Delivery room stabilization Bundle and Transfer

Dr. Victoria Nakibuuka Kirabira

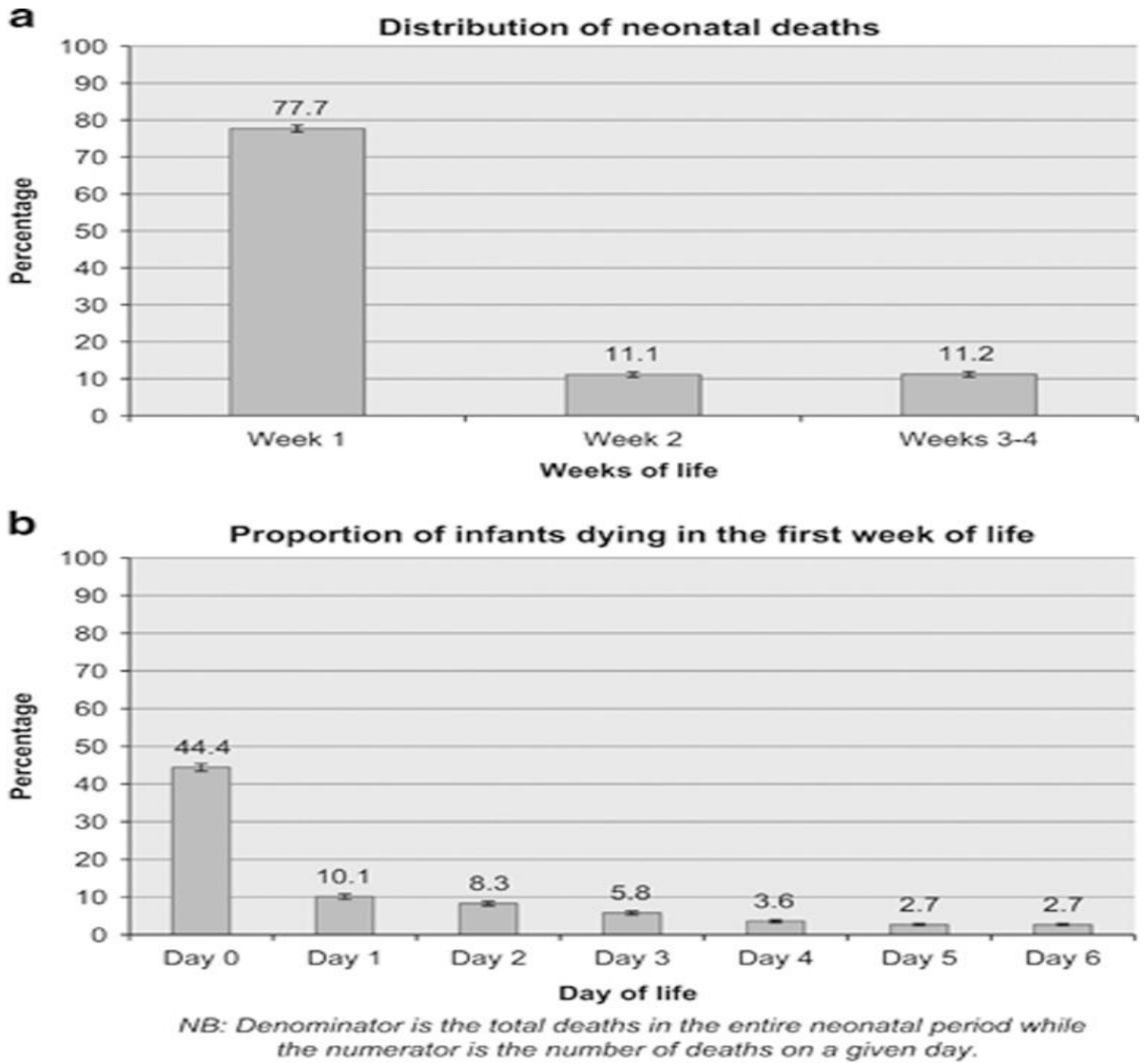
Background

Globally 2.4 million newborn deaths

- **90% occur in sub-Saharan Africa.**
- **50% of neonatal deaths occur on the day of birth**

- Birth asphyxia accounts for 30- 35% of the neonatal deaths
  - **This translates to one million deaths annually**

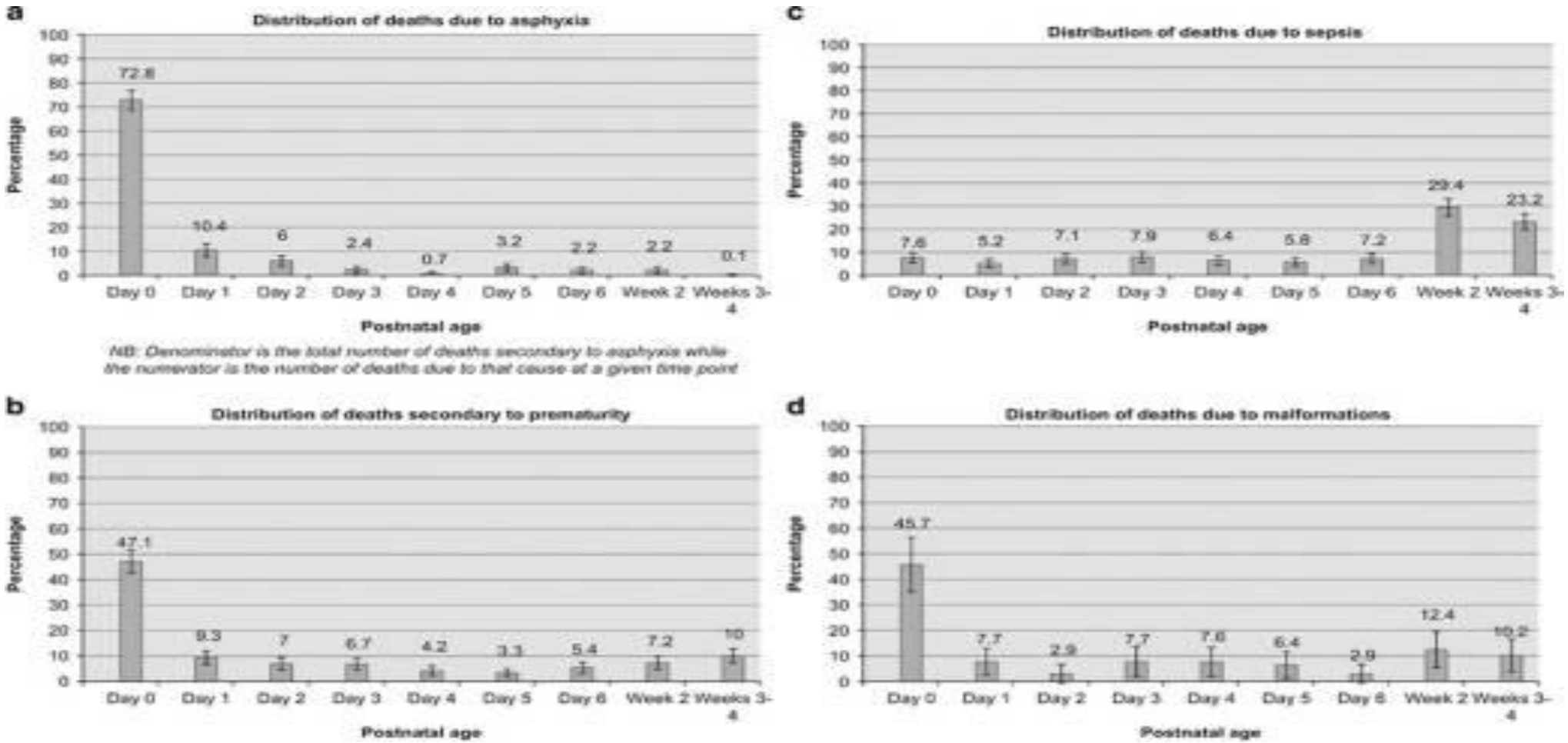
- **Majority of the these babies die in the first 24 hours and 60-70% in the first one Hour**



