



Care Bundle to Reduce Intraventricular Hemorrhage in  
Preterm Neonates.

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**Contents Table:**

Acronyms:.....	1
.1 Introduction .....	2
2. Scope .....	2
3. Purpose .....	2
4. Definitions .....	2
5. Guidelines .....	3
7. Responsibilities.....	6
8. Document History and Version Control.....	8
9. Related Documents:.....	8
10. References:.....	9



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**Acronyms:**

IVH	Intra Ventricular Hemorrhage
VLBW	Very Low Birth Weight
PVL	Periventricular leukomalacia
GMH	Germinal matrix hemorrhage
ICP	Intracranial pressure
PaCo2	Partial pressure of carbon dioxide
PICC	Peripherally Inserted Central Catheter
Q6H	Every six hours
SN	Staff Nurse



## Care Bundle to Reduce Intraventricular Hemorrhage in Preterm Neonates

### 1. Introduction

IVH is attributed to the intrinsic weakness of the germinal matrix vasculature and to fluctuations in cerebral blood flow. IVH is a major problem in premature infants and preterm infants who experience significant IVH develop neurologic sequelae. Infants born in non-tertiary Hospitals are at greater risk for severe IVH. Previous studies have reported up to 20-25% of IVH in infants born before 30 weeks of gestation and weighing less than 1500 gram. As the neonatal intensive care continues to improve the care for infants at greater extremes of prematurity, the need to minimize the risk of IVH increases. Interventions performed during the first minutes, hours and days can influence survival and long-term morbidity.

Majority of IVH's occur within the initial 3-5 days. Therefore, this period is very crucial in applying measures to prevent this complication.

### 2. Scope

This Guideline applies to physicians including pediatrician, obstetrician and nurses taking care of preterm infants less than 30 weeks of gestation or birth weight less than 1250 gram.

### 3. Purpose

The aim of these guidelines is to establish a standardized, evidence-based approach to the management of preterm infants in order to reduce the rate of IVH.

### 4. Definitions

**4.1 GMH:** Bleeding in the subependymal germinal matrix, an area from which precursor central nervous system cells originate.

**4.2 IVH:** When bleeding from subependymal extend to lateral ventricles.

**4.3 Grade 1 IVH:** Germinal matrix hemorrhage.

**4.4 Grade 2 IVH:** IVH without ventricular dilation.



**4.5 Grade 3 IVH:** IVH with ventricular dilation.

**4.6 Grade 4 IVH:** IVH with ventricular dilation and parenchymal hemorrhage.

**4.7 Mild IVH: Grade 1 and grade 2.**

**4.8 Severe IVH: Grade 3 and grade 4.**

## 5. Guidelines

### 5.1 Antenatal interventions:

5.1.1. Antenatal steroids should be given to all pregnant women who are at risk of preterm delivery between 22 and 34 weeks of gestation. It reduces the incidence and severity of IVH. Additionally, it stabilizes the germinal matrix microvasculature and reduced disruption of cerebral blood flow.

5.1.2. Magnesium sulfate should be given to all women with imminent preterm birth (< 30 weeks of gestation). It provides fetal neuroprotection, specifically, decreases the risk of childhood cerebral palsy.

### 5.2. Interventions at birth:

5.2.1. Delayed cord clamping for 45-60 seconds should be done for all preterm neonates who do not require resuscitation. It provides ~10-15% additional blood volume. There is less IVH and less need for transfusion in preterm infants with delayed cord clamping. **It is worth noting that cord “milking” increases the risk of IVH in preterm infants and should be avoided.**

### 5.2.2. Achieve and Maintain Normothermia:

Aim to maintain normothermia for infants'  $\leq 32$  weeks of gestation by using heat provision measures with close monitoring and documentation e.g. polyethylene plastic bag on blankets. Hypothermia is associated with a higher risk of IVH.

**5.2.3. Optimize ventilation strategies that support use of volume guarantee and early surfactant administration as per the unit guidelines.**

**5.3. Stabilization in Neonatal Intensive care (First 72 hours of life) – IVH Care Bundle. See (appendix 1).**



The following interventions form the IVH care bundle. The rationale for implementing the care bundle over the first 72 hours is that IVH mostly develops over this time period.

