

A clinical care bundle to reduce the risk of intraventricular haemorrhage (IVH) in all preterm babies ≤ 28 weeks' gestation on the Neonatal Unit

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Shared Learning Event

Oxford AHSN Maternity and Neonatal Clinical Network

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Overview

- Background
 - Clinical Care bundle to reduce IVH in preterm babies ≤ 28 weeks' gestation
- Clinical care bundle
 - Delivery and stabilization
 - Clinical care on NICU
 - Positioning
 - Photo guide
- IVH trends
- Ongoing work

Background

- IVH:
 - significant complication of preterm birth (Volpe 2008)
 - Strongly associated with adverse neurodevelopmental and survival outcomes
- Pathogenesis of GMH-IVH linked to fragility of cerebral vasculature and fluctuations in cerebral blood flow
- Improvement in overall survival rates of preterm infants over the last few decades (Stoll 2015), incidence of moderate to severe GMH-IVH in premature infants has not declined (De Bijl-Marcus 2017)

Brain injury occurring during or soon after birth: annual incidence and rates of brain injuries to monitor progress against the national maternity ambition

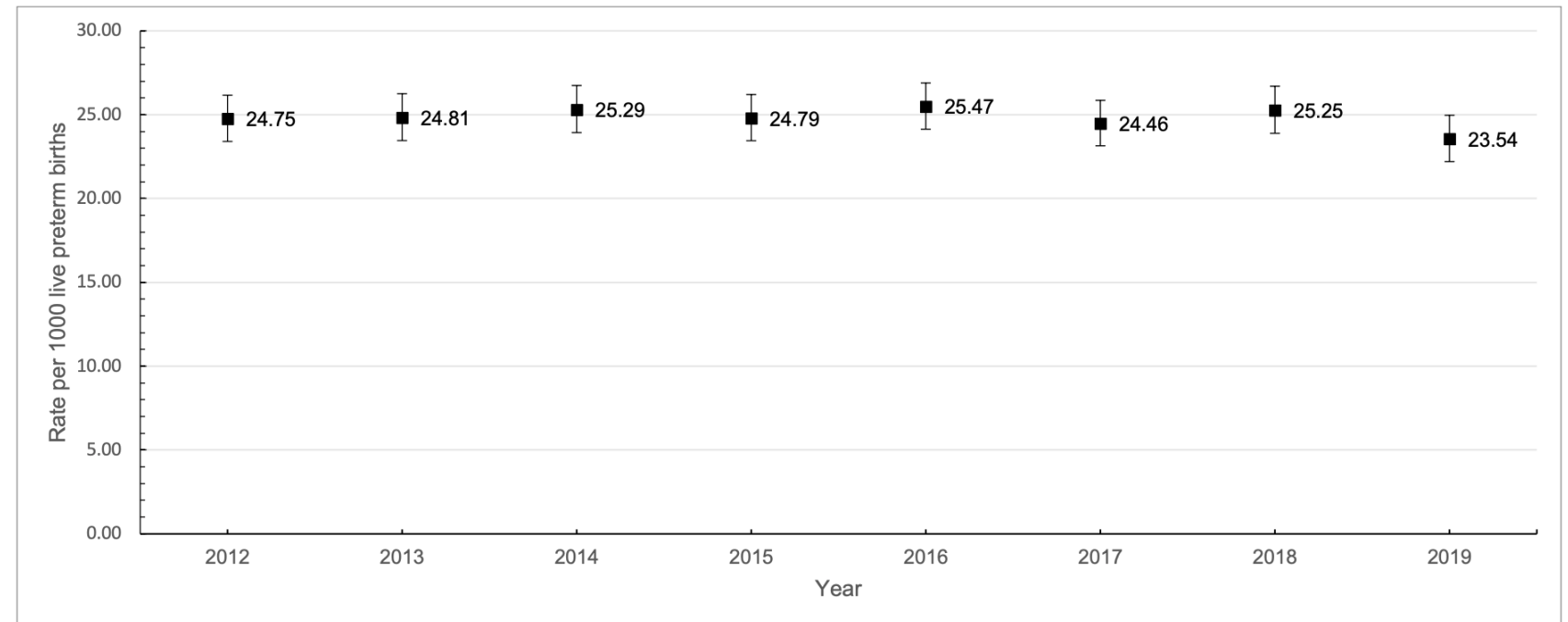
2018 and 2019 national data

Authors: Dr Chris Gale, Miss Kayleigh Ougham, Ms Sena Jawad, Dr Sabita Uthaya, Professor Neena Modi

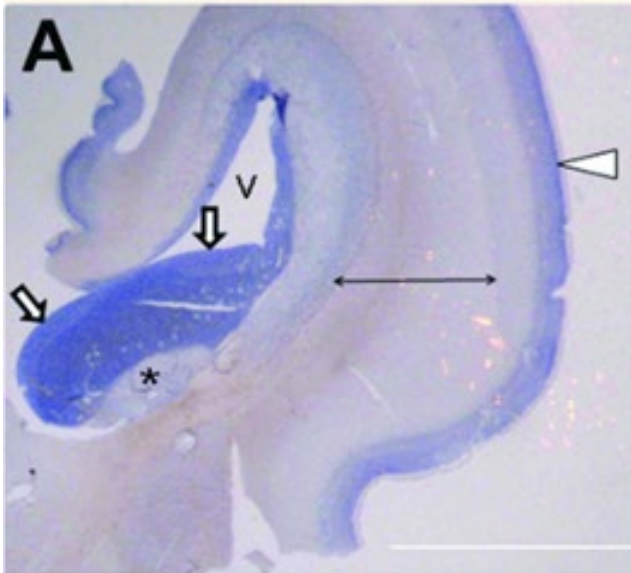
Affiliation: Neonatal Data Analysis Unit, Imperial College London, Chelsea and Westminster Hospital campus, SW10 9NH

Date of production: 28th January 2021

Figure 3: Annual rates of brain injury occurring during or soon after birth in England in preterm infants (<37 gestational weeks) 2012-2017 without exclusions; error bars indicate 95% confidence intervals



Germinal matrix



- Highly vascular structure
- Neuronal progenitor cells
- Thin walled blood vessels
- Mature by D4