MJ Sankar, CK Natarajan et al 2016 Systematic review

Siobhan Devine, UN Report Neonatal mortality Rates 2018

Timing of Neonatal Deaths according to their causes



MJ Sankar, CK Natarajan et al 2016 Systematic review Siobhan Devine, UN Report Neonatal mortality Rates 2018

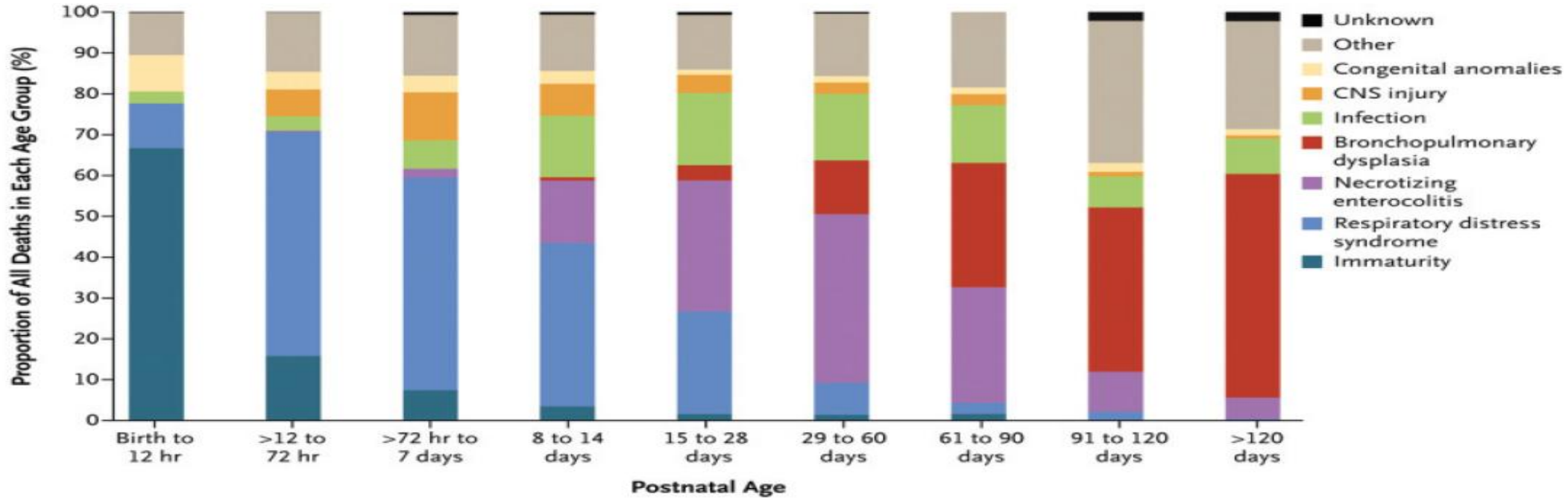
When do Babies in Africa die

- In Gambia, *57% of all neonatal deaths occurred with in the first 48 hours of admission and 48% of these Deaths were preterms . (*Uduak A. Okomo et al 2016)

- *In Uganda a study reported that* Majority of the newborn deaths (90%) occurred within the first week of life with 52% occurring in the first 24 Hours , of these deaths 37% were preterms **(yaser et al 2016)**

- *In a follow up study of 370 preterms infants at Kawempe, of the 124 preterms that died, 76% died with in 48 hours (Lucy et al 2020)*

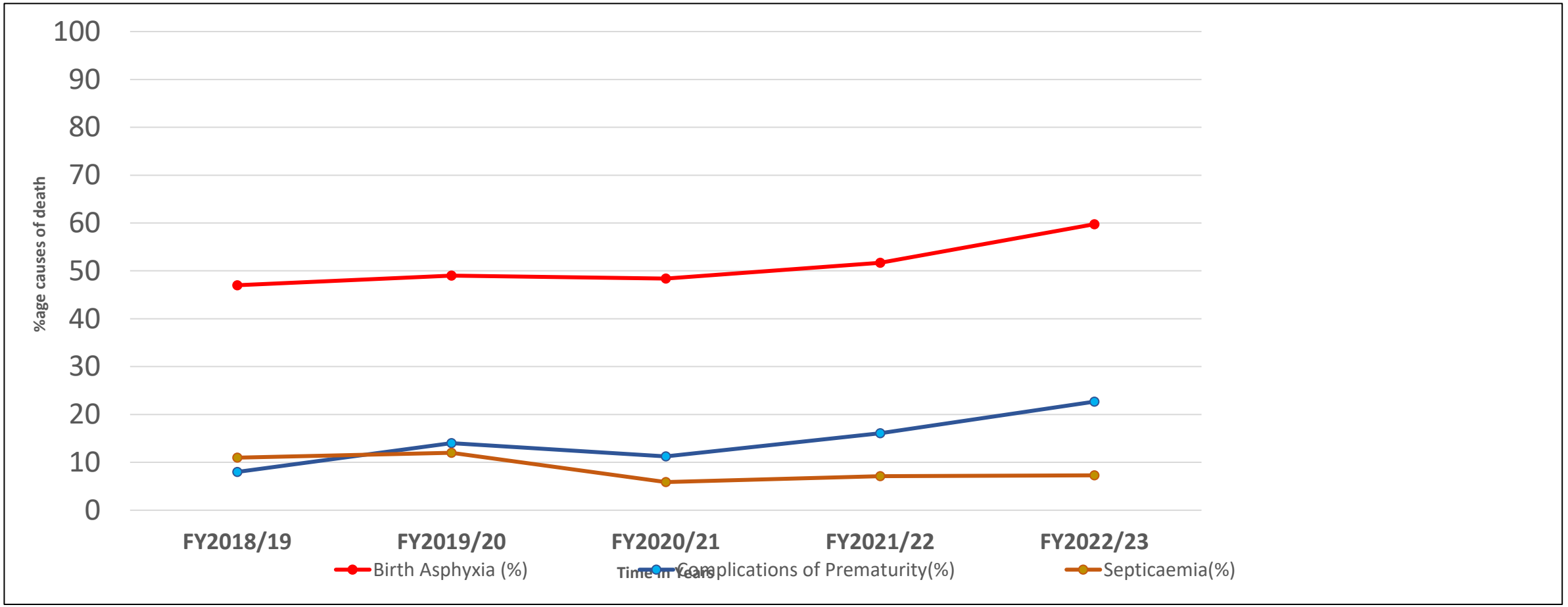
Proportionate mortality according to major causes of Death postnatal among preterm infants



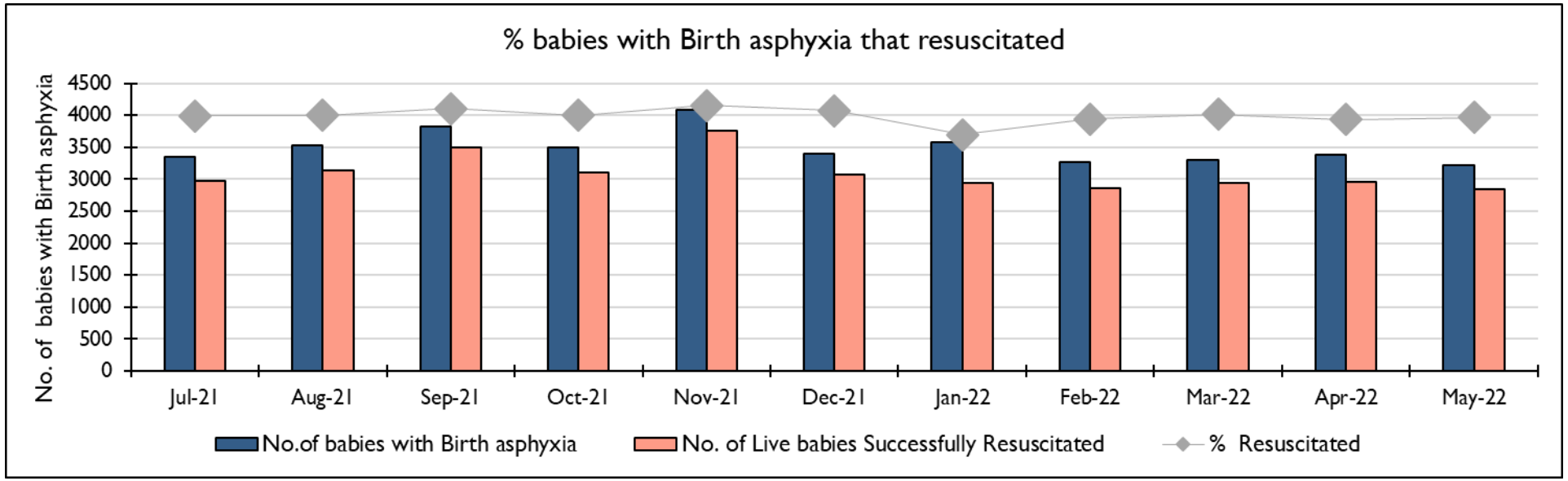
No. of Patients	2453	854	417	603	696	509	184	92	265
Proportion of All Deaths (%)	40.4	14.1	6.9	9.9	11.5	8.4	3.0	1.5	4.4

