Education, training and team work, improving in neonatal resuscitation

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Education

Ganong Medical Physiology

At birth, the placental circulation is cut off and the peripheral resistance suddenly rises.

Ganong's Review of Medical Physiology (2012) In: Barrett KE, Barman SM (eds). Circulation through special regions (24thedtn). McGraw Hill Medical, New York.

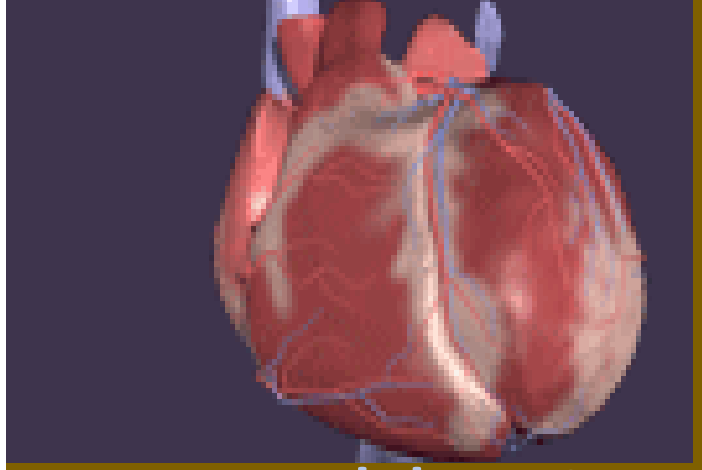
Pediatrics and Cardiology

Two textbooks of paediatrics, and one of cardiology describes the cord clamp as part of the physiological process.

Mc Millan JA (1999) Osaki's Pediatrics (3rdedtn). Lippincott Williams and Wilkins, Philadelphia: 286. 8. Behrman RE, Klieghman RM, Jenson HB (2004) Nelson's Textbook of Pediatrics (17thedtn) Saunders, Philadelphia: 1479.

Campbell AGM, McIntosh N (1998) Forfar and Arneil's Textbook of Pediatrics (5thedtn) Churchill Livingstone New York, Edinburgh: 106-107.

Braunwald E, Zipes DP, Libby P (2001) Heart Disease, A Textbook of Cardiovascular Medicine (6thedtn) Saunders Philadelphia: 1512.

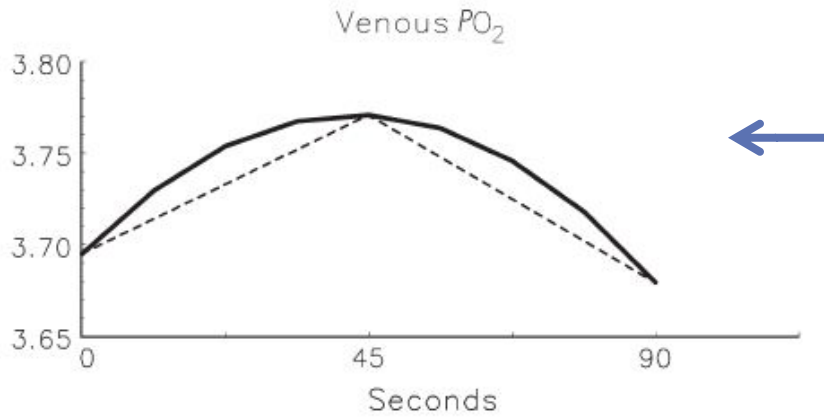


The beating heart

1. Sudden increase in afterload of the heart. (40%)
2. Sudden loss of preload volume in the venous return from placenta. (40%)
3. Loss of the “placental transfusion” and the additonal blood volume trapped in the placenta when cord compression has been a problem.
4. Loss of oxygen returning in the blood from the placenta

Placental circulation after birth

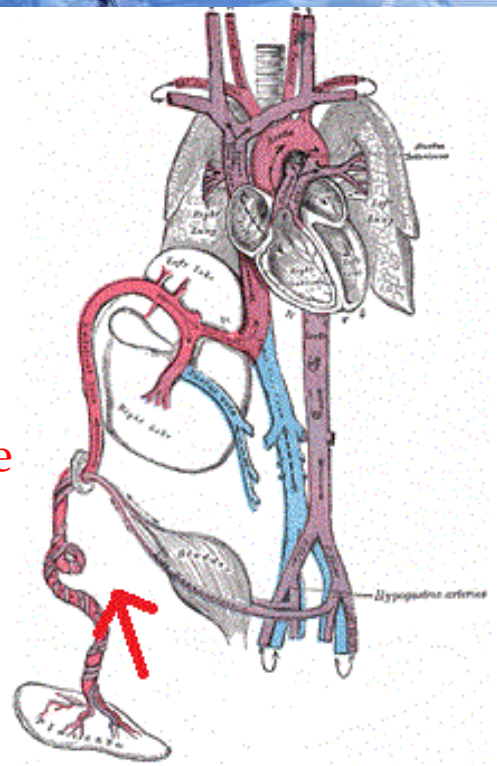
- The placental circulation **continues for several minutes** until stopped by **vasospasm** in the umbilical arteries and vein.
- There is a **significant oxygen content 3.7 to 3.77 kPa** in the blood returning to the baby.