Cerebral autoregulation

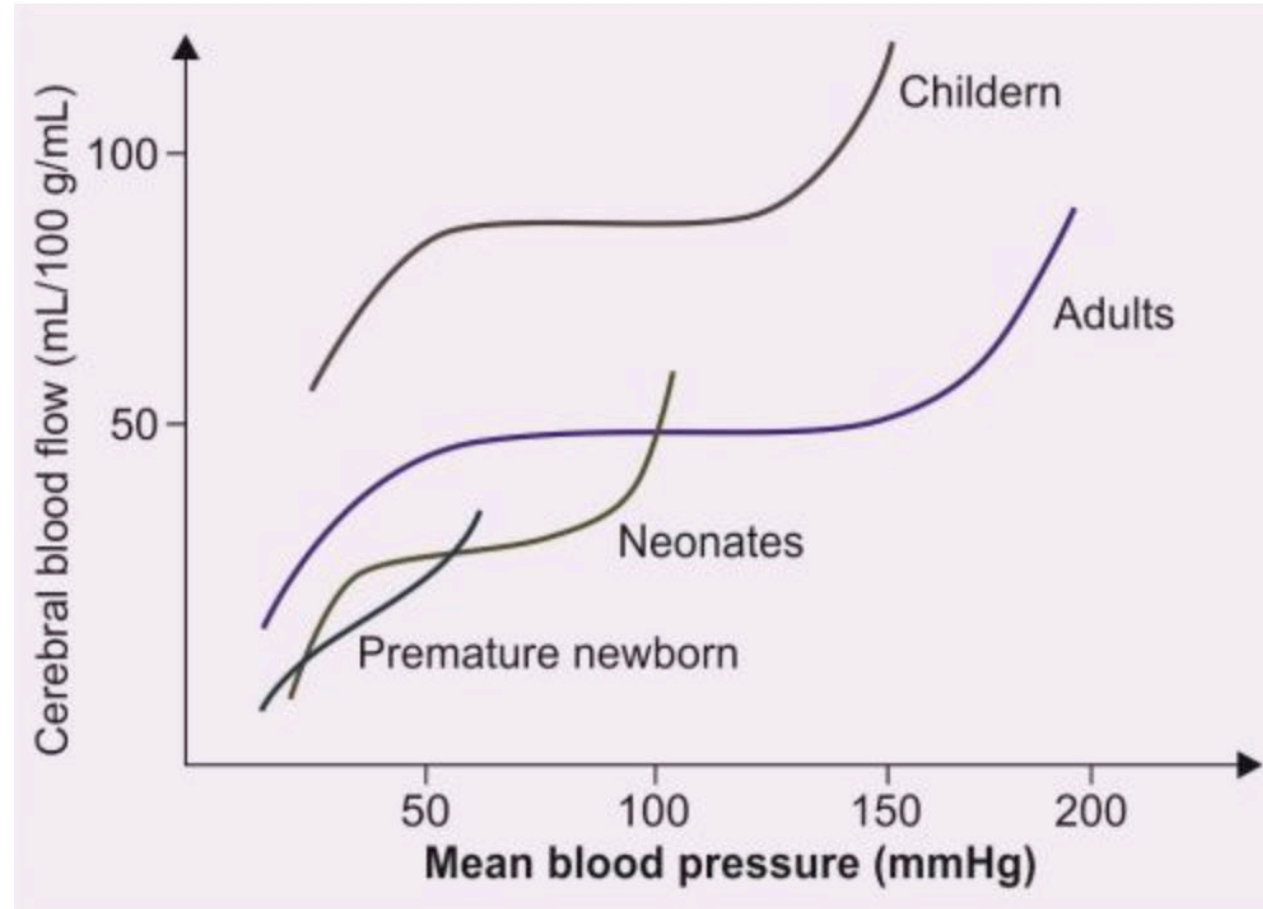


Table 1

Neonatal risk factors in the pathogenesis of IVH.

	Major Pathogenic mechanism	Putative mechanisms*	Risk factors
1	Disturbance in CBF	1. Fluctuation in CBF 2. High cerebral venous pressure 3. Abnormal blood pressure 4. Pressure passive circulation	Hypoxia Hypercarbia Severe acidosis Asynchrony between infants and ventilator breathe Severe RDS Patent ductus arteriosus Frequent suctioning of airway Rapid infusion of NaHCO ₃ Pneumothorax High ventilator pressure Prolonged labor and vaginal delivery Hypotension Hypertension Sepsis Dehydration Extreme prematurity and low birth weight (<1000g) Clinically unstable resulting from respiratory compromise, sepsis or other reasons
2	inherent fragility of germinal matrix vasculature	Might be worsened by an inflammatory injury to the blood brain barrier	Hypoxic ischemic insult Sepsis
3.	Platelet and coagulation disturbances	Hemostatic failure	Thrombocytopenia Disseminated intravascular coagulopathy

- Disturbance in cerebral blood flow
 - CO2
 - BP
 - Fluid boluses

- Fragility of GM
 - Hypoxia
 - acidosis
 - Sepsis

- Antenatal steroids - astrocyte maturity

Background:

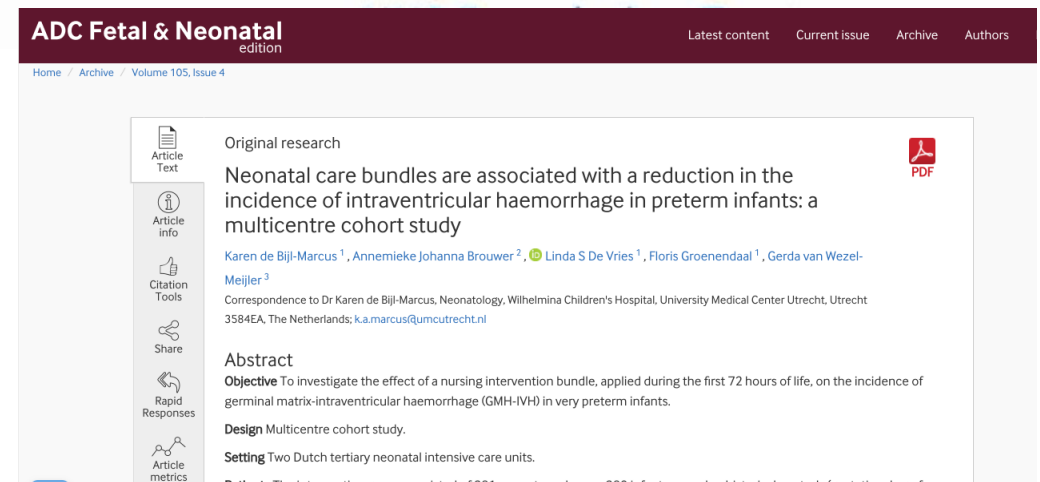
Positioning and care interventions

- First 72 hours highest risk of developing GMH-IVH in preterm infants (Volpe 2008, Perlman 1986)
- Keeping head in the midline
 - Decrease fluctuations in cerebral blood flow
 - Optimise cerebral venous drainage (De Bijl-Marcus 2017)
 - head rotation in either side may lead to complete occlusion or obstruction of the jugular venous-drainage system of the same side (Cowan 1985)
- Maintaining an elevated head position (Kochan 2019)

- Avoiding abrupt increase in venous flow and cardiac preload
 - Elevation of the legs during nappy changes (Limperopoulos 2008)
 - Arterial and IV flushes
 - Withdrawing blood from arterial lines
 - Rapidly withdrawing blood (arterial line) associated with temporary, significant decrease in cerebral oxygenation through rapid steal of blood (Schulz 2003)

Neonatal care bundles

- A recent multi-centre cohort study of nursing interventions (n=281, <30/40)
 - (i) maintaining the head in the midline
 - (ii) tilting the head of the incubator by 15-30 degrees upwards to facilitate cerebral venous outflow
 - (iii) avoidance of flushing/rapid withdrawal of blood and sudden elevation of the legs)
- Reduced risk of developing severe GMH-IVH, cystic periventricular leukomalacia and/or death (adjusted OR 0.54, 95% CI 0.33-0.91) (de Bijl-Marcus 2020).



The screenshot shows the article page for 'ADC Fetal & Neonatal' edition. The article title is 'Neonatal care bundles are associated with a reduction in the incidence of intraventricular haemorrhage in preterm infants: a multicentre cohort study'. The authors listed are Karen de Bijl-Marcus, Annemieke Johanna Brouwer, Linda S De Vries, Floris Groenendaal, and Gerda van Wezel-Meijler. The abstract states the objective is to investigate the effect of a nursing intervention bundle on the incidence of germinal matrix-intraventricular haemorrhage (GMH-IVH) in very preterm infants. The design is a multicentre cohort study, and the setting is two Dutch tertiary neonatal intensive care units. The article is available as a PDF document.