(Patel et al 2015 N Eng,J med)

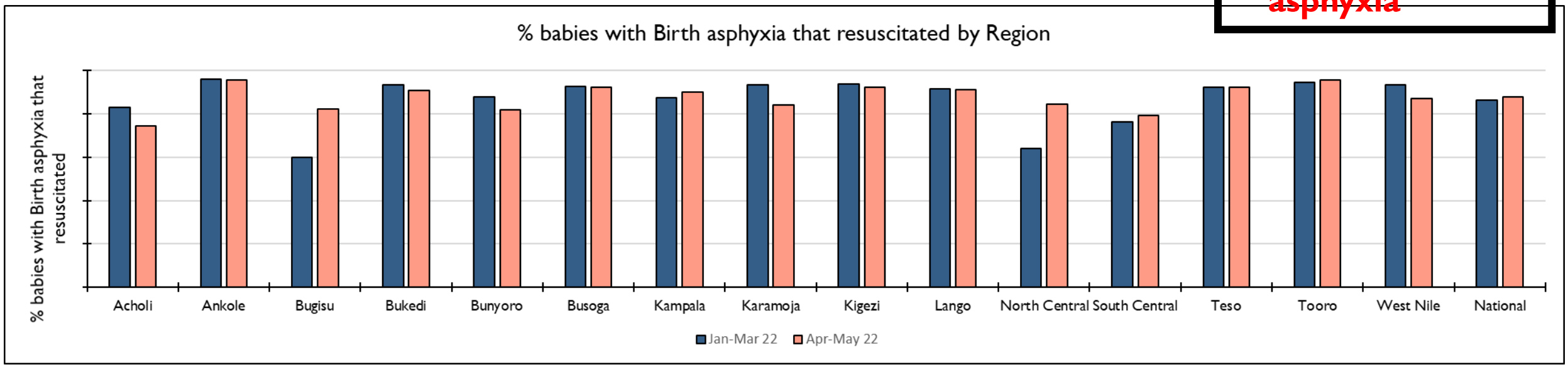
Trends in the causes of Early neonatal mortality



Babies not breathing spontaneously at birth who are successfully resuscitated (July2021–April 2022)



- 88% of the neonates were successful resuscitated
- And yet 50% of all the early neonatal deaths are due to birth asphyxia



Hypothermia at delivery as a risk for neonatal mortality

- There is 28% increase in neonatal mortality with each 1 °C fall in axillary temperature while admitted in NICU (Abbot R.et al 2007)
- Admission temperature in NICU is a strong predictor for neonatal mortality
- Each 1°C decrease in axillary temperature is associated with a 75% increase in neonatal mortality (Mullany LC, et al 2010)
- **The highest risk of neonatal hypothermia is within the first minutes to hours after birth as there is wide difference between inutero and environmental temperature (Raman s et al 1992)**

Delivery Room Interventions

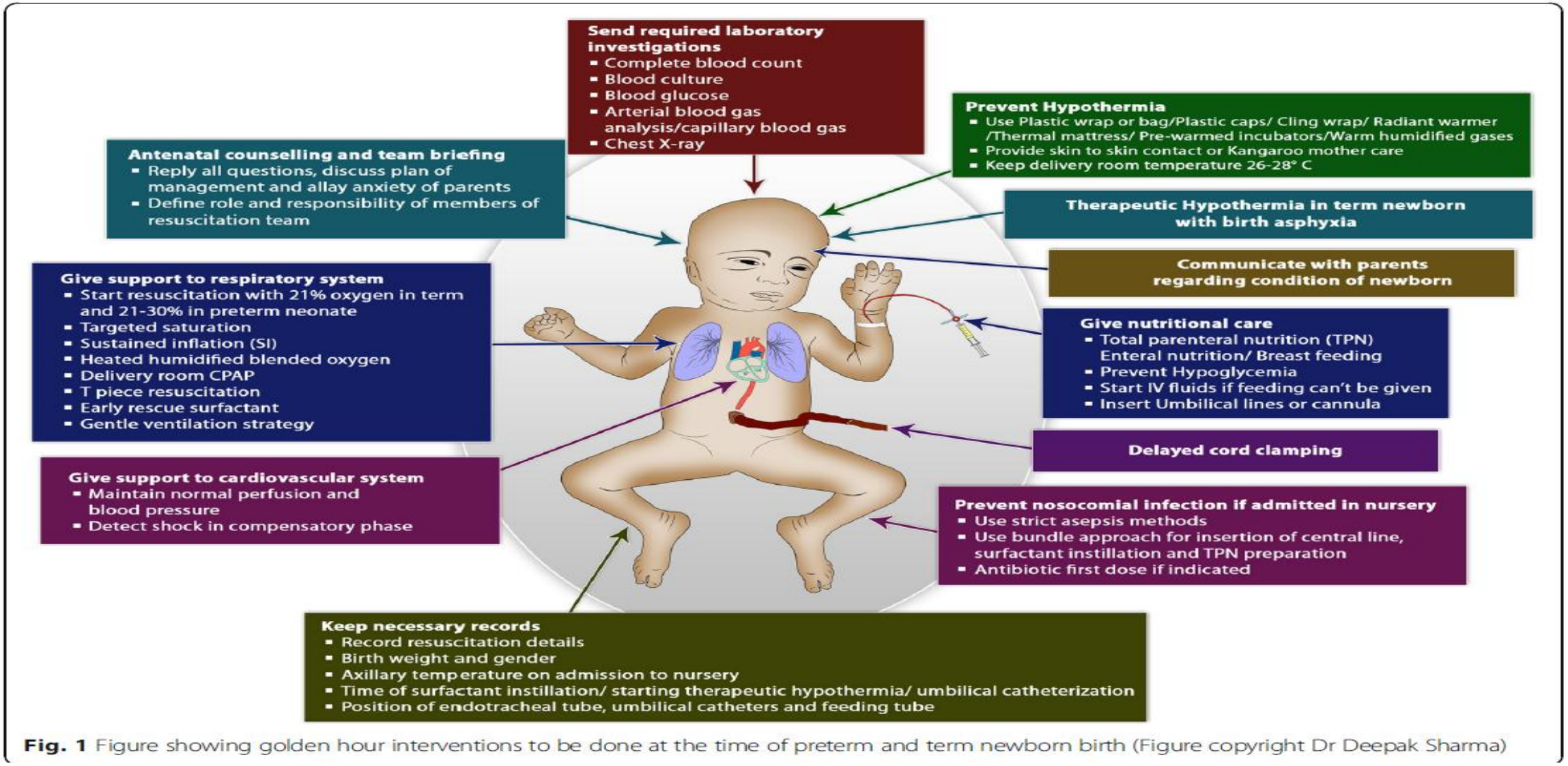


Fig. 1 Figure showing golden hour interventions to be done at the time of preterm and term newborn birth (Figure copyright Dr Deepak Sharma)

INTERVENTIONS DONE TO REDUCE BIRTH ASPHXIA

- Training in neonatal resuscitation reduced deaths in newborns with intrapartum asphyxia by 30% and immediate basic care can reduce intrapartum deaths by 10%.[45]

- A study from china reports that the incidence of asphyxia reduced from 6.32% to 1.42% and mortality decreased from 0.76‰ to 0.19‰ after a well-coordinated NRP programme over a period of 15 years .