#### 5.3.1. Maintain Neutral/Midline Head Positioning:

- A. Head position should be maintained neutral/midline and to avoid prone positioning or lateral positioning.
- B. During handling and procedures the head position should be maintained in neutral/midline position. Turning infant's head to the side effects jugular venous return and may affect intracranial pressure and cerebral blood flow.
- C. Left or move infant as a unit.
- D. After NICU admission the head of the bed should be elevated 30 degrees as this reduce ICP.
- E. X-ray completion is a 2-person procedure and should be done with head of bed elevated.

#### 5.3.2. Gentle Care:

- A. Assessment and investigation should be clustered every 6 hours. Aim for "eyes on, hands off".
- B. Minimal and gentle handling should be maintained by avoiding routine abdominal girth and routine fontanelle assessment.
- C. Use 2 people to transfer infant, weigh and change sheet under infant as needed.
- D. Care by nurses with expertise in VLBW infant care .To facilitate expertise, co-care/training with an experienced nurse should be facilitated.
- E. Avoid changing bedsheet for 72 hours. A 2-person procedure if required before 72 hours.
- F. Use skin probe temperature and avoid axillary temperatures unless correlation is needed for clinically unstable neonate.
- G. Avoid routine weight for the first 4 days of birth, on conditions that weight is required, the process must be performed by 2 persons.



### **5.3.3. Minimize Hypoxemia and Prevent Hypocapnia:**

- A. Avoid hypocapnia  $< 35$  mmHg. Low PaCO<sub>2</sub> is associated with PVL. Moreover, PaCO<sub>2</sub> extremes and fluctuations associated with severe IVH.
- B. Intubation should be done by expert.
- C. After stabilization, target normal blood gas values (pH 7.20-7.40, PaCO<sub>2</sub> 40-50 mmHg).
- D. Timely adjustment of ventilation and volume guarantee ventilation as per blood gas result to achieve the targets and to minimize alterations in cerebral blood flow and hypoxemia.
- E. Monitor for apnea and possible complications e.g. pneumothorax.

### **5.3.4. Minimize Disruptive Procedures:**

- A. Umbilical catheter insertion by expert to minimize longer duration for insertion and avoid hypothermia.
- B. Avoid early PICC and lumbar puncture (i.e. first 72 hours). Obtain consultant approval if required.
- C. Do not use manual BP when UAC is available unless clinically unstable and/or correlation is required.
- D. Monitor BP Q6H if infant clinically stable and no UAC.
- E. Avoid routine suctioning; suction should be based on physiologic signs like changes in heart rate, desaturation or respiratory distress. Closed endotracheal tube suction should be used to avoid lung volume loss.

### **5.3.5. Medication:**

- A. Vitamin K to be given IV not IM.
- B. Strictly limit the use of bicarbonates.
- C. Use boluses with caution in the first 72 hours. If required, give 10 mL/kg over 60 minutes. Avoid rapid volume administration.
- D. Avoid rapid withdrawal of blood from arterial lines, as it can cause a decrease in cerebral perfusion and prolonged sampling over 30-40 second can ameliorate this problem.





### **5.3.6. Pain/ Agitation Management:**

- A. Assess for any sign or symptoms of pain or discomfort for example unexplained tachycardia, agitation and irritability and report it to medical team.
- B. Use non-pharmacological therapy for comfort/ procedural pain for example using oral immune therapy (OIT).
- C. If pharmacological interventions are required use morphine as the first drug of choice (less potent and greater sedative properties). Initiate morphine at 5 mcg/kg/hr and increase only if required.

### **5.3.7. Gentle Diaper Changes:**

The purpose is to reduce any stress (external or internal) that causes a sharp increase or decrease in blood pressure, which can result into an increase/decrease in cerebral blood flow and/or intracranial pressure (ICP).

- A.** When changing diapers Do Not lift baby by their feet or raise the hips higher than the head, care should be taken by sliding the diaper under to avoid raising legs.
- B.** For infants with birth weight less than 1000 gram, keep the diaper open for the initial 7 days in order to minimize groin irritation and potential skin breakdown. Genitalia should be covered by gauze to avoid any splash of urine.