Newborn Care Services Guidelines

A clinical care bundle to reduce the risk of intraventricular haemorrhage (IVH) in all preterm babies ≤ 28 weeks' gestation on the Neonatal Unit

Delivery and Stabilisation

Antenatal corticosteroids, ideally at least 48 hours before delivery of a premature baby

Aim for delayed cord clamping for 60 seconds at birth

Avoid multiple attempts at intubation: only those with appropriate experience to intubate extremely premature babies

Clinical Care

Care by QIS nurses

In the first 72 hours of life

Maintain Normothermia

Ensure Vitamin K has been prescribed and given

Aim to maintain normocapnia PaCO₂ 5- 8.5kPa

- avoid hypocarbia PaCO₂ <5 kPa
- avoid hypercarbia PaCO₂ >8.5 kPa
- use volume guarantee ventilation
- monitor transcutaneous CO₂

Try to avoid large fluctuations in BP

Moderate hypotension with reassuring sings of perfusion is acceptable.
Use fluid boluses carefully.
(Refer to Preterm CVS support guideline)

Avoid rapid intravenous (IV) flushes & avoid rapid arterial blood sampling

>30 seconds through umbilical lines

Ensure ET tube fixation is secure to avoid unplanned extubation

Positioning

Two members of staff +/- parent to change a baby's position

- turn baby slowly and steadily
- avoid turning 180° in one movement

Minimal handling, leave at least 6 hours between cares

- depending on condition of the infant
- consider skin integrity and behavioural state

Nurse with

Head and trunk in line with each other, and shoulders in line with hips

Legs should not be lifted above their head

To carry out nappy changes flex legs into chest and slide nappy under bottom. Consider side lying nappy changes

Keep head end of the incubator elevated at all times by at least 15°

Unless necessary for a procedure

Try to handle babies as little as possible

- only those with appropriate experience to insert central lines
- optimise Point of Care Ultrasound (POCUS) use to reduce XRays
- consider if it is vital to re-xray after minor adjustments

Appendix 1. Positioning photo guide For babies born <28 weeks gestation in the first 72 hours of life

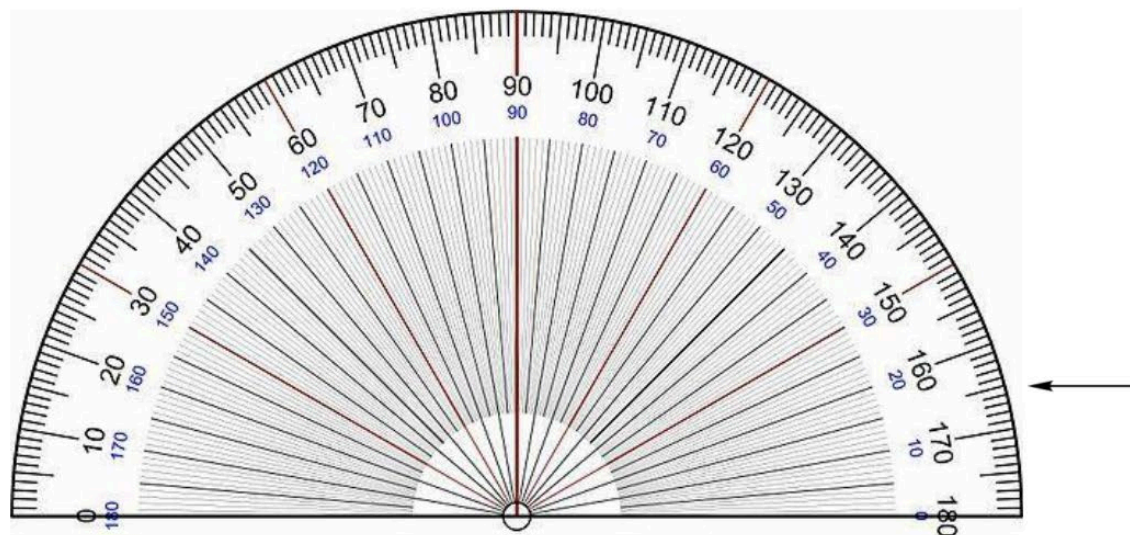
NHS Foundation Trust

Nurse with head and trunk in line with each other, and shoulders in line with hips

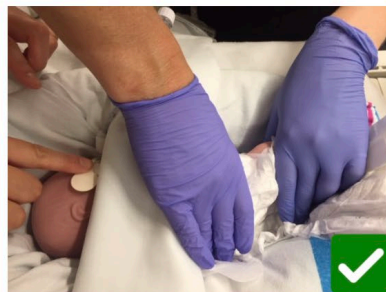


Head rotation to either side may lead to complete occlusion or obstruction of the jugular venous-drainage system of the same side⁶ and this should be avoided

Keep head of incubator elevated, up to 15 degree tilt, Unless necessary for a procedure.



Legs should not be lifted above their head. To carry out nappy changes flex legs into chest and slide nappy under bottom. Consider side lying nappy changes



