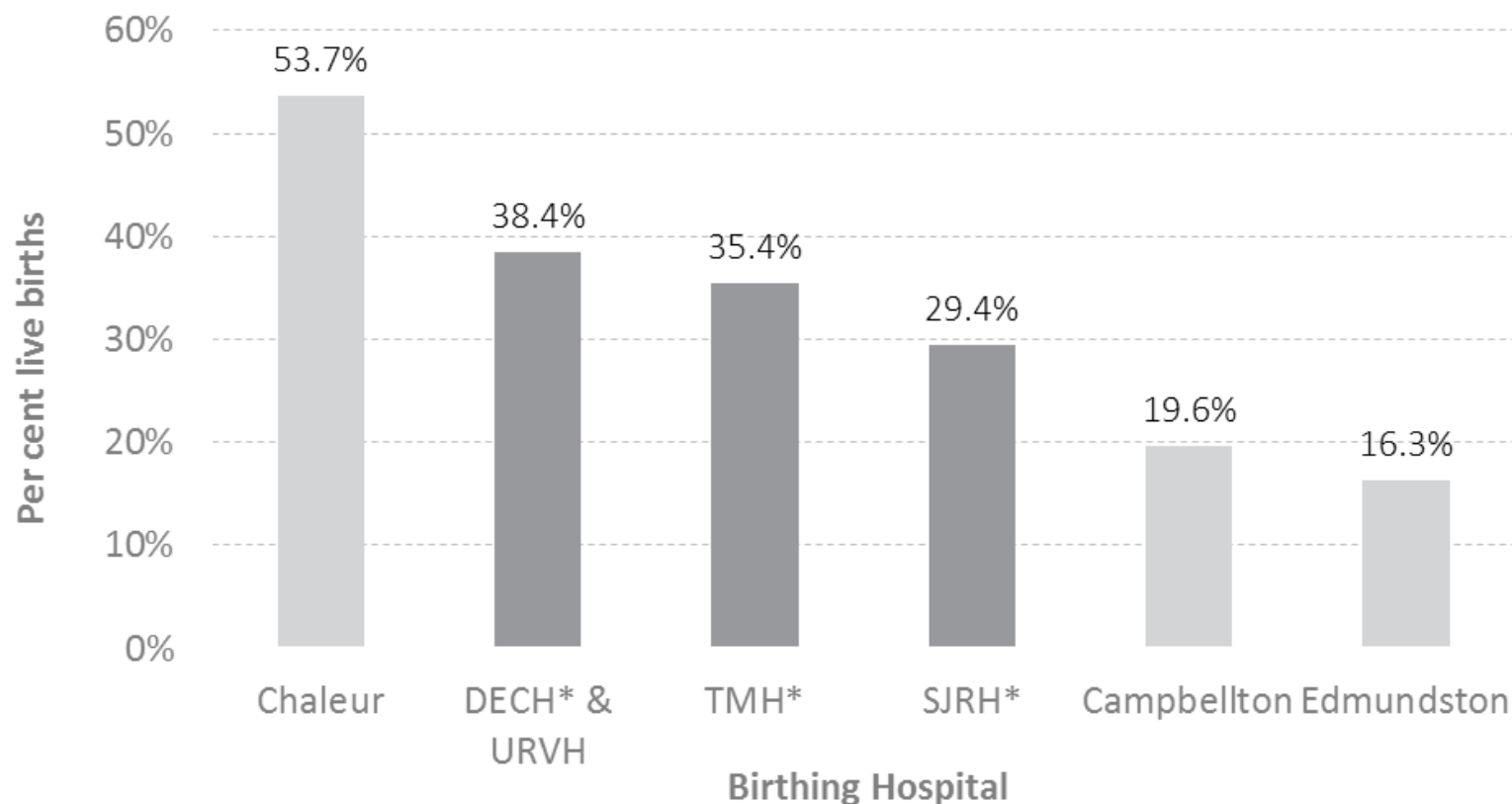
Per cent of infants admitted to SCU/NICU within the first 28 days of life, by Regional Health Authority, New Brunswick, 2011/12-2015/16

NICU Admissions

Primary Special Care Nursery/NICU Admission

Birthing Facility	2011/12	2012/13	2013/14	2014/15	2015/16
• Campbellton Regional Hospital	54.3% ▲	49.7% ▼	45.8% ▼	29.2% ▼	19.6% ▼
Chaleur Regional Hospital	36.7% ▲	36.0% ▼	48.6% ▲	49.8% ▲	53.7% ▲
Edmundston Regional Hospital	14.6% ▲	16.0% ▲	18.3% ▲	19.8% ▲	16.3% ▼
• The Moncton Hospital*	38.5% ▲	31.5% ▼	34.6% ▲	32.8% ▼	35.4% ▲
Saint John Regional Hospital*	31.8% ▲	32.4% ▲	33.5% ▲	28.1% ▼	29.4% ▲
Dr. E Chalmers Regional Hospital* & Upper River Valley Hospital	29.9% ▲	27.3% ▼	30.9% ▲	30.5% ▼	38.4% ▲