← Umbilical vein

90 seconds

Oxygenated blood returning from the placenta to the baby



Effect on research conclusions

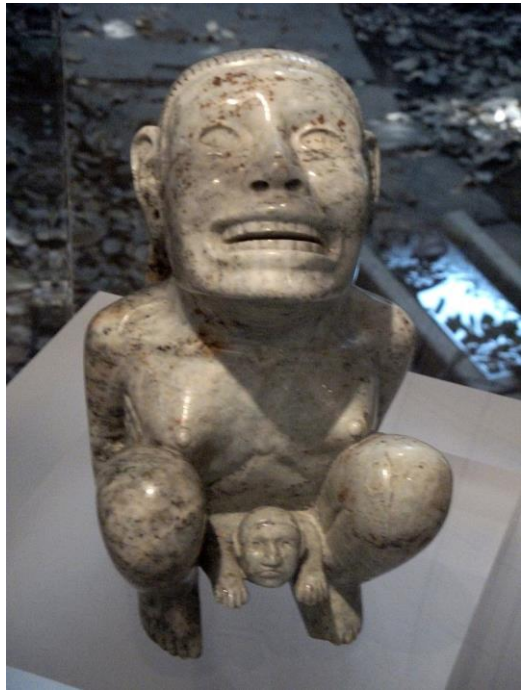
- Delayed cord clamping is considered **the intervention**.
- When there is no significant difference in outcomes the conclusion is that there is no advantage in delayed clamping, so carry on as normal
- Instead of the correct conclusion that there is **no advantage in early cord clamping, therefore it needs to be stopped**

- For anaemia the conclusion should have been that **early cord clamping results in iron deficiency and anemia** instead of delayed clamping leading to higher iron stores and higher Hb.

Irrational thought processes

- Neonate can get too much blood - WRONG
- For controlled cord traction as part of active management of the third stage the woman really needs to be on her back. - HARMFUL
- No evidence that the timing of the oxytocic affects the risk of haemorrhage. (Soltani H, Hutchon DR, Poulose TA. Timing of prophylactic uterotonics for the third stage of labour after vaginal birth. *Cochrane Database of Systematic Reviews* 2010, Issue 8.)
- So **NO** evidence for clamping and initiating controlled cord traction even at 5 minutes.

Skin to Skin



- **Natural in many primitive cultures**
  - Birth occurs with women squatting who then sit when the baby is born.
  - She then hold the her thighs and abdomen close to her breasts.

Native Americans. A woman in labor stood, knelt, or sat, but she never gave birth lying down. Usually no one bothered to catch the baby, who fell onto leaves placed beneath the mother.

So the baby remains at or below the level of the placenta

“Skin to Skin “ at birth

- Improved breast feeding and the results in the benefits of breast feeding
- Temperature control – less hypothermia
- Maternal satisfaction

Skin to skin on the abdomen with the mother in the lithotomy or on their back at birth.

So the baby lies about 10 centimeters ABOVE the placenta.

Does that slow down the rate of blood returning from the placenta?