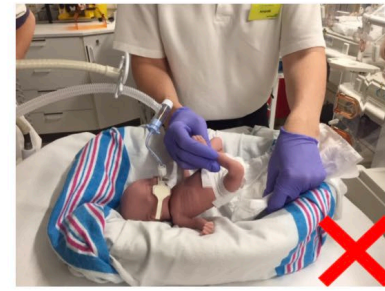
Tuck clean nappy outside dirty nappy



Undo dirty nappy and clean baby

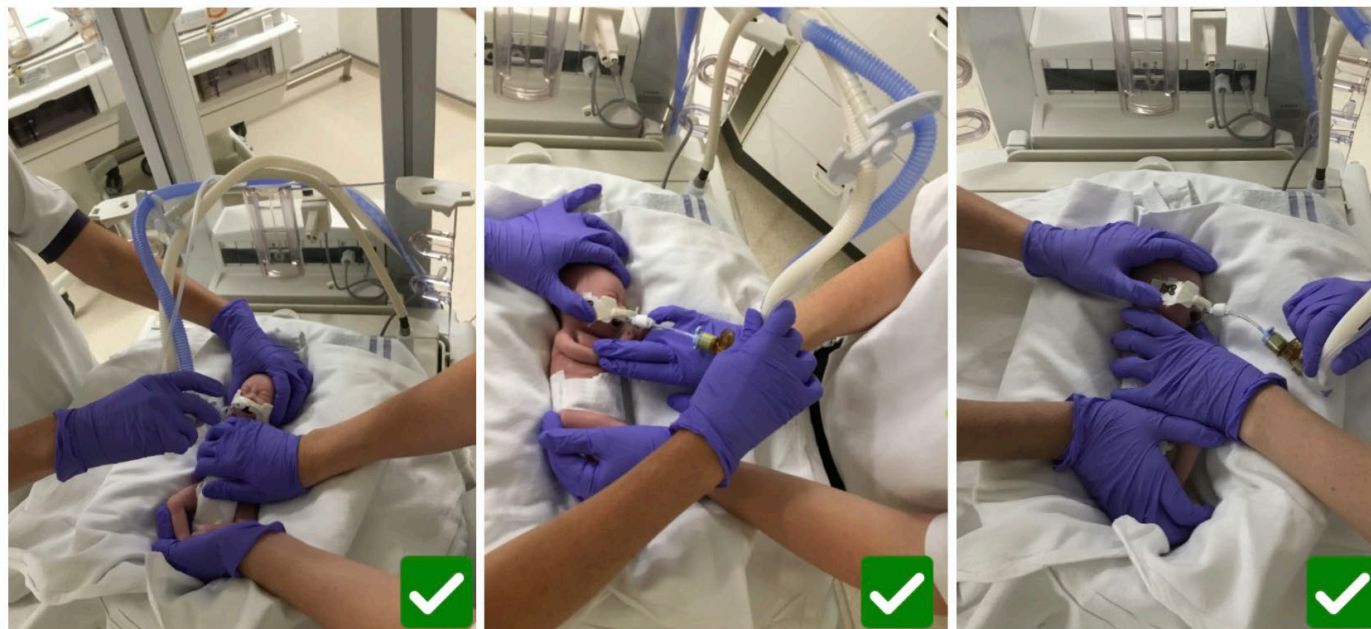


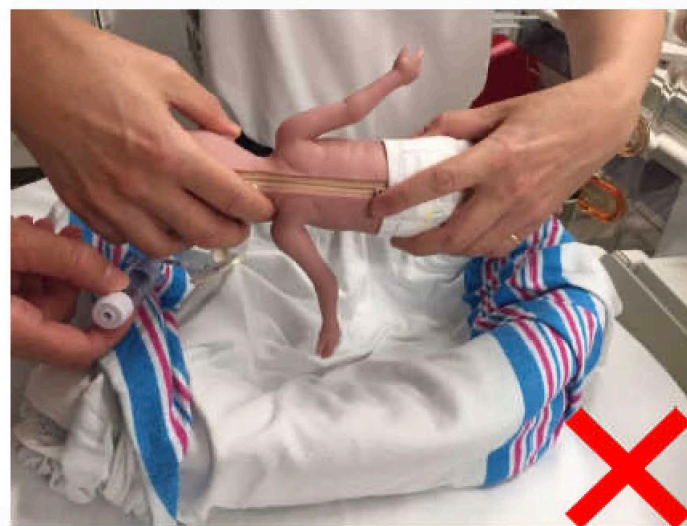
Remove dirty nappy.
Legs not elevated during whole process.



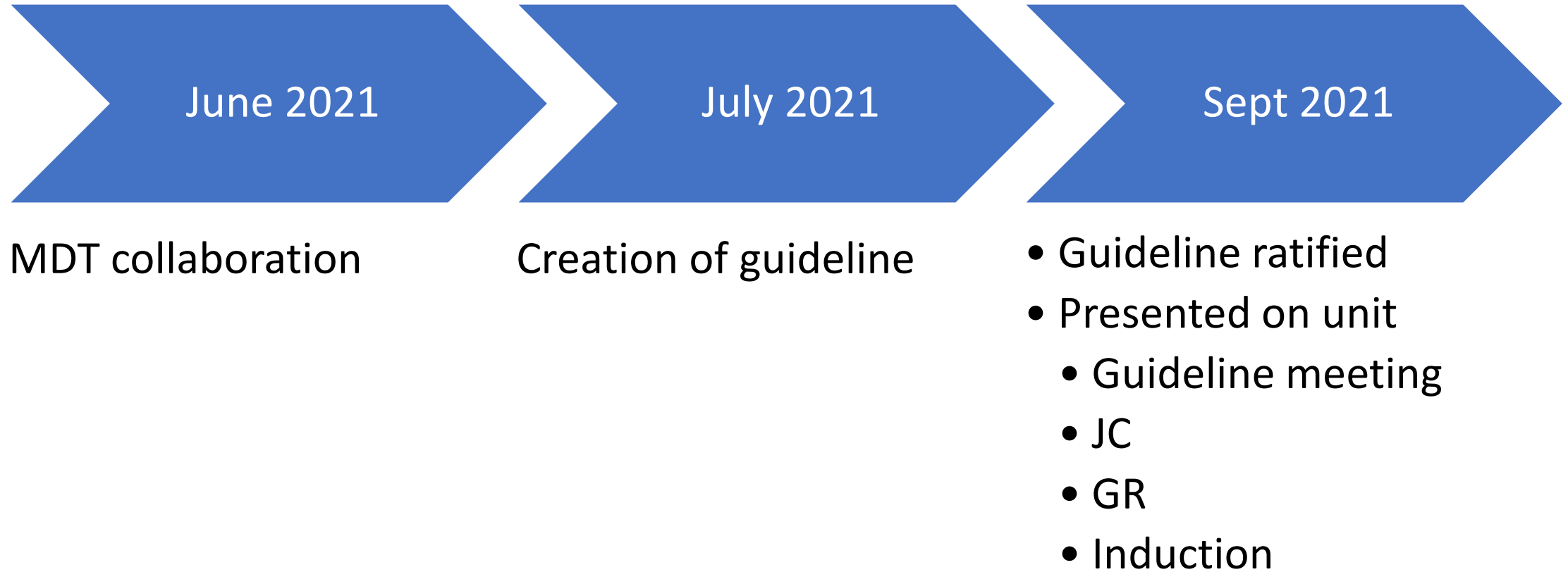
Legs should not be lifted
above their heads

Two members of staff +/- parent to change a baby's position. Turn baby slowly and steadily. Turn a maximum of 90 degrees at a time.





Avoid turning a baby 180 degrees in one movement. Only change sheets if really necessary - prioritise a safe head over a tidy bed!



Nursing & MDT Leads

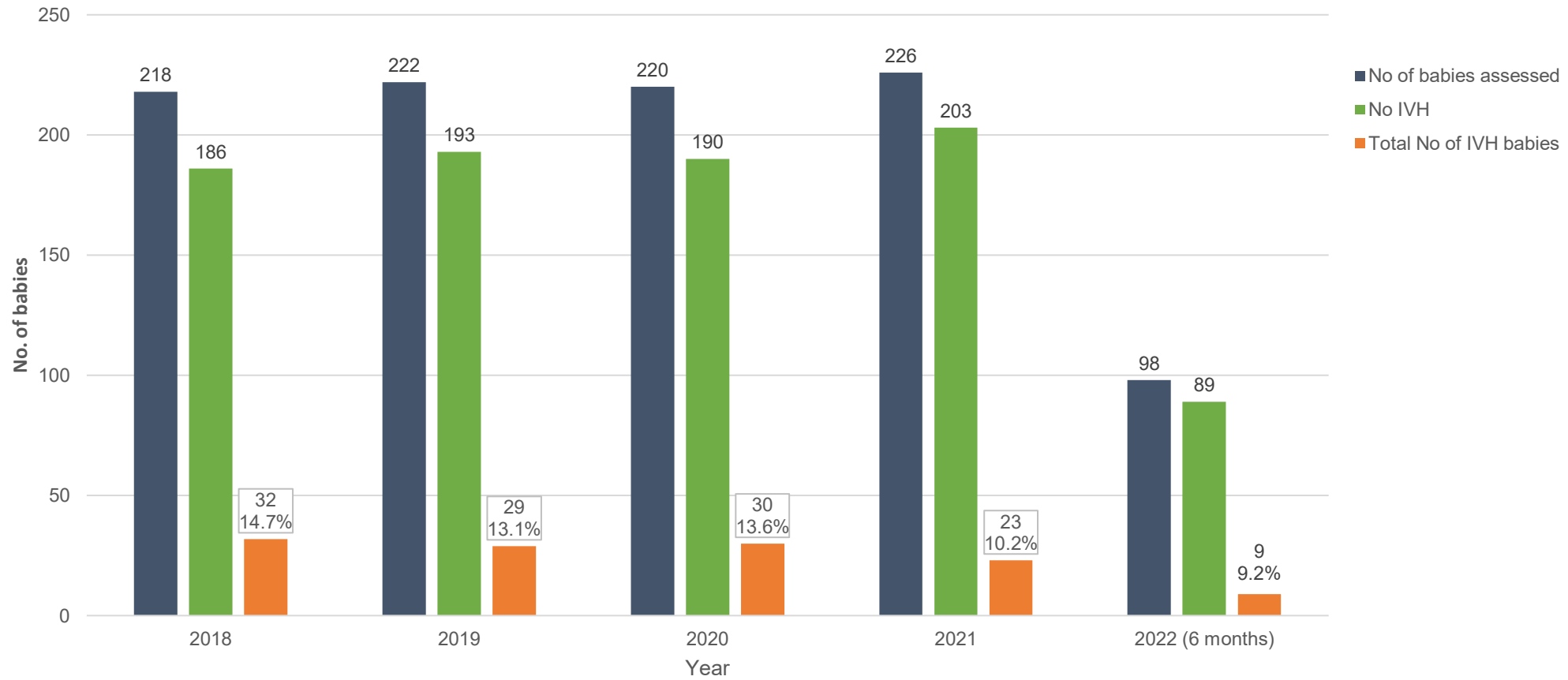
- Key nursing staff involved
 - Badri/Maddie
 - Holly/Coral
- Physio
 - Merete Olsen
- OT
 - Amanda