NICU Admissions 2015-16



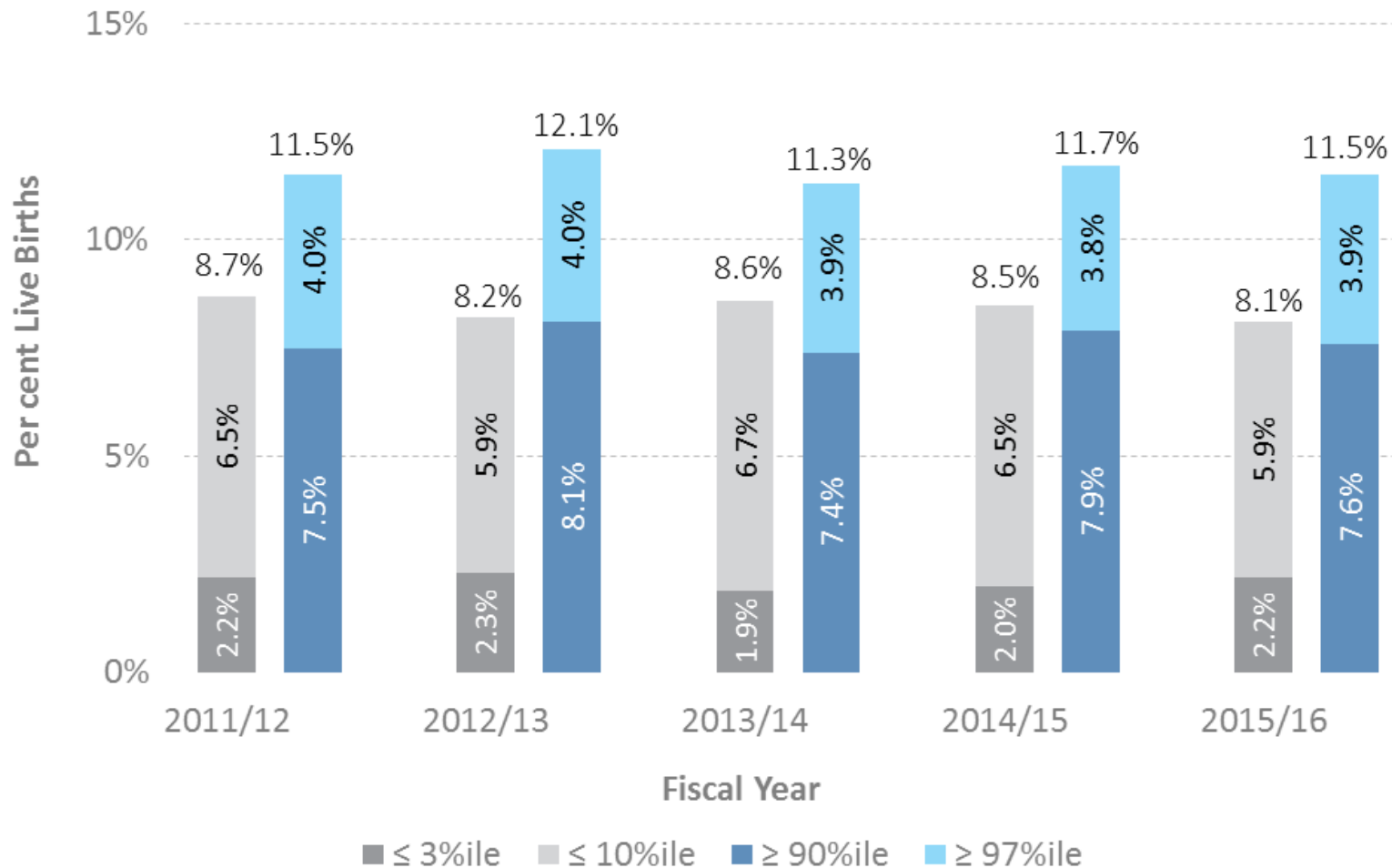
NICU Admissions

- What do the figures show ?
 - High rate of admissions
 - Wide variation across Units
 - Steady admission rate in NICUs

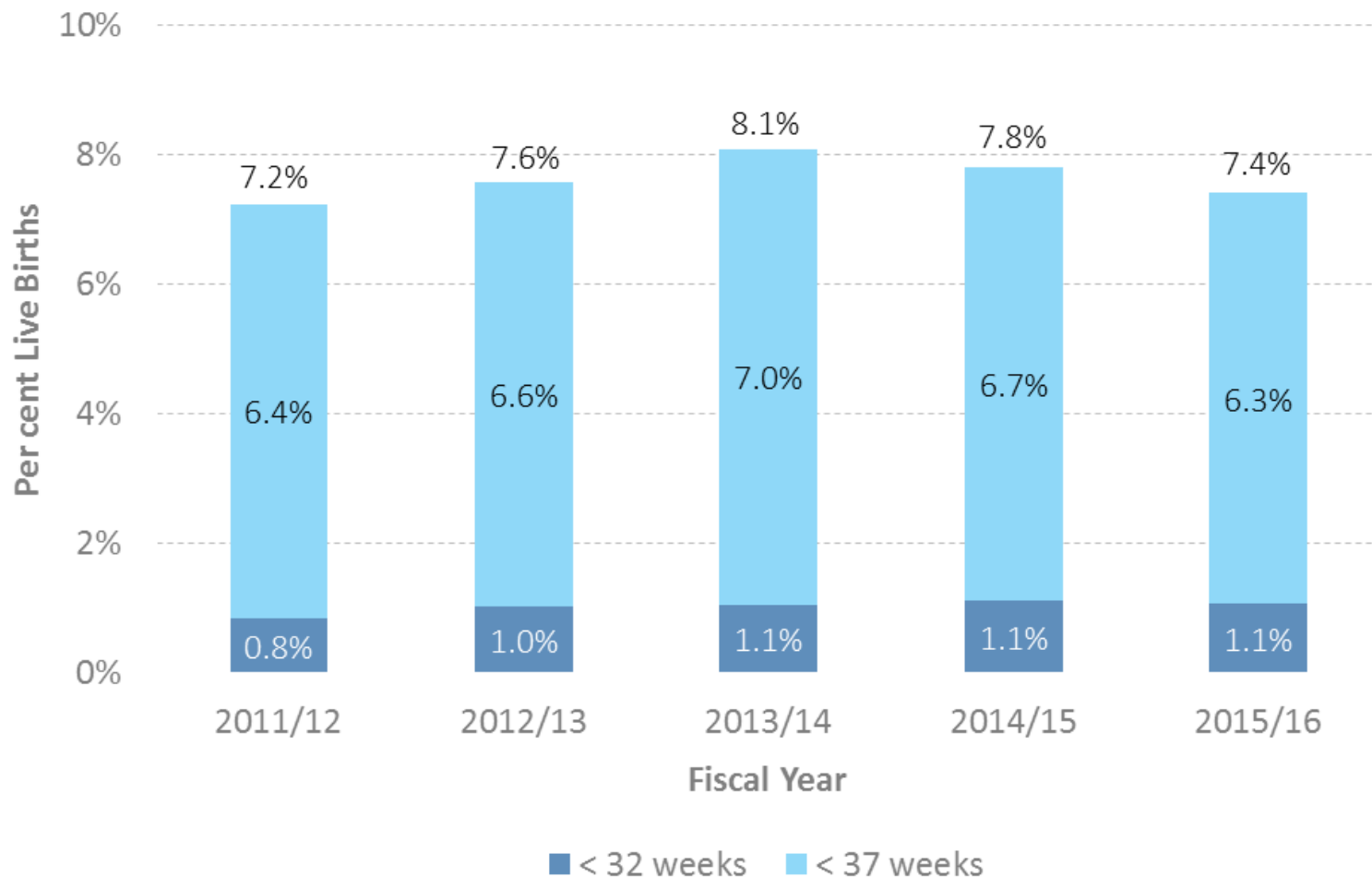
NICU Admissions

- Possible causes
 - Changes in Mothers ?
- Changes in Obstetric practices ?
 - Changes in Paediatrics / Family Medicine ?
- Changes in Babies ?

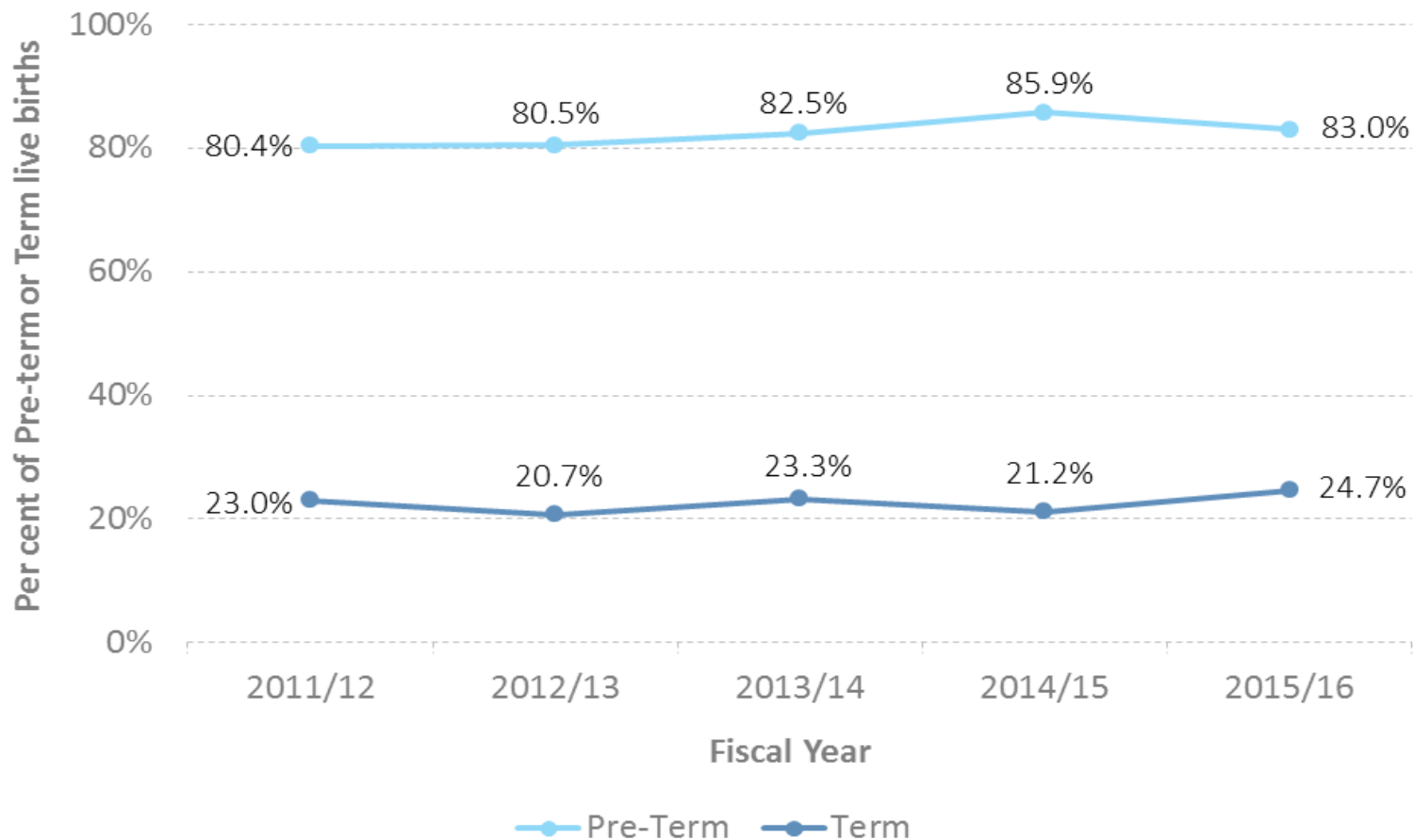
NICU Admissions



NICU Admissions - Prematurity



NICU Admissions



Per cent of infants admitted to SCU/NICU within the first 28 days of life, by length of gestation, New Brunswick, 2011/12-2015/16

NICU Admissions

Most Responsible Diagnosis for SCU/NICU Admission

• Rank	Diagnosis	Number	Rate
• 1	Other low birth weight	260	13.5%
• 2	Other preterm infants	197	10.2%
• 3	Infant of mother with GDM	150	7.8%
• 4	Newborn PROM	116	6.0%
• 5	Respiratory distress, unspecified	109	5.6%
• 6	Transient tachypnoea of newborn	103	5.3%
• 7	Exam, observation other reasons	102	5.3%

The top 15 most responsible diagnoses (defined by specific ICD-10 codes) for SCU/NICU admission, New Brunswick, 2015/16

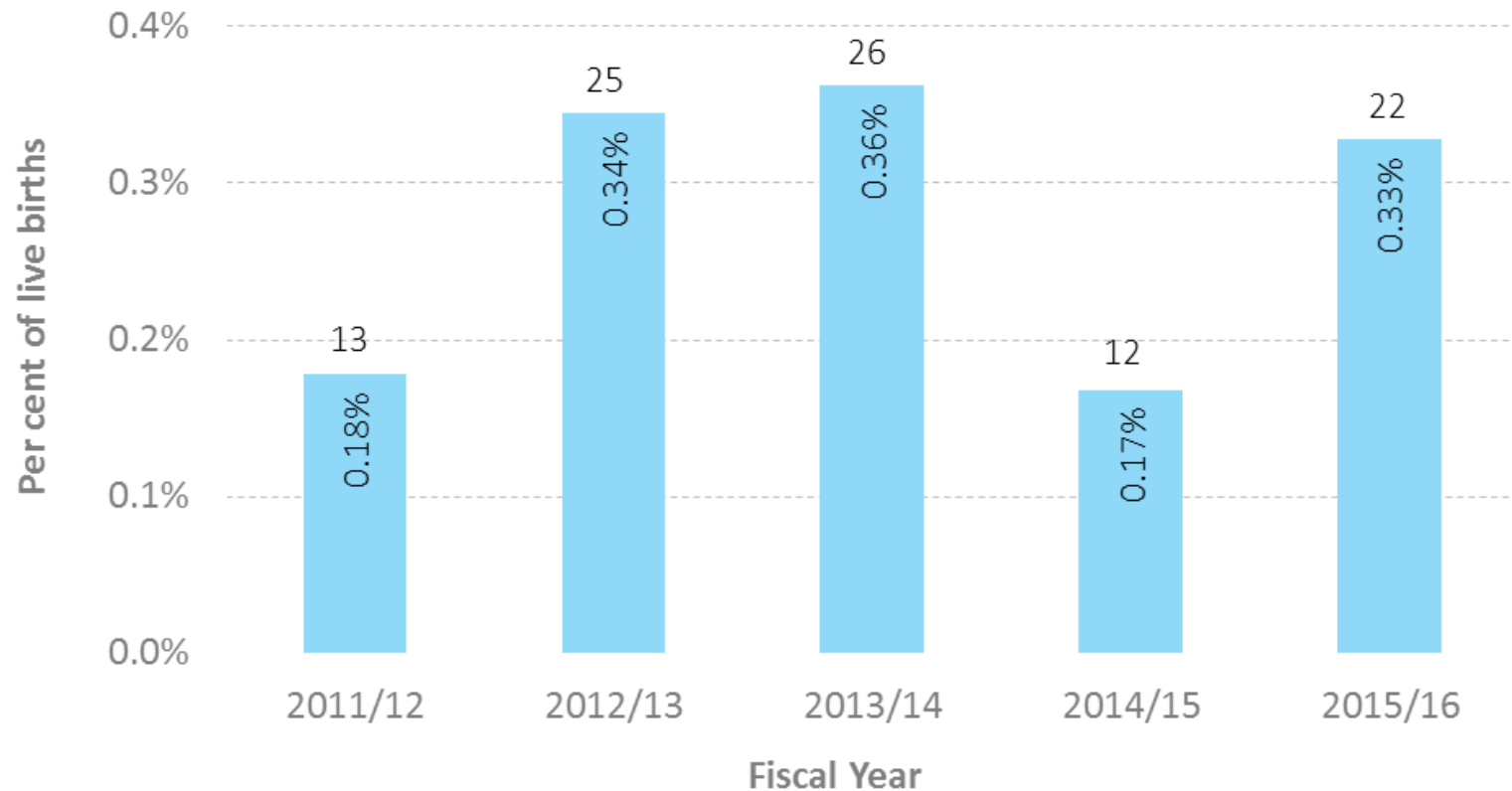
NICU Admissions

Most Responsible Diagnosis for SCU/NICU Admission

Rank	Diagnosis	Number	Rate
8	Newborn, infectious, parasitic dis	76	3.9%
9	Observation other suspected dis	75	3.9%
10	Condition, unspecified	67	3.5%
11	Other neonatal hypoglycaemia	60	3.1%
12	Singleton, born in hospital,	47	2.4%
13	Exceptionally large baby	44	2.3%
14	LGA	38	2.0%
15	Neonatal jaundice, unspecified	35	1.8%