Neonatal Hypovolaemia

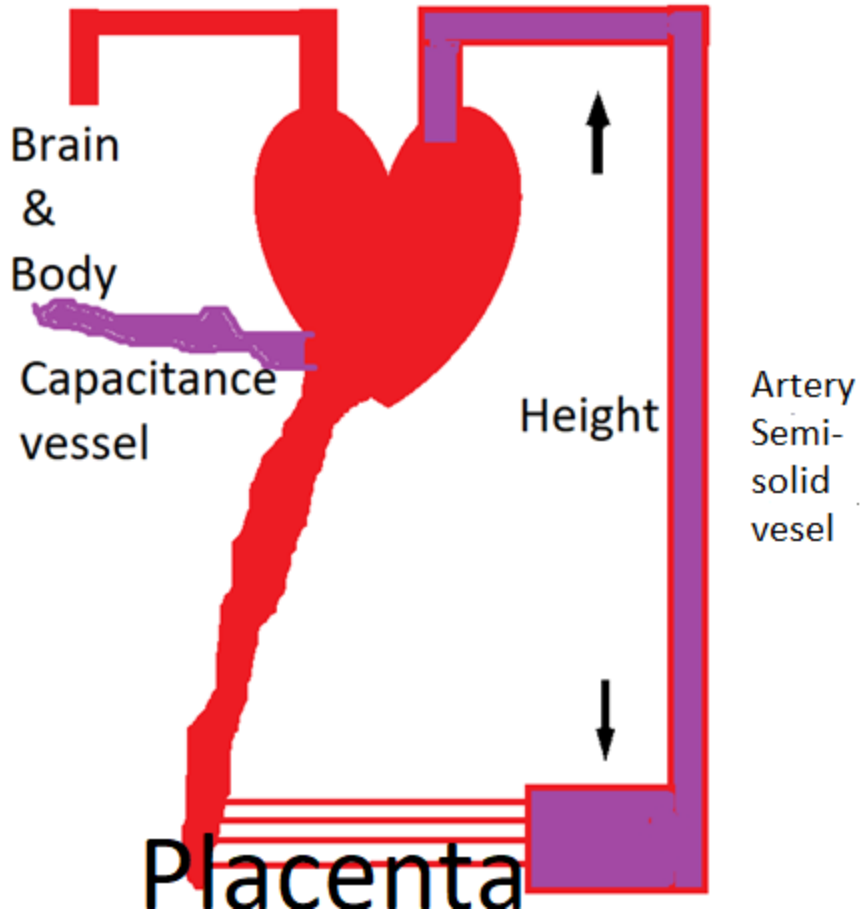
Geoffrey Sharman Dawes, CBE, FRS, FRCOG, FRCP, FACOG, FAAP was an English physiologist and was considered to be the foremost international authority on fetal and neonatal physiology.

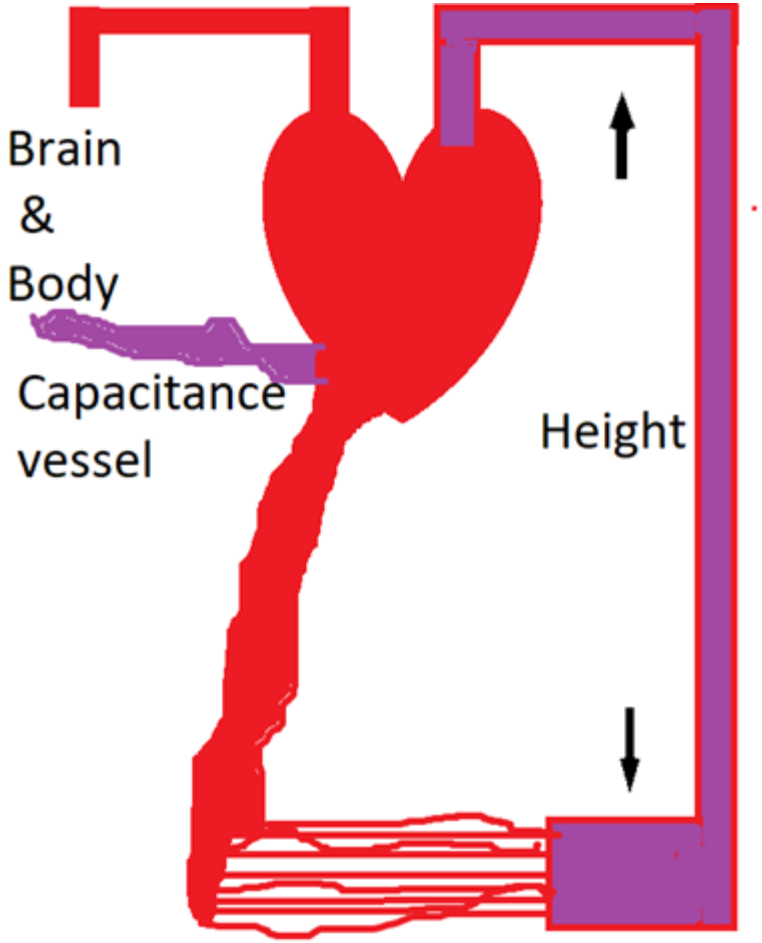
Lifting a baby high up is not physiological

Position of neonate in relation to placenta

Simple physics

Effect of height difference on capacity of placenta and umbilical vessels





Result of elevation of neonate above placenta

- Increased volume of blood in the capacitance vessels, and reduced cardiac return and preload to the heart.
- As volume of blood in capacitance vessels increases cardiac output falls.
- Effect proportional to height of neonate above placenta
- Increased uterine pressure reduces capacitance of capacity vessels – so an oxytocic may reduce risk of elevation.

Clinical studies

- No reduction of volume of “placental transfusion” by placing neonate on supine mother’s abdomen ie 5 – 10 cm above the placenta.
- Elevation of neonate on supine mother’s abdomen in theory will result in a small reduction in placental return but not clinically measurable.
- Does not mean it does not have a minor clinical effect
- For a some neonates it may be critical.

Neonate at or below level of placenta

- Minor effect on reduced output to placenta due to increased pressure in umbilical arteries.
- Reversal of pressure gradient between placental capacitance vessels and neonatal capacitance vessels.
- Increased flow from placenta to neonate.
- Significant return when there has been cord compression, (compressing the cord results in increased blood in placental capacitance vessels) as a result of increased pressure gradient.

pethidine and should be given in a dose of 100 mg/kg, which is 0.25 mL/kg of the standard-strength solution. 'Neonatal' Narcan has a concentration of 20 mg/mL and should no longer be used. Naloxone is specifically contraindicated in babies born to drug-abusing mothers.

Failure to respond to resuscitation

Most babies who are depressed at birth

and consider giving bicarbonate and glucose. Exclude a pneumothorax, if necessary by needling the chest. Consider giving uncrossmatched O-negative blood if the baby looks pale, because massive feto-maternal haemorrhage, blood loss at delivery or a failure of an adequate placental transfusion due to extreme cord compression can be a reason for birth depression. If there is no cardiac output after about 20

resuscitation. If the baby has a heart rate but is not breathing, intensive care should be offered until more information is available.

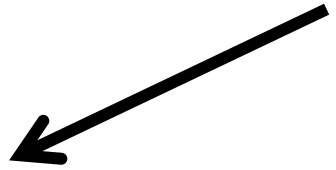
Ethical issues surrounding resuscitation

This is an area which generates a great deal of anxiety. A junior doctor suddenly faced with a very preterm

Obstetrics by TEN TEACHERS

19th edition. Neonatology, by Janet Rennie page 286

a failure of an adequate
transfusion due to
cord compression . .



lood
od bank

Placental transfusion ?

Somersault manoeuvre

TTING PREGNANT

Emergenc

Approved by the BabyCentre M

eel the urge to push?
g in three quick pants and
w. This may delay your
ival for a few minutes if
ting for help to arrive. Lie
ft side, or get on all fours
your chest down to your
ır face should be near the
your bottom in the air. This
the urge to push.

What should I do

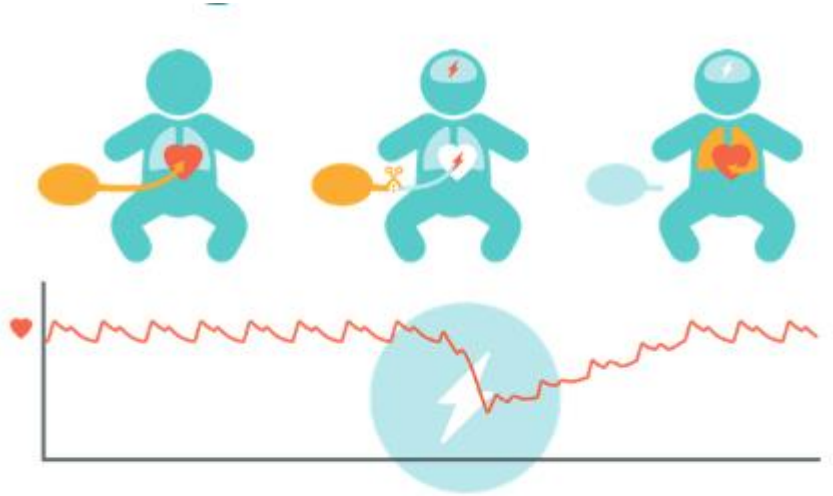
If you're on your own, bring your bottom nearer to the floor and put a folded towel beneath you to give your baby a soft landing. If there's someone with you, they can help to support your baby's body as he's being born.

rn, check if there's a loop of
is, gently slip your fingers
ver his head. Only do this if the cord is loose enough to do so without snapping. If the cord is too short or tight, leave it alone and don't pull on it. **You can deal with it after your baby is born.**

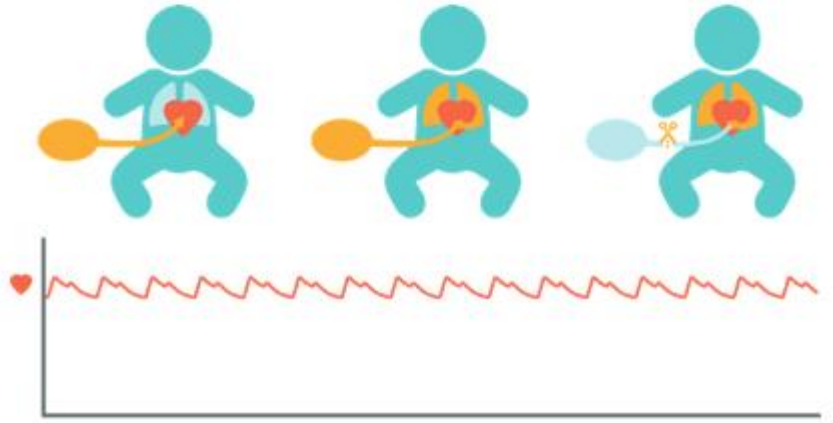
The effect of early cord clamping, before respiration

Concord Neonatal

Baby still not breathing



Baby breathing



NICE and ILCOR guideline for avoiding cord clamping for at least one minute ?

- During this time is the baby in an optimal position to facilitate an open airway ?
- During this time are there effective measures in place to prevent hypothermia ?
- During this time the hear rate must be measured and documented. ?
- At Caesarean births are there measures to ensure the sterile area is not breached ?

ILCOR recommendation for all births + NICE guideline for “at least one minute before the cord is clamped”.

The baby must be in an optimal position to facilitate an open airway ?

Flat surface

Neck position

Tone

Thermal care

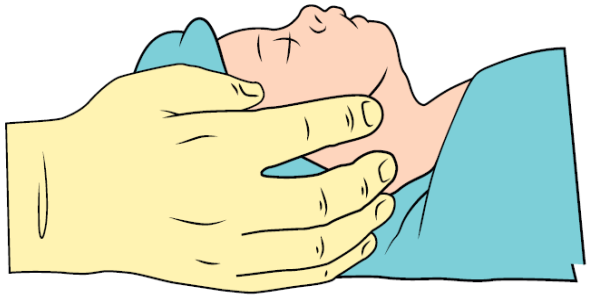


Fig. 7.2. Newborn with head in neutral position.

Newborn with head in neutral position

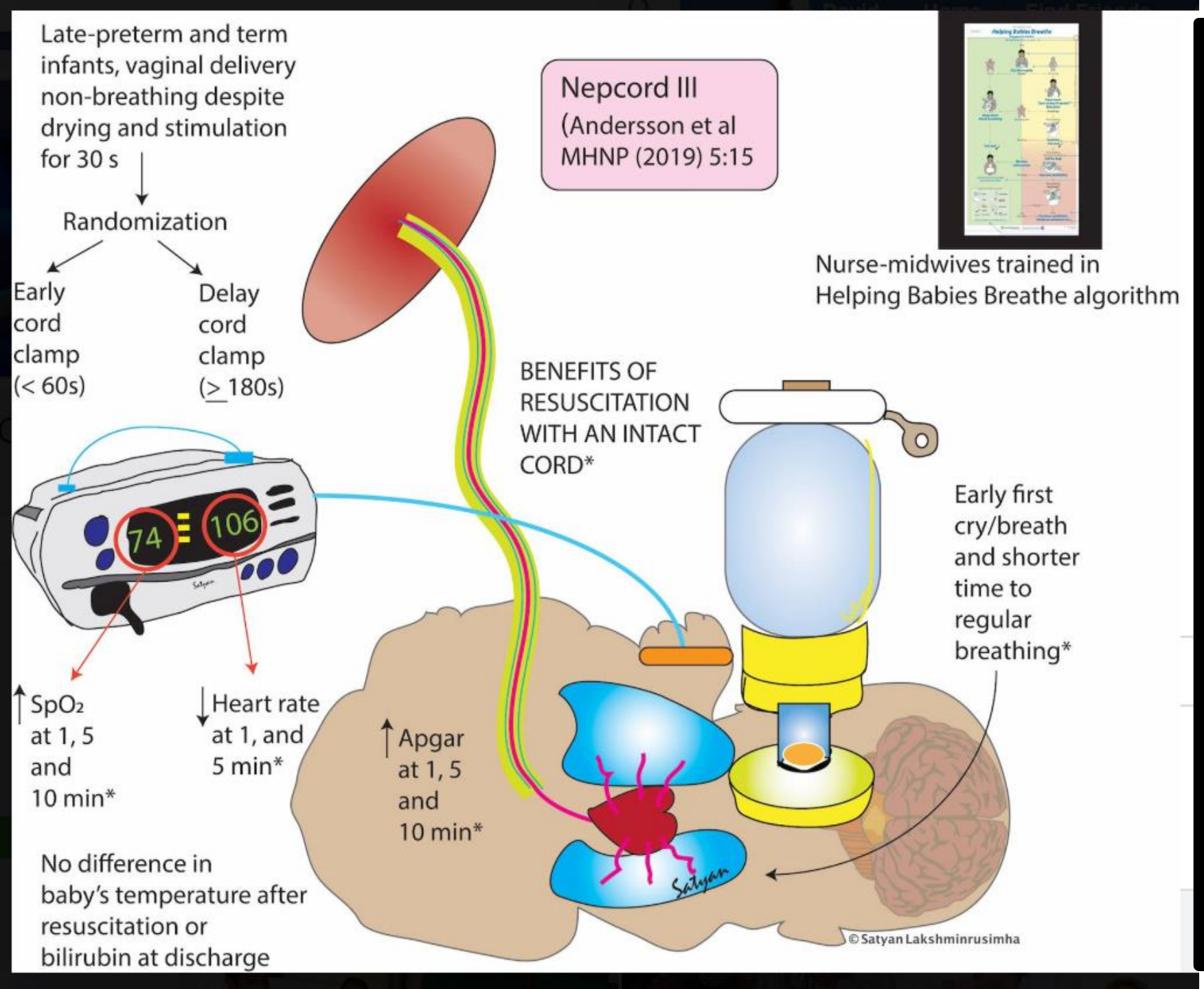
?

Mothers abdomen or chest

Resuscitation platform

Other


Nepcord III
(Andersson et al
MHNP (2019) 5:15



Motherside Neonatal resuscitation with intact cord.

Higher SpO2 at 5 minutes

Higher APGAR score at 1, 5 and 10 minutes

Earlier first breaths and shorter time to regular breathing.

Motherside ventilation with **an intact cord** and placental circulation.

How can it be achieved ?

Conviction

Co-operation and **teamwork**

Innovation and Evolution - Equipment

Preparation and Practice

Prepared

Rapid assessment of the condition of the neonate at birth – but it must be an accurate assessment.

(1) Vigorous breathing or crying. Good tone. Heart rate higher than 100 min−1.

. . . .drying, wrapping in a warm towel and, where appropriate, handing to the mother. The baby will remain warm through skin-to-skin contact with mother under a cover, and may be put to the breast at this stage.

(2) Breathing inadequately or apnoeic. Normal or reduced tone. Heart rate less than 100 min−1.

(3) Breathing inadequately or apnoeic. Floppy. Low or undetectable heart rate. Often pale suggesting poor perfusion.

ILCOR

Measures must be in place to prevent hypothermia

Term neonate

?

Ambient temperature

Cap on head

Warm dry towels

Skin to skin

Overhead radiant heater

Other source of heat – chemical bags

Other approaches ?

Measures must be in place to prevent hypothermia

Preterm neonate

Ambient temperature in theatre

Cap on head

Warm try towels

?

Polythene bag

Overhead radiant heater

Other source of heat – chemical bags

Other method ?

Positive pressure ventilation

?