Ariff S, Lee AC, Lawn J, et al. Global Burden, Epidemiological Trends and Prevention of intrapartaum related deaths in low resource Limited settings. Clin Perinatol 2016

Wang C, Yue Q XT. Reducing Neonatal Mortality with a Three-Stage Neonatal Resuscitation Training Programme - China, 2004-2021 . China CDC Wkly 2022

Evidence for CPAP in the delivery room

- Labour room (LR) CPAP reduces the need for intubation, mechanical ventilation and surfactant in preterm neonates with RDS.

- Use of LR CPAP is an efficacious means of reducing the need for surfactant and mechanical ventilation in resource limited settings, thereby improving neonatal care.

- There was 36% absolute risk reduction in the need for surfactant and 56% for mechanical ventilation in the LR CPAP group respectively.
- There was 20% reduction in the need for intubation among preterms initiated on CPAP at delivery in a study conducted in China

- ***Saumil Ashvinkumar Desai , et al. Sudanese journal of paediatrics , 2017***
- ***Xiaoxing Zhang et al, Pediatric Discovery 2025***

A clinical care Bundle to improve Health Outcomes

- What is a Clinical Care Bundle?
  - Small set of evidence-based interventions for a defined patient population and care setting that, when implemented together, results in significantly better outcomes than when implemented individually

- EMOTIVE care bundle
  - Designed to address challenges to implementation and adherence to evidence based PPH guidelines by using a bundle approach

- **E-MOTIVE trial** found that a multifaceted health service intervention reduced severe **PPH** after vaginal delivery by **60% in 78** hospitals in Nigeria, Kenya, Tanzania and South Africa .

Why have Delivery Room Stabilization Bundle

- The transition from fetus to neonate represents a series of rapid and dramatic physiologic changes during which the placenta is replaced by the lungs as the primary organ of gas exchange

- The NEW BABY HAS TO BE SUPPORTED DURING THIS TRANSITION

- **Anticipation and Preparation for Resuscitation AND THEN STABILIZATION AND TRANSFER**

Components of the Delivery Room Stabilization Bundle

1. **Designated Neonatal resuscitation team**
    1. 2 Midwives
    2. One Medical officer
    3. ***It would be desirable to have a Paediatrician/ neonatologist***
    4. Attend to High Risk Deliveries

2. **Initiation of CPAP in the Delivery**
    1. Use SAS of more than 3
    2. Initiate with Neopuff or Bubble CPAP
    3. Surfactant when SAS is greater than 6
3. **Neonatal warm Transport**
    1. Maintain warm Temperature
    2. Polyethene bag for those less than 28 weeks
    3. Transported in Warmilu to the Neonatal ICU

Neonatal Resuscitation Team

- Every delivery **MUST be attended by a skilled trained person** in neonatal resuscitation whose primary role is to do neonatal resuscitation **, not other duties**

- Hence the designated neonatal resuscitation team (1 medical officer, to receive a baby

- Similar to other emergencies,
- **the best outcome is achieved when there is a skilled, organized, and efficient response from a highly effective team.**
- **Ensuring such a response requires comprehensive training, deliberate practice, and careful preparation.**

Components of neonatal resuscitation

- **Anticipation**
  - Before every birth, the neonatal health providers should review the **pregnancy history with the obstetric care team** to determine which personnel should be present at the time of birth.

  - Using a comprehensive list of risk factors,
  - **approximately 80%** of newborns who require resuscitation
  - can be identified before birth (and that the risk can be stratified into categories that correlate with the need for positive-pressure ventilation
- When the neonatal team was called to attend a birth,
  - When the pregnancy was considered high risk,
  - **47% of newborns received positive-pressure ventilation.**

Perinatal Risk Factors Increasing the Likelihood of Neonatal Resuscitation

Antepartum Risk Factors	Intrapartum Risk Factors
Gestational age <36 0/7 weeks	Emergency cesarean delivery
Gestational age ≥41 0/7 weeks	Forceps or vacuum-assisted delivery
Preeclampsia or eclampsia	Breech or other abnormal presentation
Maternal hypertension	Category II or III fetal heart rate pattern*
Multiple gestation	Maternal general anesthesia
Fetal anemia	Maternal magnesium therapy
Polyhydramnios	Placental abruption
Oligohydramnios	Intrapartum bleeding
Fetal hydrops	Chorioamnionitis
Fetal macrosomia	Narcotics administered to mother within 4 hours of delivery
Intrauterine growth restriction	Shoulder dystocia
Significant fetal malformations or anomalies	Meconium-stained amniotic fluid
No prenatal care	Prolapsed umbilical cord

Preparation

- **Preparation**
- After evaluating the perinatal risk factors,
- The equipment necessary to initiate positive-pressure ventilation should be checked and ready for immediate use at every birth.
- Using a standardized prebirth checklist helps to ensure
  - adequate preparation,
  - allows rapid identification of missing equipment,
  - improves communication and teamwork,

- Every birth should be attended by at least one qualified health provider whose only job is to manage the newborn

Perinatal Risk Factors Increasing the Likelihood of Neonatal Resuscitation

Antepartum Risk Factors	Intrapartum Risk Factors
Gestational age <36 0/7 weeks	Emergency cesarean delivery
Gestational age ≥41 0/7 weeks	Forceps or vacuum-assisted delivery
Preeclampsia or eclampsia	Breech or other abnormal presentation
Maternal hypertension	Category II or III fetal heart rate pattern*
Multiple gestation	Maternal general anesthesia
Fetal anemia	Maternal magnesium therapy
Polyhydramnios	Placental abruption
Oligohydramnios	Intrapartum bleeding
Fetal hydrops	Chorioamnionitis
Fetal macrosomia	Narcotics administered to mother within 4 hours of delivery
Intrauterine growth restriction	Shoulder dystocia
Significant fetal malformations or anomalies	Meconium-stained amniotic fluid
No prenatal care	Prolapsed umbilical cord

Team Work and Preparation

Pre-resuscitation team briefing

Identify a team leader

Assess perinatal risk factors

Delegate tasks

Identify who will document events

Team leader

Provide clear direction

Situation awareness

Effective communication

Closed-loop communication

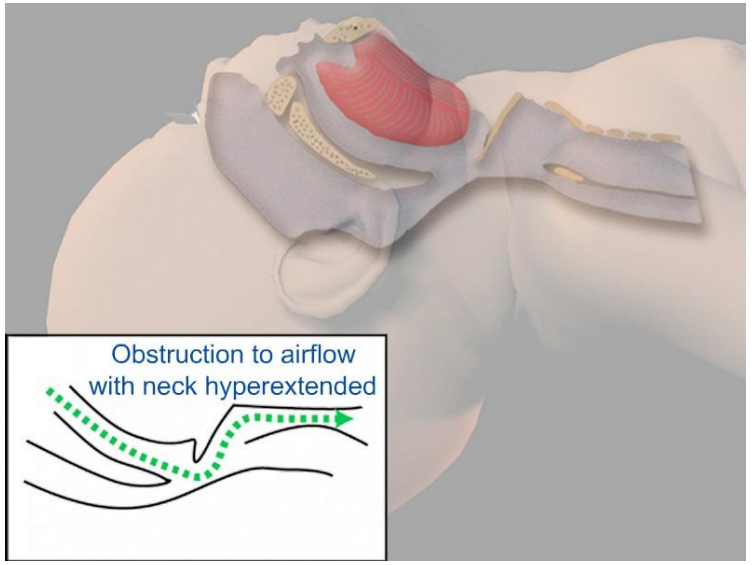
Documentation

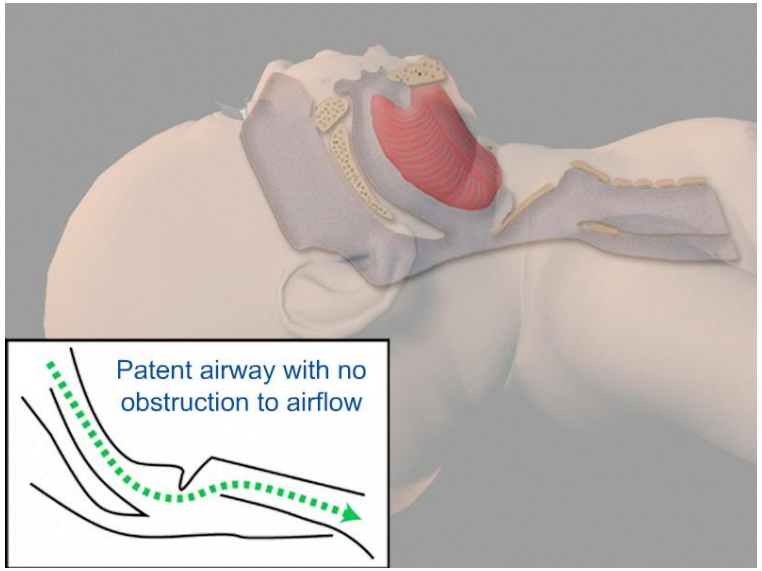
Post-resuscitation team debriefing

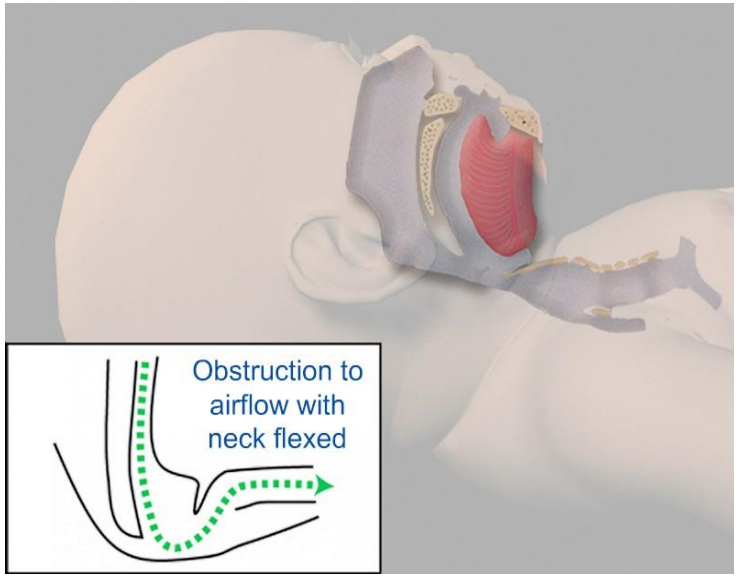
Interventions, Warmth, Position, Suction, Stimulation

- **Warmth**
  - Immediately after birth, a vigorous term newborn may be placed on the mother's chest or abdomen ,
  - Warmth will be maintained by drying the newborn's skin and maintaining direct skin-to-skin contact with the mother.
  - A nonvigorous newborn should be placed on prewarmed radiant heat source, the skin dried, and the wet linen removed , placed under a radiant warmer
- **Position**
  - The infant should be placed supine with the head and neck in a neutral or slightly extended position "sniffing" position
  - This position opens the baby's airway, aligns the posterior pharynx and trachea, and allows unrestricted air movement.
- **Suction**
  - Gentle oral and nasal suction should be reserved for babies who are having difficulty breathing, who have secretions obstructing their airway, or who require positive-pressure ventilation.
- **Stimulation**
  - The process of positioning and drying the newborn often provides sufficient stimulation to initiate spontaneous respirations. If the newborn is not breathing, brief additional stimulation by rubbing the newborn's back, trunk, or extremities may be helpful.

Opening the Airway







Positive Pressure ventilation

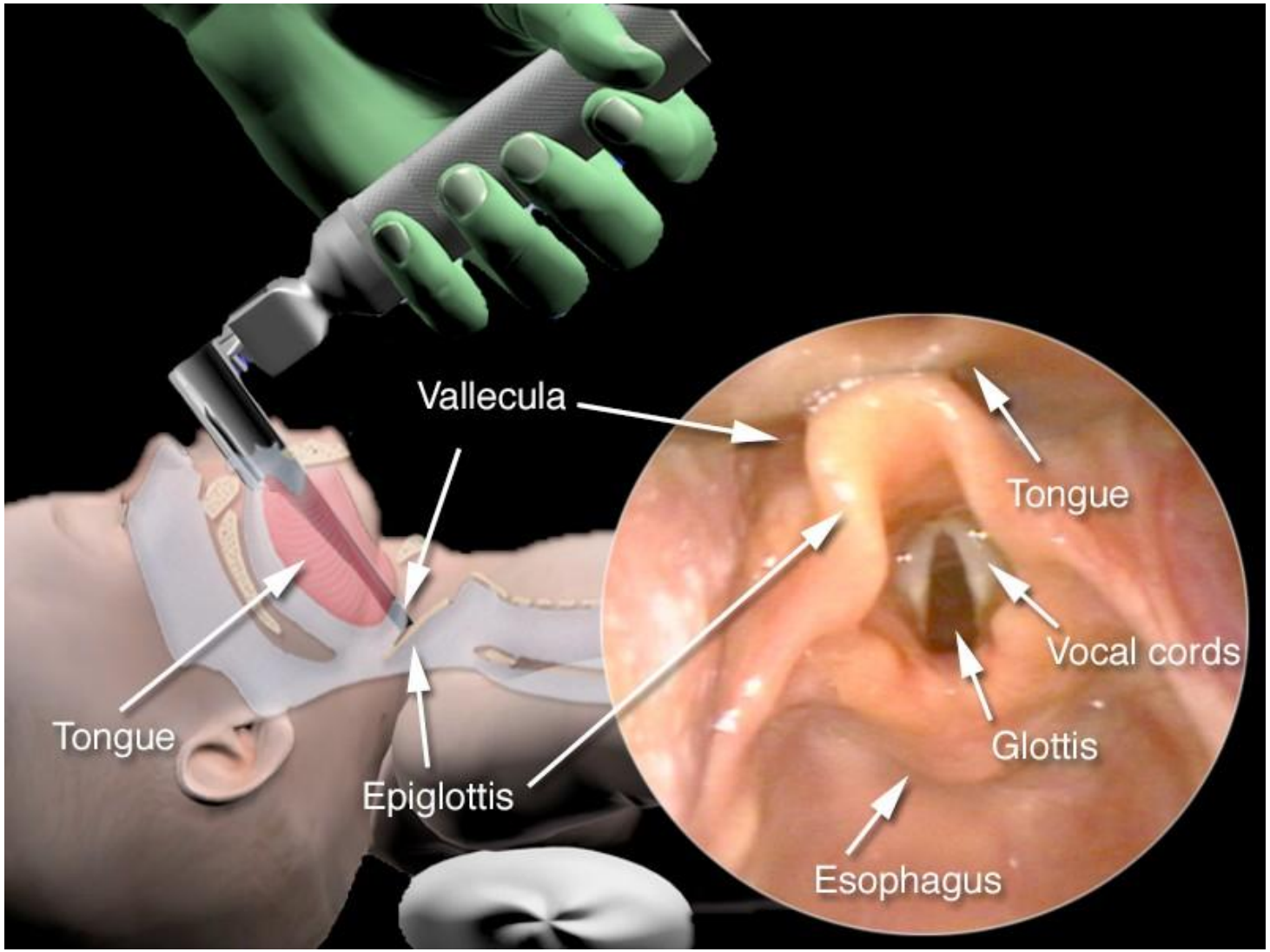
- Any newborn infant who does not initiate regular respiration, or who fails to respond
- **to initial measures of drying, wrapping, and gentle stimulation,**
- **should be given positive-pressure support.**
- **Using noninvasively using a face mask or nasal prong(s) and a pressure-generating device**

Positive pressure Ventilation

Endotracheal Intubation: Indications

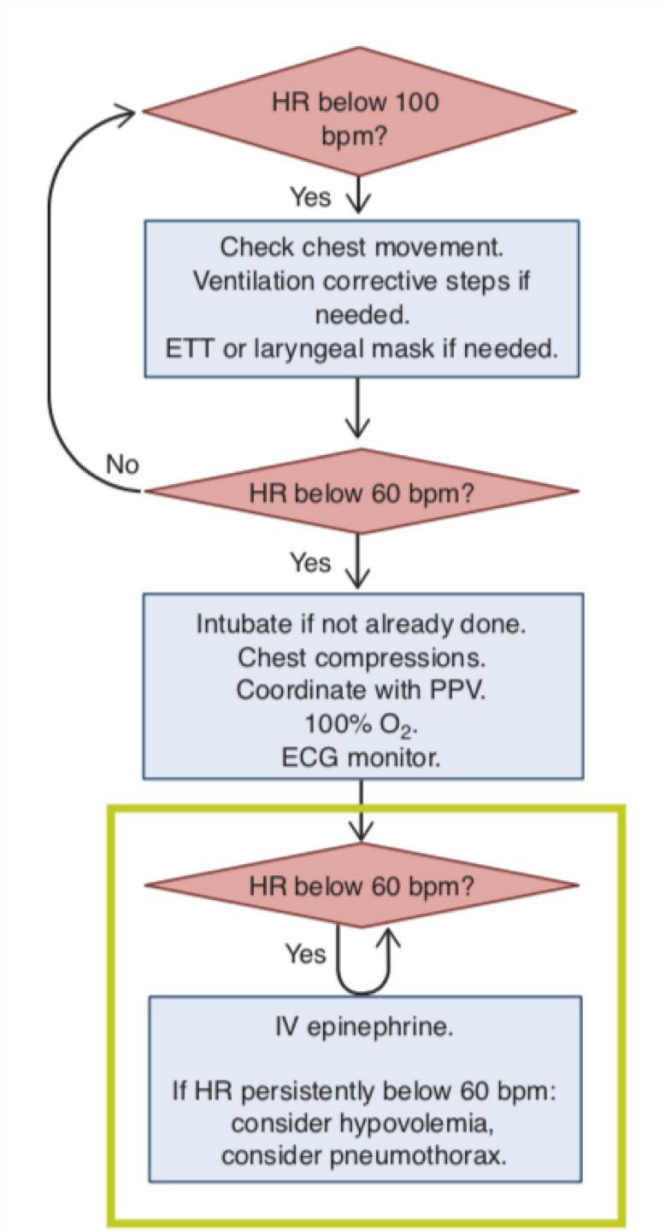
- To improve ventilation after several minutes ineffective bag- and-mask ventilation
- To facilitate coordination of chest compressions and ventilation
- To administer epinephrine while establishing IV access

Anatomic Landmarks

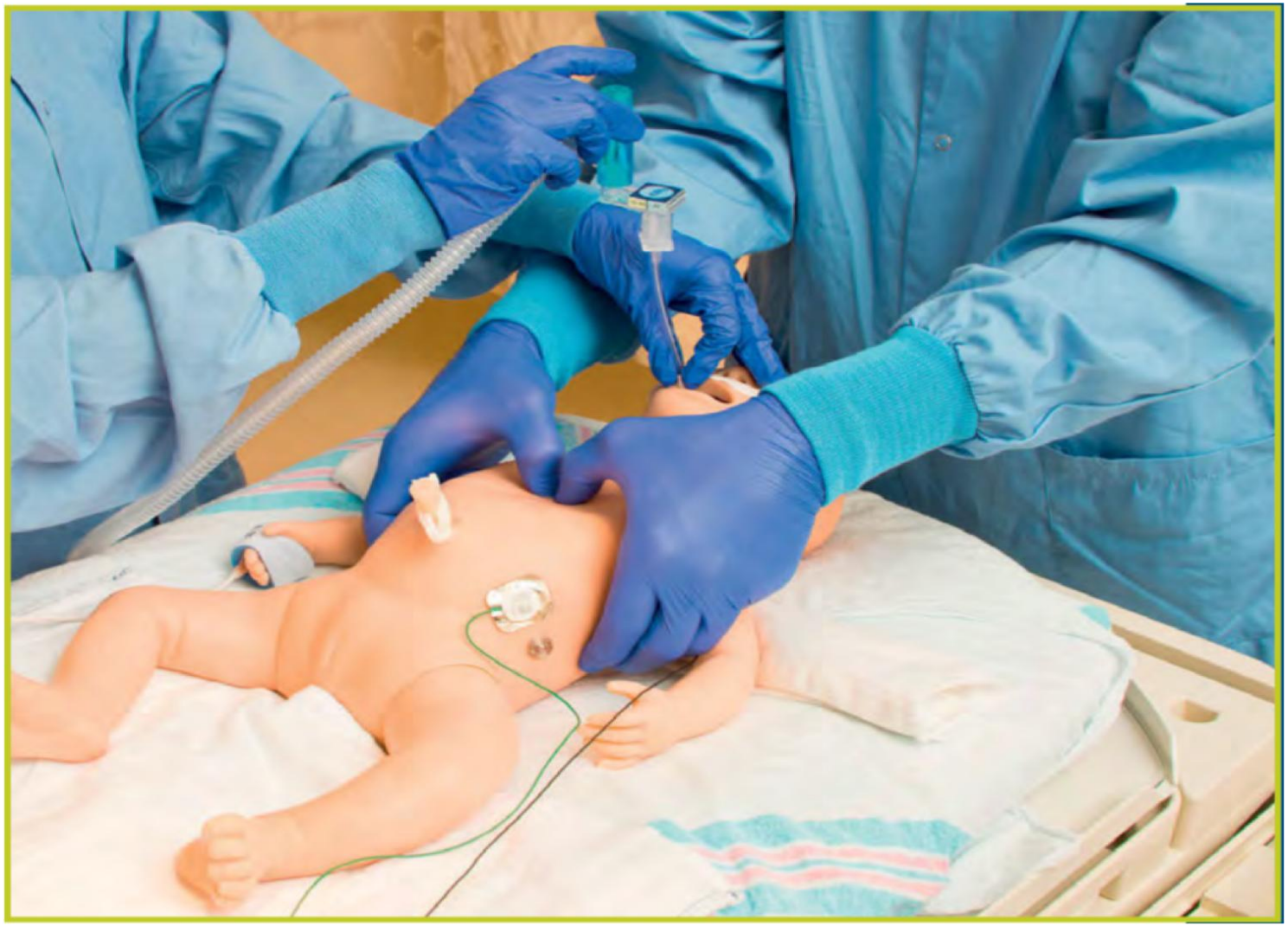


Indications for chest compressions

- **Heart rate remains less than 60 beats per minute (bpm) despite 30 seconds of effective PPV**



Chest Compressions



Epinephrine (Epi)

Functions as a cardiac and vascular stimulant.

Is indicated when the heart rate remains < 60 bpm after:

- 30 seconds of assisted ventilation that inflates the lungs and
- 60 seconds of coordinated compressions and ventilation using 100% oxygen

---

Total =90 seconds

- Note: Epinephrine is **not** indicated before adequate ventilation is established.

- **CPAP in the Delivery Room**

Improving outcomes for RDS

- Many neonates born at <34 weeks gestation require respiratory support
- To prevent the injuries caused by mechanical ventilation, less aggressive (non-invasive) ways of providing respiratory support for these neonates has been designed
- The recent evidence supports early continuous positive airway pressure (CPAP) for management of respiratory distress in these preterm neonates
- It has now been incorporated in the neonatal resuscitation guidelines

Why CPAP in the delivery room ?

- CPAP if initiated early at the time of delivery , establishes adequate lung volume or functional residual Capacity
- It avoids the need for intubation, that may lead to cardiovascular instability and and surfactant administration, that may lead to cerebral blood flow
- Ventilation also leads to Volutrauma and Lung inflammation (BPD)
- It is for these reasons that CPAP MUST be started early in the delivery room for those preterms with RDS.

Why use CPAP early ?

- Early continuous positive airway pressure (CPAP) has proven to be beneficial in reducing ventilator dependence and subsequent chronic lung disease in neonates suffering from Respiratory distress syndrome (RDS).
- The aim of providing early respiratory support is to
  - achieve functional residual capacity (FRC)
  - Provide appropriate tidal volume (4 -6 ml/kg) and minute ventilation,
  - decrease work of breathing, avoid apnea, and
  - to avoid invasive ventilation by providing assistive ventilation

CPAP in the delivery room

- Labour room (LR) CPAP reduces the need for intubation, mechanical ventilation and surfactant in preterm neonates with RDS.

- Use of LR CPAP is an efficacious means of reducing the need for surfactant and mechanical ventilation in resource limited settings, thereby improving neonatal care.