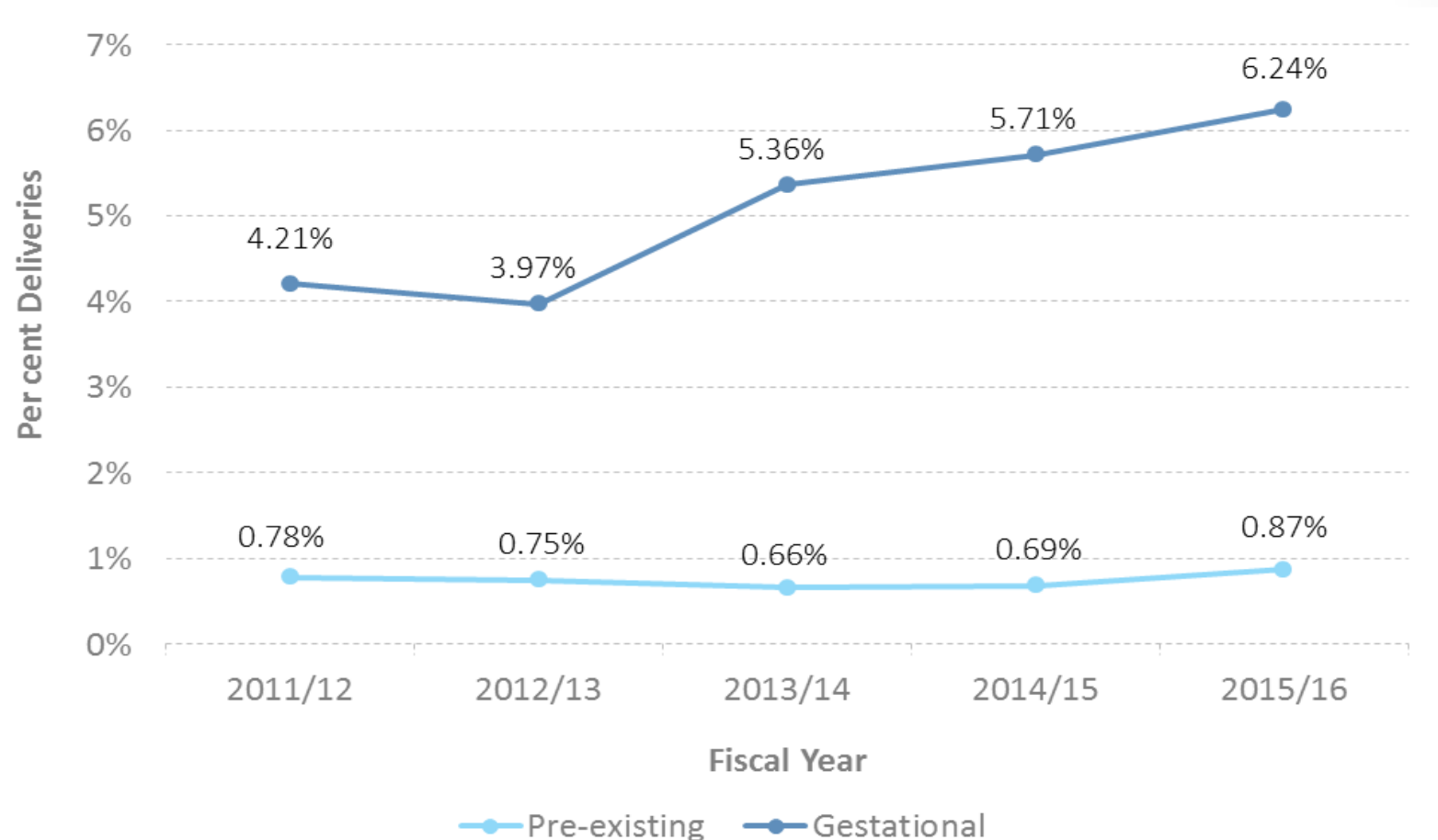
The top 15 most responsible diagnoses (defined by specific ICD-10 codes) for SCU/NICU admission, New Brunswick, 2015/16

NB Births– Mortality Rate



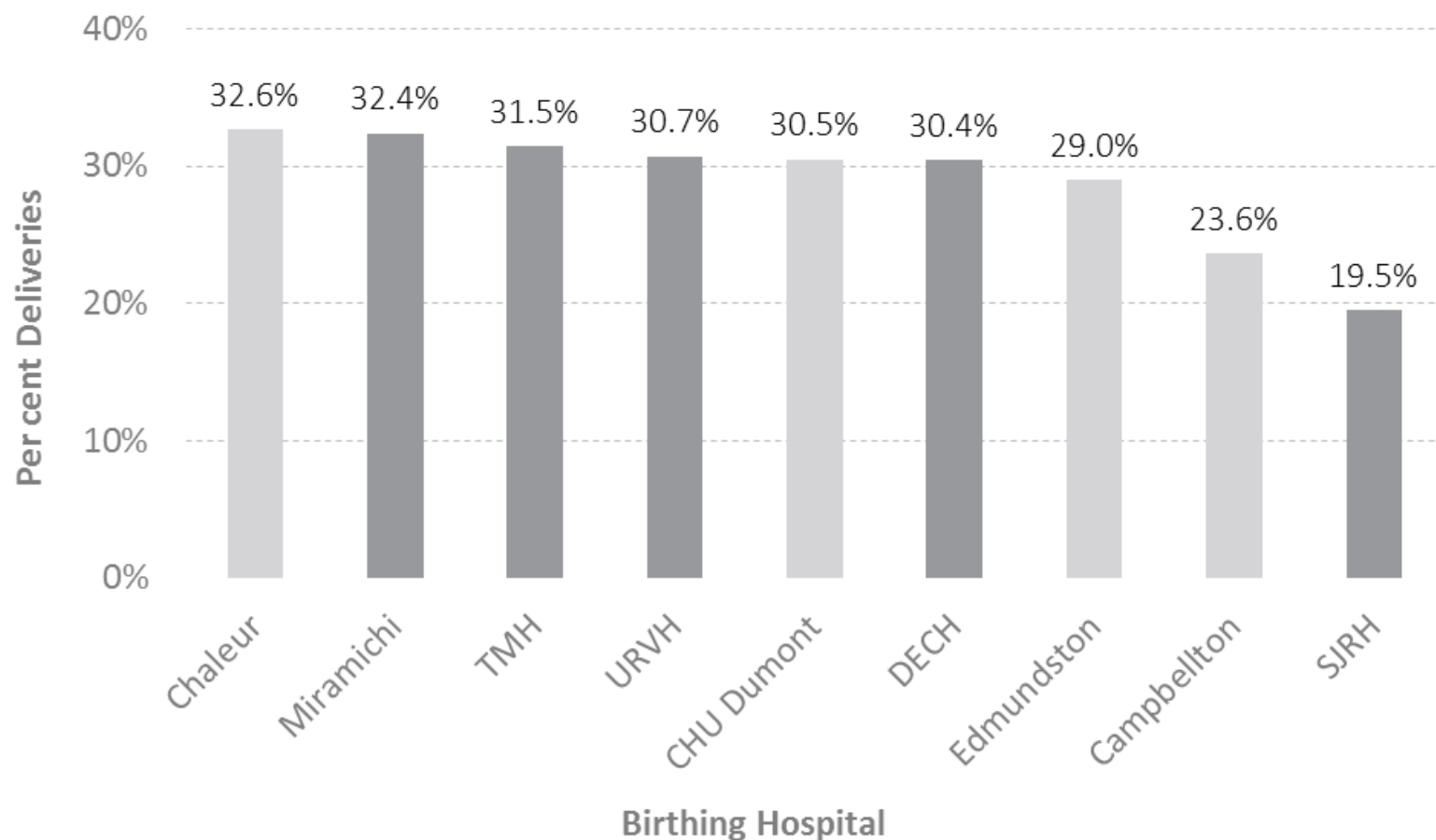
Number and per cent of neonatal deaths, New Brunswick, 2011/12-2015/16