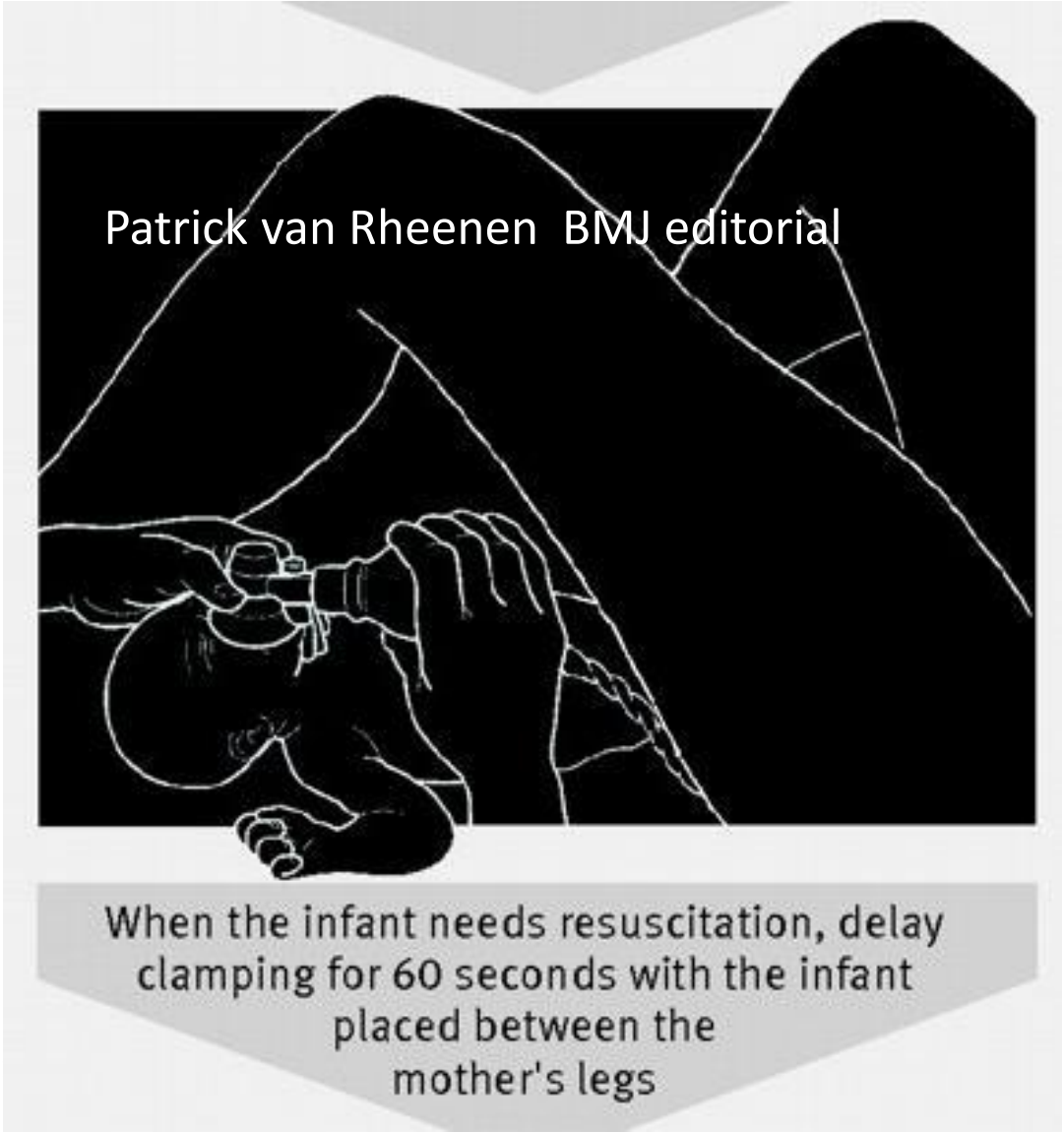
Ambubag and mask

PEEP with tee piece

Air warming/humidifier

Other ? (! no equipment available)

Normal birth and resuscitation



Every midwife should have the facility to provide PPV with an intact cord at every birth.

Regular updates are needed to maintain ability

Resuscitation with cord intact


Oxygen and suction available from resuscitaire via sterile tubing

A GE resuscitaire was brough up to the side of the operating table, the surgeon or assistant obstetrician steps aside and the neonate is moved to resuscitation surface. All facilities of a normal resuscitation are present.

Darlington Memorial Hospital 2007

Hutchon et al

- **This means avoiding the shock of a sudden closure of the placental circulation ie avoiding early cord clamping.**

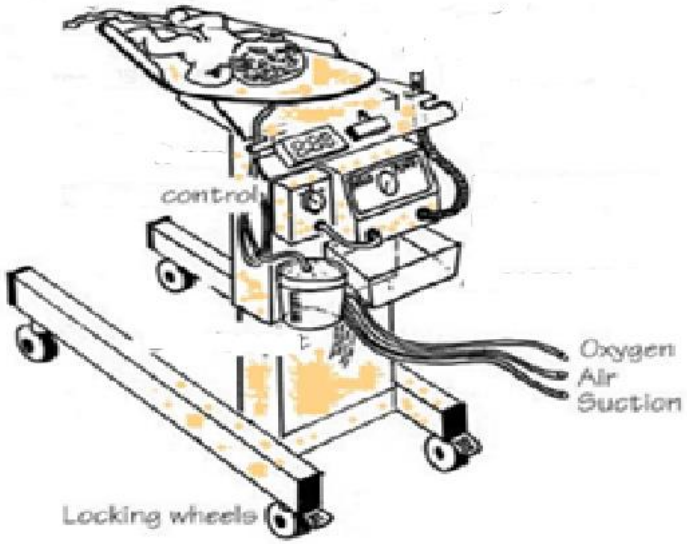
- **This means waiting until breathing is well established and ideally until the cord is white and empty (Wait for White)**

- **For the asphyxiated baby this means providing Motherside resuscitation with an intact cord.**

Facilitating delayed cord clamping when ventilation is anticipated

Hospital table

Glasgow trial of preterm DCC
Aladangady et al



BASICS trolley, adapted by Peter Watt
INNOVATIONS WINNER 2010

LifeStart Trolley
designed by Nick Bettles

This is when a new human being can win or lose.

Giving babies a 'shock free' birth flow

Motherside resuscitation with an intact cord has the potential to - - - - - - -

- Reduce complications at birth, like sepsis, intraventricular hemorrhage (IVH) or necrotizing enterocolitis (NEC)
- Improve survival
- Prevent long term disability
- Reduce the cost of care

From Concord Neonatal

Number of personnel for resuscitation ?

1 2 3 4!

Monitoring equipment

Heart rate

Auscultation with stethoscope ??
Oximetry ??
ECG ??
Other

<u>Documentation</u>

Oxygenation /ventilation

Oximetry
Expiratory CO2
Video laryngoscopy

Length of cord

Team work with simulation practice

Normal birth
Caesarean birth
Assisted vaginal birth

Role of each member, what should be done before neonatal team arrive, position and platform for neonate.

frontiers in Pediatrics

Providing a Placental Transfusion in Newborns Who Need Resuscitation

REVIEW
published: 25 January 2017
doi: 10.3389/fped.2017.00001

Anup C. Katheria, Melissa K. Brown, Wade Rich and Kathy Arnell*

Neonatal Research Institute at Sharp Mary Birch Hospital for Women and Newborns, San Diego, CA, USA

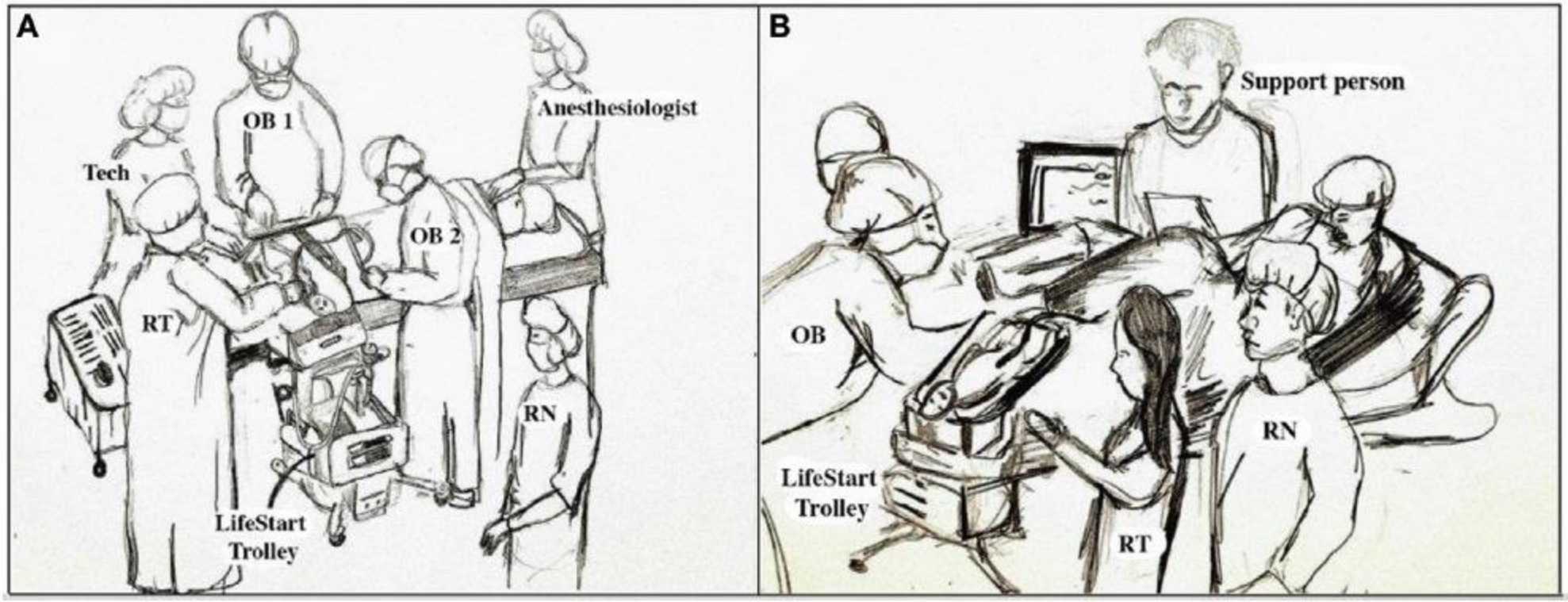


FIGURE 2 | Personnel and equipment arrangement for neonatal resuscitation with an intact umbilical cord. (A) Operating room and **(B)** labor and delivery suite.

Customised resuscitation trolleys - motherside neonatal resuscitation with intact cord

L:ifeStart trolley

VentFirst

Concord Trolley


Thank you
-
Questions ?