- Nursing staff education
 - Day/night staff
 - Components of IVH clinical care bundle
- Inclusion in nursing folders

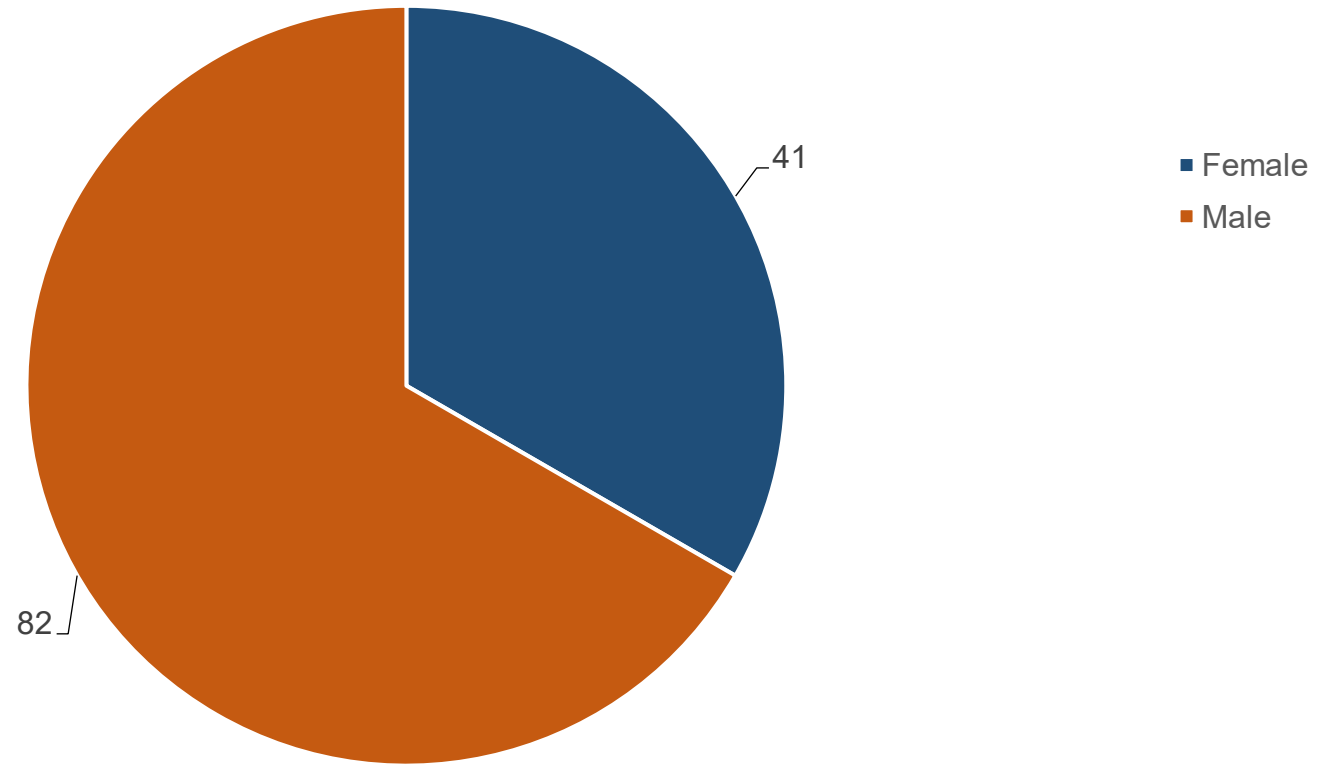
Results



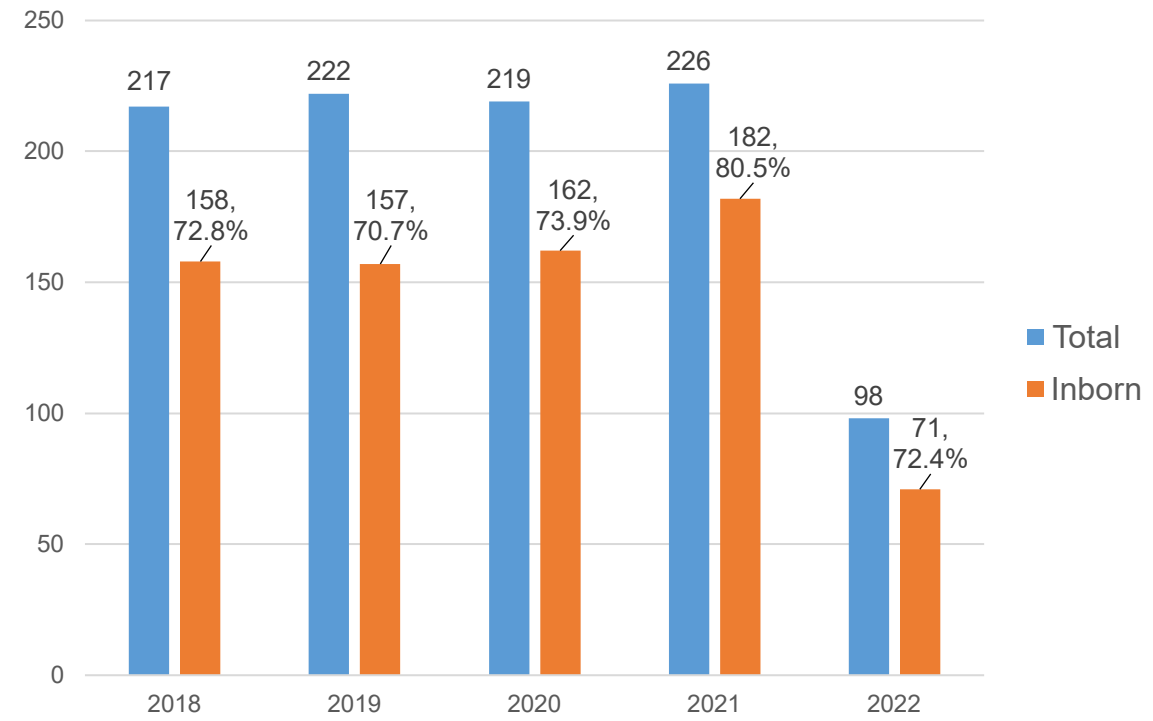
Babies with Gr3-4 IVH



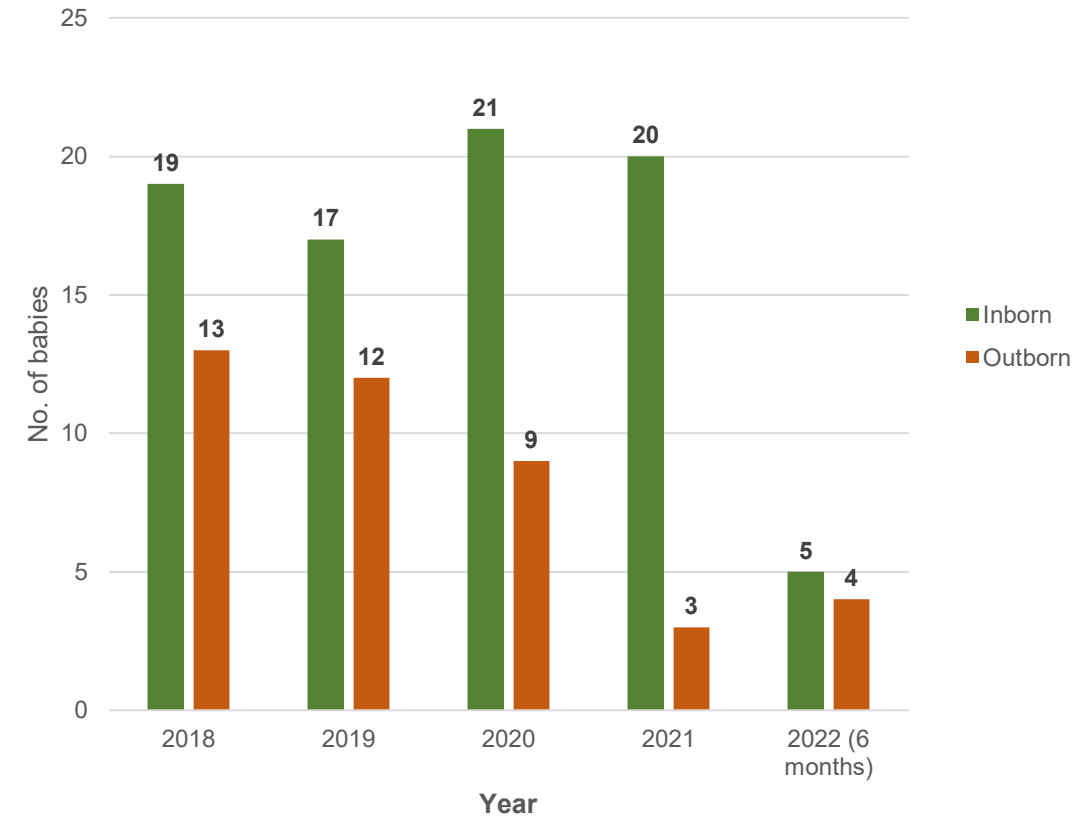
Babies with Gr3-4 IVH-Gender Distribution