Maternal concerns – Gest DM



Per cent of mothers with gestational and pre-existing diabetes, New Brunswick, 2011/12-15/16

NB Section rate



C-section Rate, by birthing hospital, New Brunswick, 2015/16

NB C-Section rate

	2011/12	2012/13	2013/14	2014/15	2015/16
Campbellton Regional Hospital	40.2%	32.8% ▼	31.9% ▼	30.6% ▼	23.6% ▼
Chaleur Regional Hospital	26.8%	28.8% ▲	37.7% ▲	33.3% ▼	32.6% ▼
Dr. Georges-L. -Dumont University Hospital	25.3%	29.3% ▲	25.9% ▼	30.1% ▲	30.5% ▲
Centre Edmundston Regional Hospital	29.8%	31.1% ▲	27.3% ▼	24.0% ▼	29.0% ▲
Upper River Valley Hospital	24.7%	26.1% ▲	27.6% ▲	23.1% ▼	30.7% ▲
Miramichi Regional Hospital	38.4%	40.0% ▲	35.6% ▼	34.3% ▼	32.4% ▼
The Moncton Hospital	29.7%	28.8% ▼	26.0% ▼	27.8% ▲	31.5% ▲
Dr. Everett Chalmers Regional Hospital	30.1%	30.6% ▲	30.9% ▲	30.0% ▼	30.4% ▲
Saint John Regional Hospital	20.3%	20.3% ▲	21.3% ▲	21.2% ▼	19.5% ▼

C-section Rate, by birthing hospital and year, New Brunswick, 2011/12-2015/16

NICU Admissions

NICU Utilization by Province

Discharge Fiscal Year	2014-2015			2015-2016			2016-2017		
CMG+ Age Category	0 - 28 days (Newborn and neonate)			0 - 28 days (Newborn and neonate)			0 - 28 days (Newborn and neonate)		
Institution Province/Territory	Cases (SUM)	Num of NICU Visits (SUM)	NICU Access Rate	Cases (SUM)	Num of NICU Visits (SUM)	NICU Access Rate	Cases (SUM)	Num of NICU Visits (SUM)	NICU Access Rate
AB	58,993	8,272	14.0%	59,923	8,405	14.0%	58,569	7,821	13.4%
BC	46,423	8,844	19.1%	46,592	11,883	25.5%	47,352	11,888	25.1%
MB	17,658	1,929	10.9%	17,943	1,957	10.9%	17,934	1,996	11.1%
NB	7,307	1,959	26.8%	6,891	2,047	29.7%	7,057	2,097	29.7%
NL	4,780	393	8.2%	4,611	371	8.0%	4,709	433	9.2%
NS	9,080	1,128	12.4%	8,887	1,170	13.2%	8,943	1,104	12.3%
ON	150,132	23,413	15.6%	150,687	23,399	15.5%	151,759	23,742	15.6%
PE	1,450	276	19.0%	1,387	276	19.9%	1,474	324	22.0%
SK	16,508	1,439	8.7%	16,491	1,425	8.6%	16,541	1,393	8.4%
Total for Provinces	312,331	47,653	15.3%	313,412	50,933	16.3%	314,338	50,798	16.2%

Source: CIHI Portal (DAD)

NICU Admissions

NICU Utilization by Province

Discharge Fiscal Year	2014-2015			2015-2016			2016-2017		
CMG+ Age Category	0 - 28 days (Newborn and neonate)			0 - 28 days (Newborn and neonate)			0 - 28 days (Newborn and neonate)		
Institution Province/Territory	Cases (SUM)	Num of NICU Visits (SUM)	NICU Access Rate	Cases (SUM)	Num of NICU Visits (SUM)	NICU Access Rate	Cases (SUM)	Num of NICU Visits (SUM)	NICU Access Rate
AB	58,993	8,272	14.0%	59,923	8,405	14.0%	58,569	7,821	13.4%
BC	46,423	8,844	19.1%	46,592	11,883	25.5%	47,352	11,888	25.1%
MB	17,658	1,929	10.9%	17,943	1,957	10.9%	17,934	1,996	11.1%
NB	7,307	1,959	26.8%	6,891	2,047	29.7%	7,057	2,097	29.7%
NL	4,780	393	8.2%	4,611	371	8.0%	4,709	433	9.2%
NS	9,080	1,128	12.4%	8,887	1,170	13.2%	8,943	1,104	12.3%
ON	150,132	23,413	15.6%	150,687	23,399	15.5%	151,759	23,742	15.6%
PE	1,450	276	19.0%	1,387	276	19.9%	1,474	324	22.0%
SK	16,508	1,439	8.7%	16,491	1,425	8.6%	16,541	1,393	8.4%
Total for Provinces	312,331	47,653	15.3%	313,412	50,933	16.3%	314,338	50,798	16.2%

NICU / SCN Levels

- There are three levels of hospital care for babies. The NICU is a Level 3 Nursery, providing the highest level of care.
- **Level 1** A hospital nursery that provides care to healthy newborn babies.
- **Level 2** A hospital special care nursery that provides care to babies
 - born after 32 weeks' gestation and weigh more than 1500 g.
 - Babies may need special care such as intravenous (IV) fluids, help with feeding, help with breathing or special medicine.
 - Babies in Level 2 may also be recovering from a more serious condition.

NICU Admissions

- There are three levels of hospital care for babies. The NICU is a Level 3 Nursery, providing the highest level of care.
- **Level 3** A hospital NICU that provides life support and specialized
- 24-hour care for babies that are very sick. This includes
- babies born at all gestational ages and weights, and babies
- born with complex and critical illnesses.
- Babies who need level 3 care need to be watched very closely
- and need very special care. This includes help with breathing
- and feeding.
- Babies in Level 3 may also need special medication,
- testing/imaging, or surgery.

NICU Admissions

Special Care Nursery/NICU Admission Criteria - ONTARIO

- This admission criteria document is developed to guide newborn admissions to the Special Care Nurseries or NICUs
- All infants less than 35 weeks+ 0 days should be admitted, and admission should be considered for all infants less than 2300 grams
- **Notes:**
 - 1) These criteria are **guidelines**, and individual clinical decisions are made with full consideration of the individual infant and the resources available to meet the infant's needs.
 -

NICU Admissions

Special Care Nursery/NICU Admission Criteria - ONTARIO

- **Admission Criteria for SCN/NICU (Separation from Mother-Baby Dyad)**
- Hypoglycaemia if IV therapy required
- Suspected sepsis if receiving IV antibiotics
- Persistent temperature instability
- Suspected cardiac problems
- Neurological abnormalities
- Respiratory distress/Apnea or dusky spells

NICU Admissions

Special Care Nursery/NICU Admission Criteria - ONTARIO

- **Admission Criteria for SCN/NICU (Separation from Mother-Baby Dyad)**
- Oxygen therapy
- Babies who have received Narcan
- Gavage feeding
- Drug withdrawal symptoms requiring treatment with pharmacotherapy
- Stabilization prior to transfer to a higher level unit
- Newborns requiring a safe environment (CAS)
- Administration of blood products

NICU Admissions

Guidelines for Admission to Horizon Health Neonatal Units

- Babies that are in respiratory distress
- Babies > 4500 grams
- Birth weight less than 2500 gms or less than 36 weeks gestation
- Central Cyanosis persisting beyond 5 minutes
- Infants with temperatures < 36.5 or > 37.5 x 2
- Suspected Neonatal seizures
- Blue light therapy requiring physiological monitoring
- Prolonged rupture of membranes

NICU Admissions

Guidelines for Admission to Horizon Health Neonatal Units

- Infants of mothers with diabetes (including gestational diabetes) on Insulin
- Five minute Apgar score less than 7
- Infants of mothers receiving MgSo4 during labor
- Babies born to mothers with known thrombocytopenia
- Babies born to Group B strep mothers fitting the CPS/AAP Guidelines

NICU Admissions

Guidelines for Admission to Horizon Health Neonatal Units

- Infants with Hypoglycemia
- Major congenital abnormalities
- Infants of mothers with active herpes - if membranes ruptured for more than 4 hours or infant of mother with active Primary Herpes
- Infants born at home

*Approved by Women and Children's Health Neonatal Working Group,
April 10, 2013*

NICU Admissions

- What do the figures NOT show ?
 - Level of care required / provided
 - Appropriateness of admission.
 - Duration of NICU stay.
 - Outcome figures
 - Cost of care

NICU Admissions

- **Variation in NICU Admission Rates Without Identifiable Cause. 2002-2008 USA**
- **OBJECTIVES:** Admission to the NICU is influenced by physiologic compromise and by hospital care protocols. Providing appropriate care must be balanced with adverse consequences of NICU admission, such as interrupting maternal-infant bonding and unnecessary interventions. This study aims to determine the variation in NICU admissions in term and late preterm infants among 19 hospitals.
- **METHODS:** We used the Consortium on Safe Labor (CSL) database to determine NICU admission rates. This database includes data from 217 442 infants aged 35 to 42 weeks within 19 US maternal delivery hospitals from 2002 to 2008
 - [Ziegler KA](#)¹ et al. [Hosp Pediatr.](#) 2016 May;6(5):255-60. doi: 10.1542/hpeds.2015-0058.

NICU Admissions

- **Variation in NICU Admission Rates Without Identifiable Cause. 2002-2008 USA**
- **RESULTS:** Percentage of infants 35 to 42 weeks' gestation admitted to the NICU without an identifiable absolute or relative cause for intensive care services ranged from 0% to 59.4% (mean, 10.8%; $P < .001$).
- **CONCLUSIONS:** There is significant variation in admission rates among NICUs that cannot be explained by infant health conditions.
 - [Ziegler KA](#)¹ et al. [Hosp Pediatr](#). 2016 May;6(5):255-60. doi: 10.1542/hpeds.2015-0058.

NICU Admissions

- **Impact of Specialized Nursery Care for Late Preterm Infants on NICU Admission Rate and Length of Stay.** Oklahoma City
- **OBJECTIVE:** To compare neonatal intensive care unit (NICU) admission rates and length of stay (LOS) of late preterm infants (LPIs) born before and after opening a specialized care nursery (SCN) at our academic, pediatric tertiary care center
- **CONCLUSION:** The frequency of LPIs admitted/transferred to the NICU decreased by ~50% after the opening of the SCN
 - [Hunt L¹ Am J Perinatol.](#) 2015 Nov;32(13):1198-204. doi: 10.1055/s-0035-1552938. Epub 2015 Jun 12.

NICU Admissions

- TMH admissions Jan – Feb 2018

	less than 34	35 – 36 wks	> 37 weeks	
Number	17	8	42	
Days in NICU				
< 1 day		0	32	
1-2 days		1	4	
3-7 days		4	2	
> 7 days		5	4	

NICU Admissions

- TMH admissions Jan - Feb 2018
- Diagnoses -top 5 (excluding <35 wks)
 - Gestation DM 10
 - Resp Distress 8
 - Low Apgars / Asphyxia 8
 - PROM 4
 - Hypoglycemia 4

NICU Admissions

[illegible]

NICU Admissions

- What do the figures NOT show ?
 - Level of care required / provided
 - Appropriateness of admission.
 - Duration of NICU stay.
 - Outcome figures
 - Cost of care

NICU Admissions

- Factors for Improvement.
 - Maternal
 - Obstetric
 - Paediatric / Family Medicine
 - Other - regionalization.