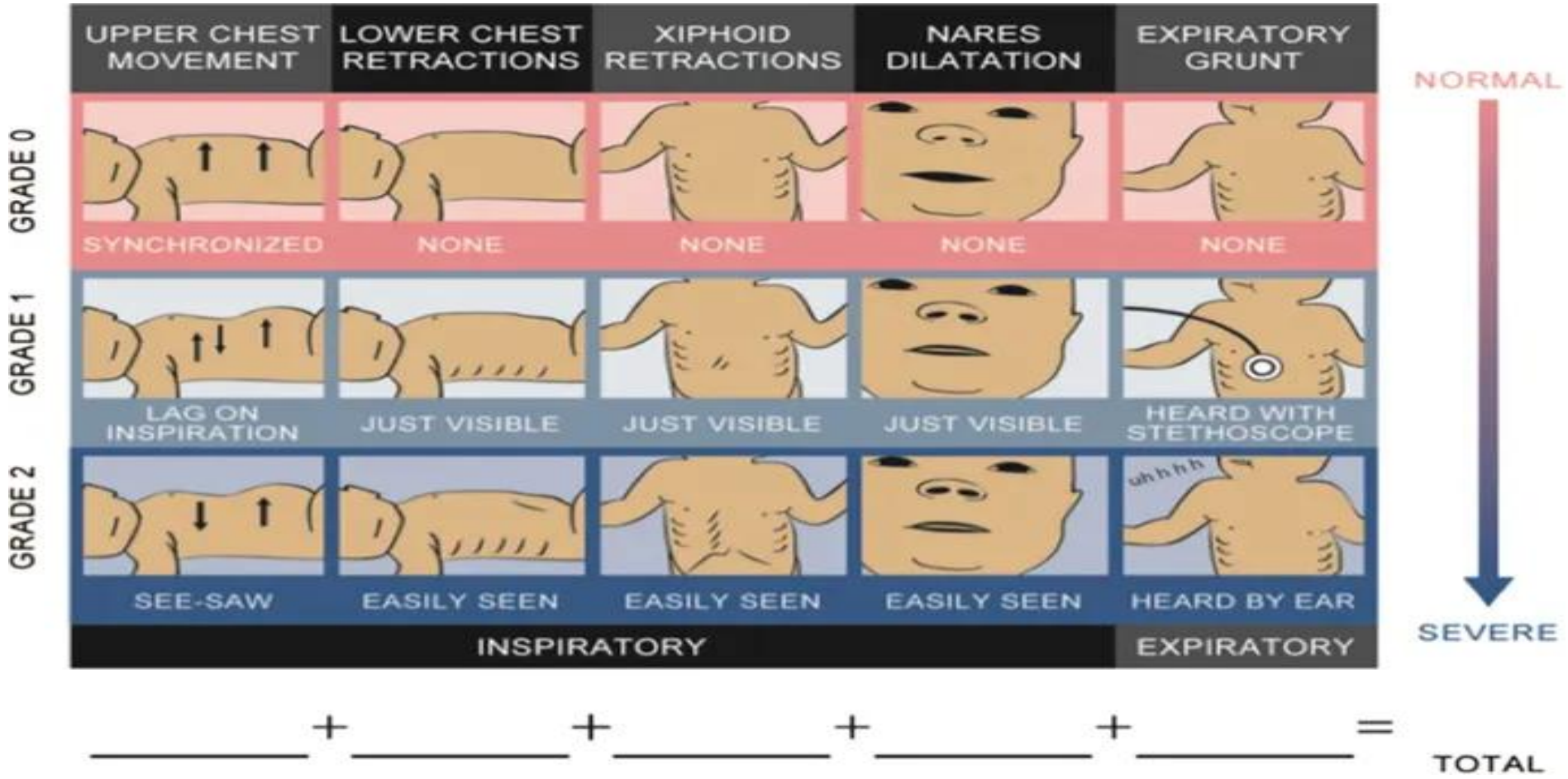
- There was 36% absolute risk reduction in the need for surfactant and 56% for mechanical ventilation in the LR CPAP group respectively.
- It has also been found to reduce Chronic Lung disease

- *Saumil Ashvinkumar Desai , et al. Sudanese journal of paediatrics , 2017*

Consensus Based studies on CPAP in the delivery room

- There is evidence that CPAP started soon after birth is a strategy that appears to reduce BPD/death and is an alternative to the prophylactic or early surfactant approach.
- Infants treated with early CPAP instead of early surfactant are not at increased risk of adverse outcomes from delaying or eliminating surfactant administration.
- Thus, early CPAP is recommended based on the most recent evidence, with the caveat that babies who develop respiratory failure and require intubation and ventilator care receive surfactant treatment promptly after intubation.

Silverman score

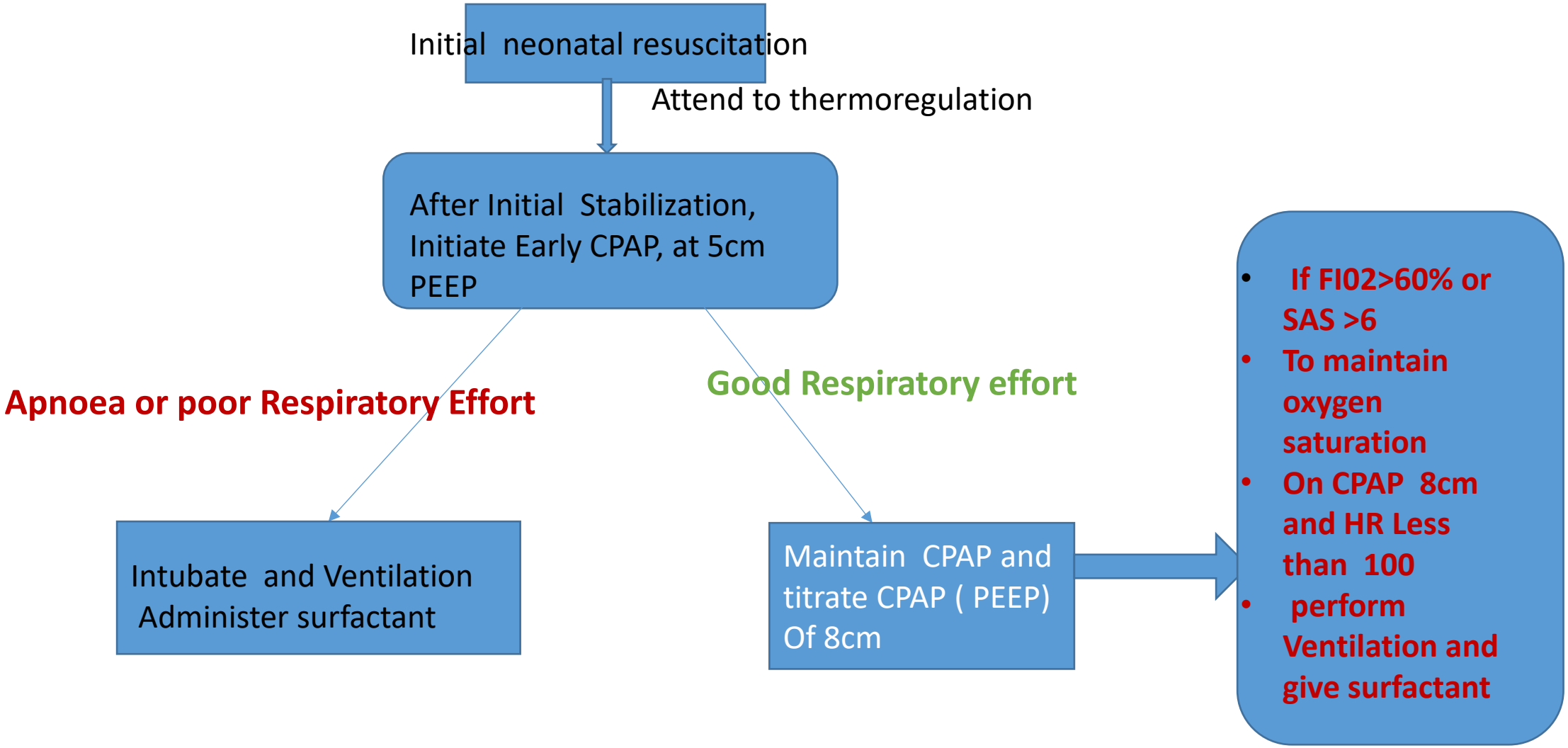


The Silverman Andersen Respiratory Severity Score (RSS) evaluates five parameters of work of breathing and assigns an overall score with a patient breathing comfortably a “0” and a patient in severe respiratory distress a “10”. (Silverman WA, et al and McAdams RM et al)

Which babies need CPAP in the delivery room

- ANY BABY AFTER STABILZATION WITH A SILVERMAN SCORE OF 3 -6 , WILL NEED CPAP
- THOSE LESS THAN 1500 grams
- THOSE WITH A SILVER MAN SCORE OF MORE THAN 6 , apnoea and heart rate of less than 100. WILL NEED TO BE INTUBATED and given surfactant if they are preterms .