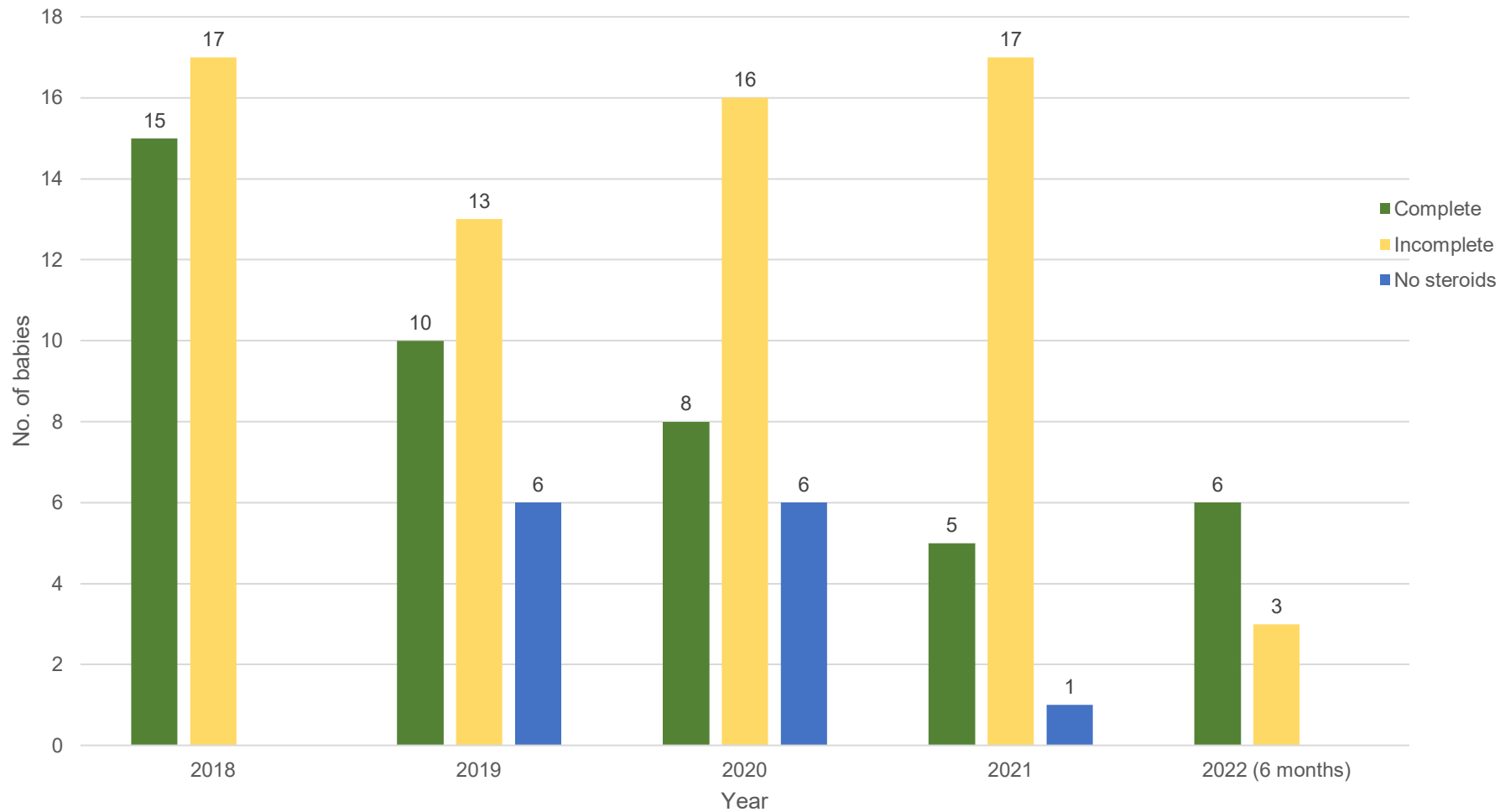
Total No. of babies



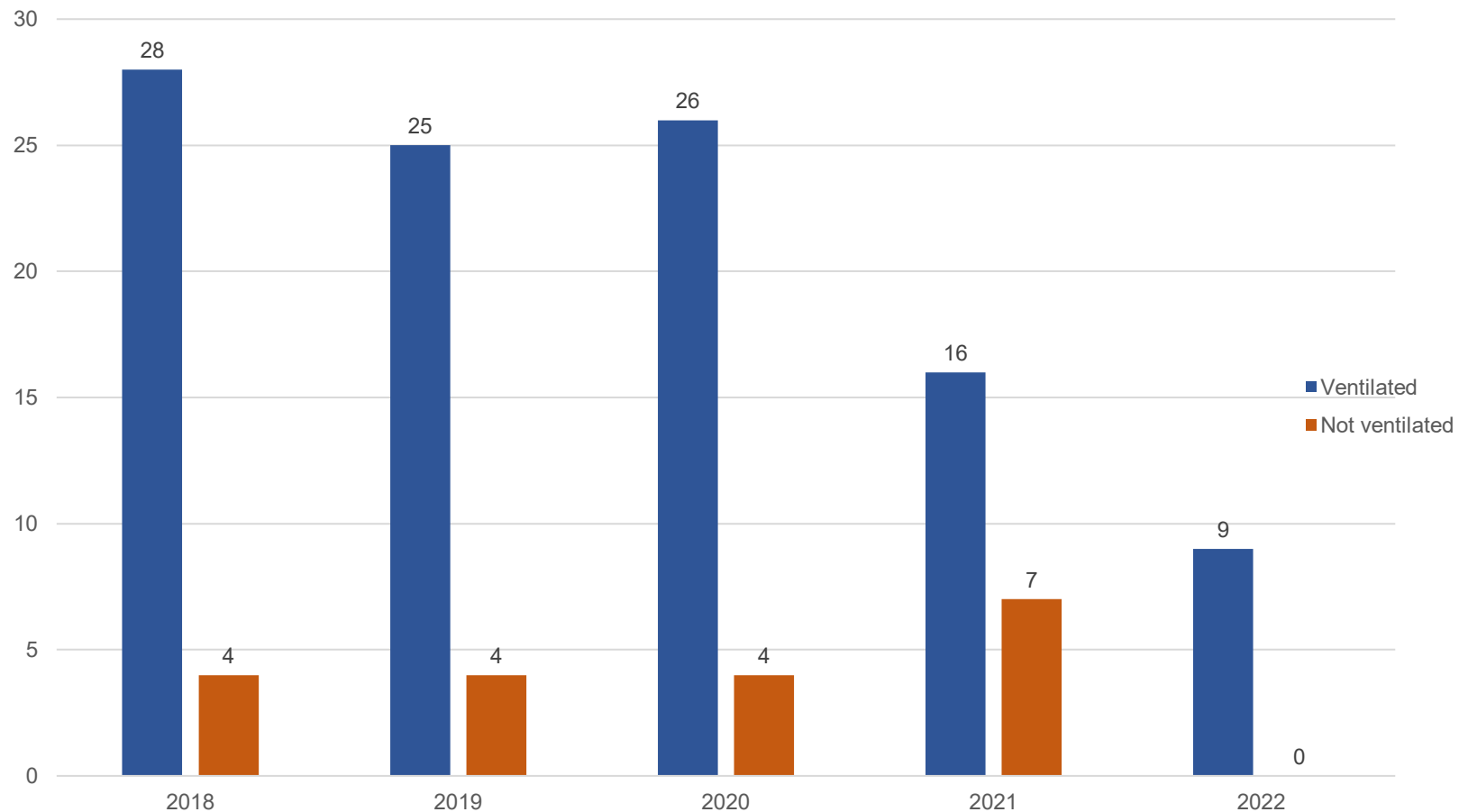
Babies with Gr 3-4 IVH- Birth hospital



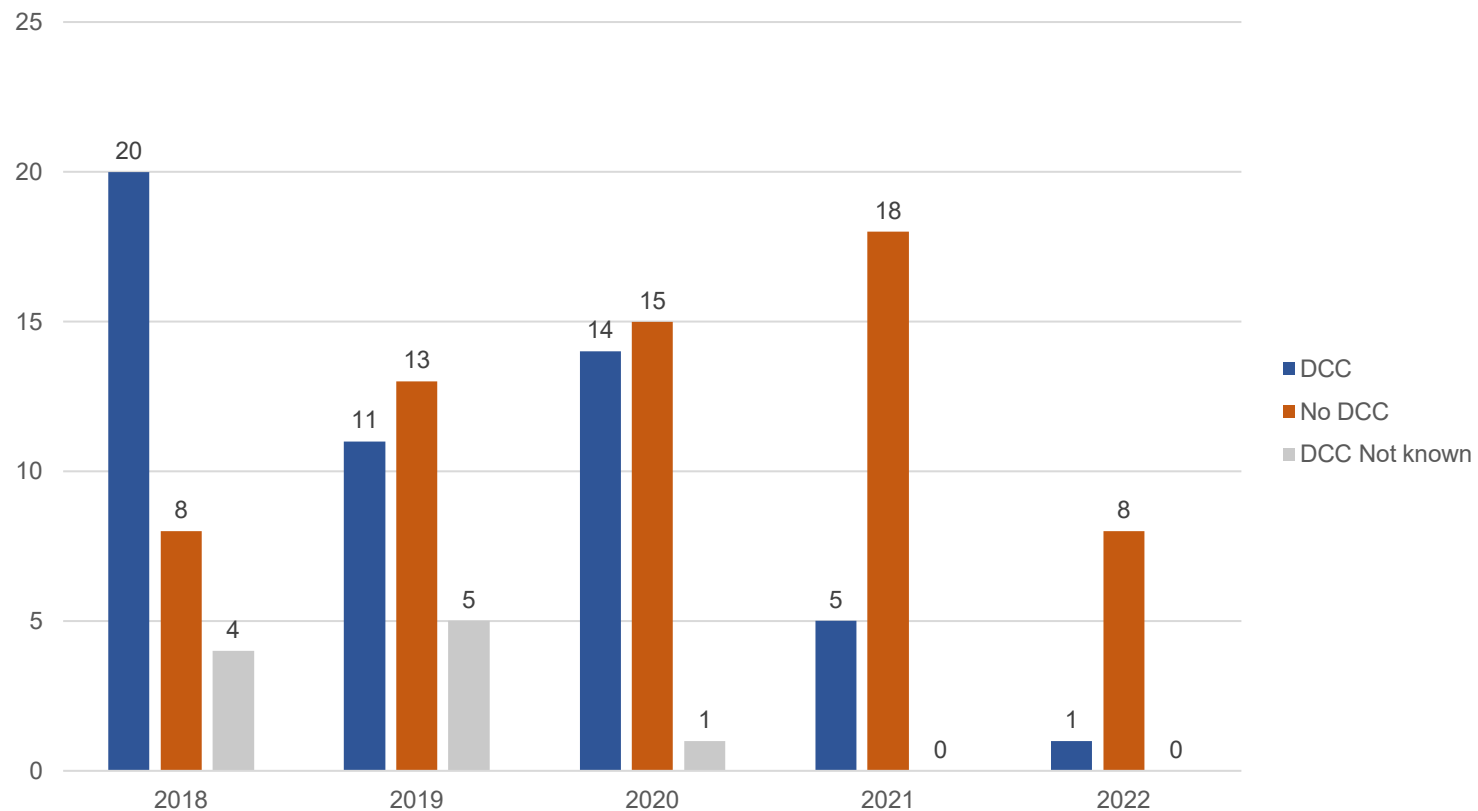
Gr3-4 IVH and steroids



Gr3-4 IVH babies- Ventilated



Gr3-4 IVH & Delayed Cord Clamping



Evidence based interventions

- Place of birth
 - NNT 8 to prevent severe brain injury
 - Association of early postnatal transfer and birth outside a tertiary hospital with mortality and severe brain injury in extremely preterm infants (<28 weeks) – mortality rates and severe brain injury

Babies born:				
Year	Total	Inborn	Outborn	%born in the right place
2018	217	158	59	72.8
2019	222	157	65	70.7
2020	219	162	57	74.0
2021	226	182	44	80.5
(6 months) 2022	98	71	27	74.5

Antenatal steroids



Trusted evidence.
Informed decisions.
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Title Abstract I

Cochrane Reviews ▾

Trials ▾

Clinical Answers ▾

About ▾

Help ▾

Cochrane Database of Systematic Reviews | [Review - Intervention](#)