Maternal – Obstetric

- Ohio Perinatal Quality Collaborative
- 20 large OB Hospitals -2008-2010
- Aim: “to reduce by 60% deliveries between 36 .0 and 38.6 wks, in absence of obstetrical indication”

Maternal - Obstetric

- Ohio Perinatal Quality Collaborative
 - Rate dropped from 15% to <5%
 - 180 fewer NICU admissions.
 - Annual savings \$10M
-
- Toolkits at www.OPQC.net and www.cmqcc.org

NICU Bed supply

- **Regional Variation in Neonatal Intensive Care Admissions and the Relationship to Bed Supply.**
- **OBJECTIVE:** To characterize geographic variation in neonatal intensive care unit (NICU) admission rates across the entire birth cohort and evaluate the relationship between regional bed supply and NICU admission rates.
- **STUDY DESIGN:** This was a population-based, cross-sectional study. 2013 US birth certificate and 2012 American Hospital Association data were used to assign newborns and NICU beds to neonatal intensive care regions.
 - [Harrison WN et al: J Pediatr.](#) 2018 Jan;192:73-79.e4. doi: 10.1016/j.jpeds.2017.08.028. Epub 2017 Sep 29.

NICU Bed supply

- **Regional Variation in Neonatal Intensive Care Admissions and the Relationship to Bed Supply.**
- **RESULTS:** The NICU admission rate was 7.2 per 100 births and varied across regions for all birth weight categories. . . . Adjusted odds of admission for newborns of very low birth weight were unrelated to regional bed supply; however, **newborns ≥ 2500 g in regions with the highest NICU bed supply were significantly more likely to be admitted to a NICU than those in regions with the lowest (aOR 1.20 [1.03-1.40]).**
- **CONCLUSIONS:** There is persistent underuse of NICU care for newborns of very low birth weight that is not associated with regional bed supply. **Among larger newborns, we find evidence of supply-sensitive care, raising concerns about the potential overuse of expensive and unnecessary care.** Rather than improving access to needed care, NICU expansion may instead further deregionalize neonatal care, exacerbating underuse.

- [Harrison WN et al: J Pediatr. 2018 Jan;192:73-79.e4. doi: 10.1016/j.jpeds.2017.08.028. Epub 2017 Sep 29.](#)

Infant illness acuity

- **Association Between Neonatal Intensive Care Unit Admission Rates and Illness Acuity. California**
- **Importance:** Most neonates admitted to a neonatal intensive care unit (NICU) are born at gestational age (GA) of 34 weeks or more. The degree of uniformity of admission criteria for these infants is unclear, particularly at the low-acuity end of the range of conditions warranting admission.
- **Objectives:** To describe variation in NICU admission rates for neonates born at GA of 34 weeks or more and examine whether such variation is associated with high illness acuity or designated facility level of care.
 - Schulman J et al: [JAMA Pediatr.](#) 2018 Jan 1;172(1):17-23. doi: 10.1001/jamapediatrics.2017.3913.

Infant illness acuity

- **Association Between Neonatal Intensive Care Unit Admission Rates and Illness Acuity. California**
- **Results:** Of the total of 358 453 live births at GA of 34 weeks or more, 35 921 infants were admitted to a NICU and accounted for 79.2% of all inborn NICU admissions; 4260 (11.9%) of these admissions met high illness acuity criteria. **Inborn admission rates varied 34-fold, from 1.1% to 37.7% of births** Percentage with high illness acuity varied 40-fold, from 2.4% to 95% (median, 11.3%; mean, 13.2% [9.9%]).
- **Conclusions and Relevance:** Percentage of admissions with high illness acuity does not explain 34-fold variation in NICU inborn admission rates for neonates born at GA of 34 weeks or more. **The findings are consistent with a supply-sensitive care component** and invite future investigation to clarify the lower-acuity end of the range of conditions considered to warrant neonatal intensive care.
 - Schulman J et al: JAMA Pediatr. 2018 Jan 1;172(1):17-23. doi: 10.1001/jamapediatrics.2017.3913

NICU Admissions

- **Characterization of the triage process in neonatal intensive care. Brigham's Women's and Children's Hosp**
- **OBJECTIVE:** Despite intense interest in allocation of resources to neonatal intensive care, no description exists of resource use by the large numbers of newborns admitted for triage, the process of short-term evaluation and management of infants after delivery.
- **INTERVENTIONS:** On a 50% random subsample, we calculated severity of illness using the Score for Neonatal Acute Physiology (SNAP) and applied a NICU resource checklist. Daily NICU workload was estimated according to the number and labor intensity of NICU admissions using Medicus and SNAP.
 - [Zupancic JA](#)¹, [Richardson DK](#). [Pediatrics](#). 1998 Dec;102(6):1432-6.

NICU Admissions

- Characterization of the triage process in neonatal intensive care. Brigham's Women's and Children's Hosp
- **RESULTS:** Mean birth weight for triage infants was 3367 g (standard deviation, 600 g) and mean gestational age 39.1 weeks **Severity illness, as measured by SNAP, was minimal, with 70% having scores of 0, indicating no derangement.** Only 6% experienced depressed 5-minute Apgar scores (<7), and 80% required no delivery room resuscitation. Median LOS was 102 minutes, corresponding over the study period to 2% of total NICU hours but 7% of NICU days charged. Median cost was \$870, with aggregate costs accounting for a total of 9.5% of total NICU costs.
 - [Zupancic JA](#)¹, [Richardson DK](#). [Pediatrics](#). 1998 Dec;102(6):1432-6.

NICU Admissions

- **Characterization of the triage process in neonatal intensive care. Brigham's Women's and Children's Hosp**
- **CONCLUSIONS:** Neonatal triage is a low-acuity but time-intensive process that contributes significantly to total resource use by newborns because of the large numbers of infants involved. Both LOS and costs are affected not only by infant medical characteristics but also by nonmedical markers of unit structure, which may be amenable to change.
- [Zupancic JA¹, Richardson DK. Pediatrics. 1998 Dec;102\(6\):1432-6.](#)

Paediatrics – Family Medicine

- Level 1 - Family Medicine
- Levels 2 and 3 : Paediatrics
 - Risk vs Illness-based care
 - Internal audit / External audit

NICU Admissions

Objectives:

- Review Provincial data on NICU / SCN admissions.
- Analyze trends in admissions.
- Compare admission rates with other provinces.
- Identify factors for improvement.

NICU Admissions

- We can always do better
- Let's do it together