Overview of management of RDS in the delivery Room



Thermoregulation

- Hypothermia and hyperthermia should be avoided during stabilization and upon admission
  - It worsens hypoglycemia.

- Cold stress with following altered pulmonary vascular tone

- And metabolic acidosis can worsen respiratory transition and trigger respiratory failure onset

Strategies to Reduce Hypothermia

- It is recommended that DR should be maintained at a temperature ranging 23–26C, to the upper limits when expecting the birth of a very preterm infant (<28 weeks' gestation) *Wyllie J, et al 2015*

- Then, all infants below 28 weeks' gestation or <1500 g should be wrapped in polyethylene or polyurethane bags up to their necks as soon as they are delivered, without being previously dried, to reduce heat loss and keep an adequate humidity *(Trevisanuto D, et al 2010)*

- Exothermic mattresses and radiant heaters are also recommended, with an accurate control of the babies' temperature especially after the first 10 minutes after birth, *(McCall EM, et al 2010*)
- Skin to Skin For stable babies is also very good and important

Thermoregulation

- There is 28% increase in neonatal mortality with each 1 °C fall in axillary temperature while admitted in NICU (Abbot R.et al 2007)
- Admission temperature in NICU is a strong predictor for neonatal mortality
- Each 1°C decrease in axillary temperature is associated with a 75% increase in neonatal mortality (Mullany LC, et al 2010)

Warm Transport

- Warm transport from the Delivery Room to the neonatal unit is one of the key components of the warm chain .

- If a baby is not kept warm from the delivery to the post natal ward or neonatal unit it associated with a significant drop in temperature , even if the temperature at Birth is normal

- A study from India reported , prolonged postnatal hypothermia after transfer from the labour wards(with radiant warmers) *M. Ellis et al 1996)*

- It is important we ensure baby's warmth during transport from the delivery room to the Noenatal unit

warmilu™

- The Warmilu ***IncuBlanket*** system is safe, non-electric, and reusable.
- It has been specially designed to accommodate a premat
- It prov gulate infants by using a talled in the zipper p

IncuBlanket InstaWarmer

warmilu™

- The IncuBlanket was specifically-designed to thermoregulate infants who are at risk of becoming hypothermic and serves as an alternative traditional incubator, a transport incubator, and/or as a supplement to kangaroo mother care.

- The InstaWarmer pack can be activated instantly with the click of a disk, and ***reused up to 100 times***.

Warm Transport and CPAP

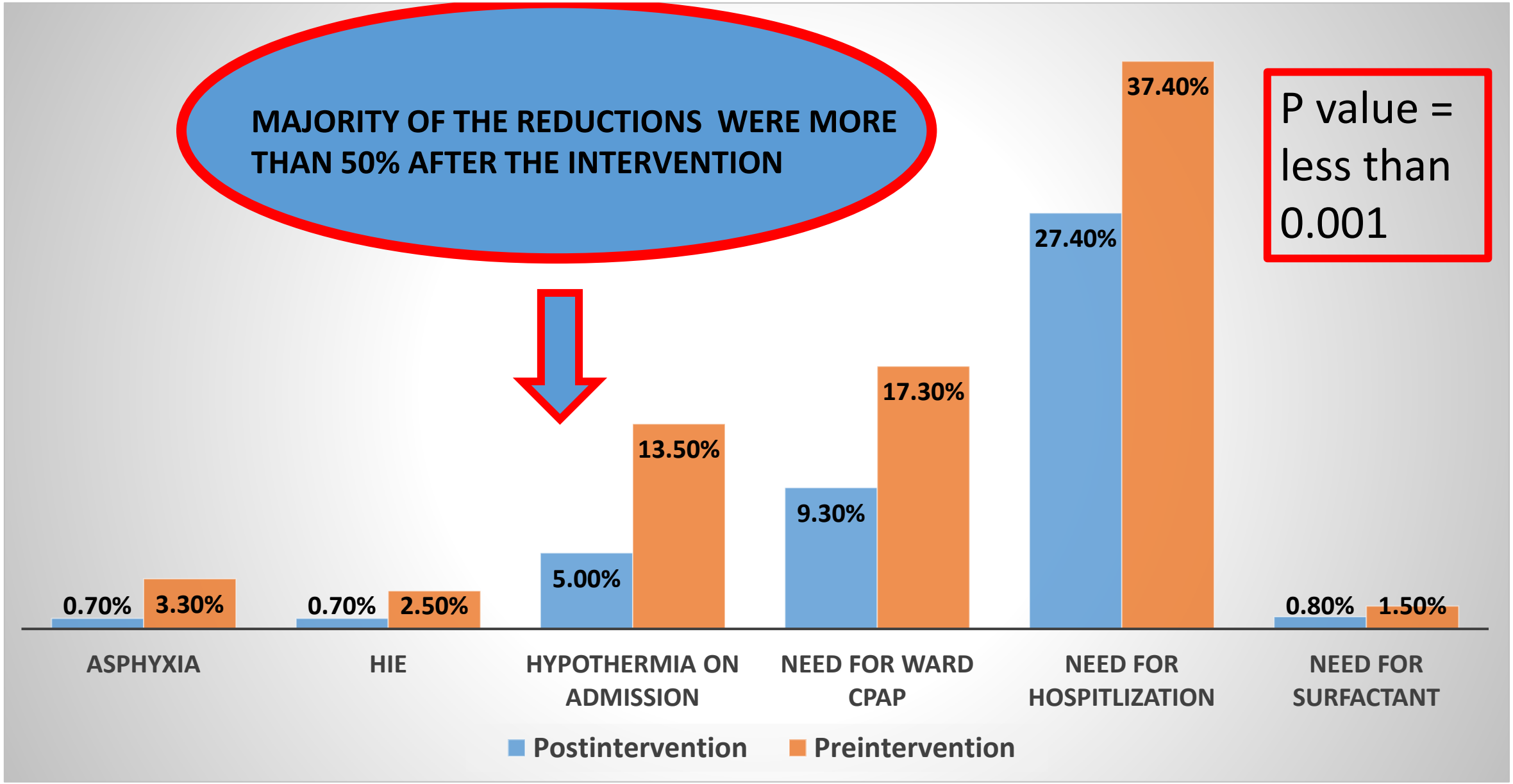
Evidence for delivery room stabilization bundle Interventions to Improve outcomes for preterm at Birth

- A delivery Room stabilization Bundle –
- That included :
  - Designated resuscitation team (2 midwives and one medical officer)
  - Training in neonatal resuscitation (Advanced)
  - **CPAP at delivery,**
  - **warm transport with CPAP ,**

  training on neonatal stabilization in the delivery room once a year ,
  - **provision of equipment (Ambubags, neopuff, Cpap, Radiant warmers)**

This was done in three hospitals in three 3 hospitals – Nsambya, Lubaga and Mengo over three years

Before and after study sample size 7736b


MAJORITY OF THE REDUCTIONS WERE MORE THAN 50% AFTER THE INTERVENTION
P value = less than 0.001
0.70%
3.30%
0.70%
2.50%
5.00%
13.50%
9.30%
17.30%
27.40%
37.40%
0.80%
1.50%
ASPHYXIA
HIE
HYPOTHERMIA ON ADMISSION
NEED FOR WARD CPAP
NEED FOR HOSPITLIZATION
NEED FOR SURFACTANT
Postintervention
Preintervention

Thank you Very Much