Antenatal corticosteroids for accelerating fetal lung maturation for women at risk of preterm birth

✉ [Emma McGoldrick](#), [Fiona Stewart](#), [Roses Parker](#), [Stuart R Dalziel](#) [Authors' declarations of interest](#)

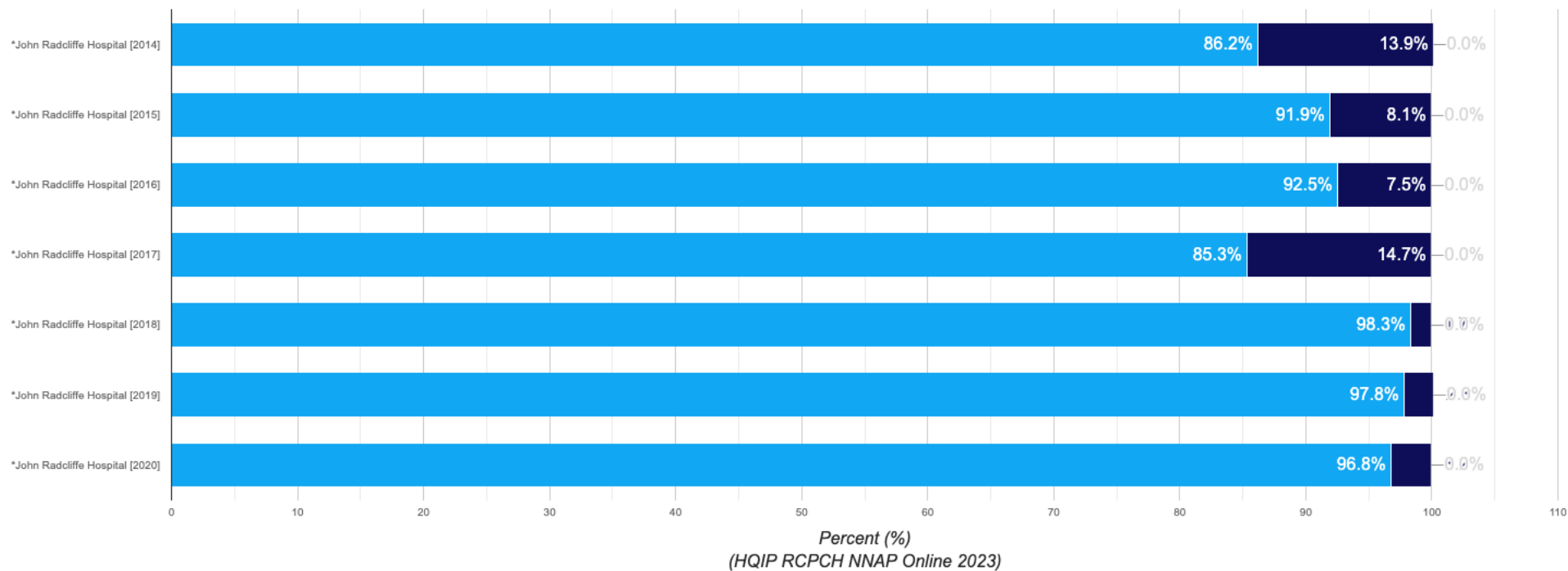
Version published: 25 December 2020 [Version history](#)

<https://doi.org/10.1002/14651858.CD004454.pub4> [↗](#)

- reduce the risk of IVH
 - (RR 0.58, 95% CI 0.45 to 0.75; 8475 infants; 12 studies; moderate-certainty evidence)

Proportion of women who delivered a baby at 23 to 33 weeks gestation and received at least one dose of antenatal steroids (2014 - 2020)

Given to mother Not given to mother Data missing



2020



Antenatal steroids

Nationally, 90.8% of mothers of babies born at less than 34 weeks' gestation were given antenatal steroids.



Deferred cord clamping

Nationally, 29.1% of babies born at less than 32 weeks' gestation had their cord clamped at or after one minute from birth.



2021



Antenatal steroids

Nationally, 92.1% of mothers of babies born at less than 34 weeks' gestation were given antenatal steroids.



Deferred cord clamping

Nationally, 43% of babies born at less than 32 weeks' gestation had their cord clamped at or after one minute from birth.



Going forwards...

Patient sticker

Neonatal Care Plan

10. PRETERM NEUROLOGICAL <28 WEEKS

AIM: to assess and protect preterm neurological development and prevent IVH

Care Aspect	Intervention	Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7	
		D	N	D	N	D	N	D	N	D	N	D	N	D	N
Head position	Midline – keeping head in line with trunk														
	2 people for turns														
	90° turns at a time														
Bed	Omnibed														
	Bed tilted to 15° (max 30°)														
	Legs not lifted above head (nappy changes)														
	Not to open lid of incubator unless emergency (not cares)														
Normothermia	Servo mode set at 36.8-37														
	Humidity as per protocol														
	Use heat shield PRN														
Fluid administration	Saline boluses over min 30 mins (except in resus)														
	Maintain BP in normal range														
	Slow IV flushes with appropriate volume														
	Arterial blood sampling: Slow withdrawal of blood over 30 seconds for														
Respiratory	Avoid prolonged suction														
	Suction as required (not routinely)														
	Maintain normocapnia (5-8.5 kPa)														
	Monitor tube leaks (especially on VG)														
Stimulation	Maintain target Saturations														
	Reduce environmental noise & light														
	Use large incubator cover														
	Ensure correct alarm settings														
	Minimal handling 10-12hrly cares														
Pain and sedation	Avoid bed linen changes for first 72 hours														
	Weight D0 then not for 72 hours (unless medically required)														
	2-4 hourly pain and sedation scores														
IVH monitoring	Consider procedural pain management														
	Appropriate pain management														
	Avoid unnecessary adhesive leads														
Initials and date	Day 0														
	Day 4														

Comments:



Specialist neonatal respiratory care for babies born preterm

NICE guideline [NG124] Published: 03 April 2019

Guidance

[Download guidance \(PDF\)](#)



Recommendations

[1.1 Risk factors for bronchopulmonary dysplasia](#)

[1.2 Respiratory support for preterm babies](#)

[1.3 Managing respiratory disorders](#)

[1.4 Monitoring](#)

[1.5 Sedation and analgesia](#)

[1.6 Involving, supporting and informing parents and carers](#)

[1.7 Discharge planning](#)

[Terms used in this guideline](#)

Volume targeted ventilation

- NICE guidelines 2019
 - For preterm babies who need invasive ventilation, use volume-targeted ventilation as primary mode of respiratory support in combination with synchronised ventilation



The screenshot shows the Cochrane Library interface. At the top, there is a search bar with the text 'Title Abstract Keyword' and a search icon. Below the search bar are navigation links: 'Cochrane Reviews', 'Trials', 'Clinical Answers', 'About', 'Help', and 'About Cochrane'. The main content area displays the title 'Volume-targeted versus pressure-limited ventilation in neonates' and the authors 'Claus Klingenberg, Kevin I Wheeler, Naomi McCallion, Colin J Morley, Peter G Davis'. It also shows the publication date 'Version published: 17 October 2017' and a DOI link. On the right side, there are options to 'Download PDF', 'Print', 'Comment', 'Share', and 'Follow'. Below these are 'Cite this Review' and 'Cited in 5 guidelines'.

- No difference in primary outcome death before discharge
- Secondary outcome:
 - Reduction rates of Gr 3-4 IVH
 - RR 0.53, NNTB 11 (CI 7-25)

- Feedback/Questions?



Many thanks !

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