### **5.3.8. Minimize Light:**

- A. Prevent constant exposure to light by covering the isolette.
- B. No direct light in infants' eyes.

### **5.3.9. Minimize Noise:**

- A. Reduce the alarms volume.
- B. Do not place objects on isolette.
- C. Speak softly at bedside.
- D. Prevent agitation and maneuvers that may fluctuate cerebral blood flow.

### **5.3.10. Hand hugging or therapeutic positioning:**

The purpose is to provide containment to reduce stress, fear, vulnerability and pain. It promotes normal development.

- A. Provide nesting and containment . Shaped nest positioning aid designed by a NICU nurse to help achieve goals for developmentally supportive positioning.



- B. Support flexed position and provides postural stability.
- C. Position head in midline (not right or left), Neck in neutral position, flexed forward and aligned with spine.
- D. Ensure shoulders softly rounded and Hands touching face.
- E. Align knees, ankles & feet, softly flexed (Not in a frog-legged position).

## **6. Responsibilities**

### **6.1. Head of Pediatrics shall:**

- 6.1.1. Ensure that all doctors and nursing staff are aware of the policy.
- 6.1.2. Parents should be counselled about these guidelines.

### **6.2. NICU In-charges shall:**

- 6.2.1. Ensure that all babies who are included in criteria of prevention of IVH, is cared according to guidelines.
- 6.2.2. Ensure that all babies who are included in criteria, must have bedside IVH bundle filled and countersigned by attending physician.

### **6.3. Pediatricians shall:**

- 6.3.1. Aware and adhere to these guidelines.

### **6.4. Obstetricians shall:**

- 6.4.1. Aware and adhere to these guidelines

### **6.5. Nurses at NICU shall:**

- 6.5.1. Aware and adhere to these guidelines

### **6.6. Nurses at labour and delivery shall:**

- 6.6.1. Aware and adhere to these guidelines



## 7. Document History and Version Control

Document History and Version Control			
Version	Description of Amendment	Author	Review Date
01	Initial Release		
02			
03			
04			
05			
Written by		Reviewed by	Approved by



## 8. References:

Title of book/ journal/ articles/ Website	Author	Year of publication	Page
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Patient identification

**Appendix 1**

**Neonatal Intensive Care Unit**

**IVH bundle checklist for infants (GA < 30 weeks, B.W < 1250g) for the first 72hours**

		Day 1			Day 2			Day 3		
		M	A	N	M	A	N	M	A	N
Patient Head	Midline positioning during handling and procedures									
	Avoid prone positioning									
	Log roll to avoid twisting of neck and head									
Head of Bed	Head of Bed not more than 30°									
	Complete x-rays with head of bed elevated									
	Legs below the head level during diaper change									
	X-ray completion a 2-person procedure									
Normothermia	Servo mode 36.5-37 (no Axillary Temperature)									
	Humidity as per policy									
Gentle Care	Cluster cares Q6H									
	2 people to transfer infant, weigh and change sheet									
	No routine fontanelle assessments									
	No routine abdominal girth									
	No routine weight									
Slow Administration of Fluid Boluses	Boluses over 30-60 mints (except in resuscitation)									
	D10W bolus over 5 min									



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	Avoid NaHCO <sub>3</sub>																				
	Mean BP in normal range																				
Sample withdrawal	Slow withdrawal and flushing over 30 sec/ml																				
	Use closed system for UAC																				
	Avoid frequent sampling																				
Respiratory interventions	Avoid prolonged suction <15 sec																				
	Avoid routine suctioning																				
	Stabilize before administering surfactant																				
	Avoid hyper/hypocapnia																				
	Target (pH 7.20-7.40 , PaCO <sub>2</sub> 40-50)																				
	Maintain target SpO <sub>2</sub>																				
	Prevent abrupt hemodynamic alterations																				
Minimal Stimulation	Reduce environment noise																				
	Cell phones on silence mode																				
	Respond to alarms immediately																				
	Minimize light(flash phototherapy)																				
	Avoid changing the bed linens for first 72 hours																				
	Do not use manual BP if arterial line is available																				
	Avoid early PICC and lumbar puncture																				
	Procedural pain management																				
	Vitamin K - change route to IV																				

Date of Birth:                      Gestational age:                      weeks: