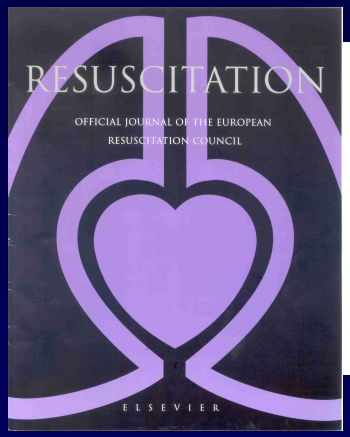
Resuscitation of the newly born

European Resuscitation Council

Definition

The term “newly born” refers specifically to the neonate in the first minutes to hours following birth



Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care –
An International Consensus on Science

The American Heart Association in Collaboration With the International Liaison Committee on Resuscitation (ILCOR)

International guidelines for neonatal resuscitation

International Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care: a Consensus on Science

Resuscitation 2000; 46:3-430

Introduction

- ✓ 5 to 10% of newly born infants have difficulty during the transition phase and may require some form of assistance at birth

- ✓ Ideally, at least one person trained in newborn resuscitation should attend every delivery

Key point

The most important and effective action in neonatal resuscitation is:

Ventilation with oxygen

Evaluation of the newly born

- ✓ Most term newborns do not require any resuscitative intervention at birth
- ✓ Few essential steps are generally followed in every setting:

Warm and dry the baby

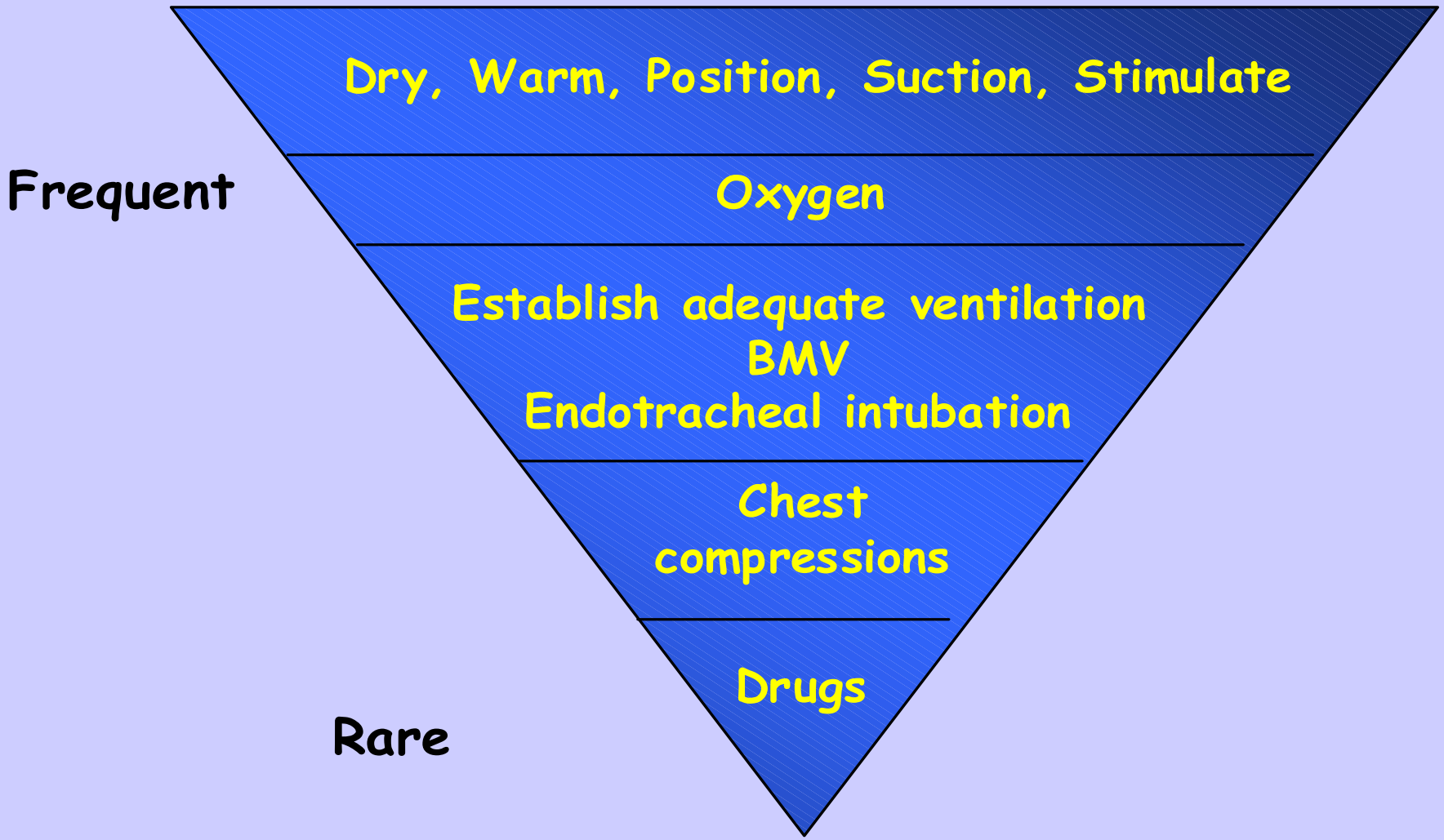
Clear the airway

Asphyxia at birth

- ✓ Haemodynamic adaptation may be delayed or reversed by a number of antepartum or intrapartum factors, which may cause asphyxia

- ✓ The newly born may present apnoeic, hypotonic and cyanotic and may require immediate resuscitative efforts

Resuscitation of the newly born



Evaluation of the newly born

- The Apgar score after 1 and 5 minutes remains the most widely accepted method of neonatal assessment at birth
- Not useful in deciding the need for cardiopulmonary support

Visual inspection of the newly born

- ✓ Clear of meconium
- ✓ Spontaneously breathing or crying
- ✓ Good muscle tone
- ✓ Skin colour pink
- ✓ Term gestation

Evaluation of the newly born

The need for life support interventions will be indicated by the simultaneous evaluation of:

- Respiration
- Heart rate
- Colour

Respiration

- ✓ Good spontaneous respiratory activity may manifest as vigorous crying or adequate breaths

- ✓ IMPORTANT: if apnoea or gasping persist after few seconds of tactile stimulation:

Start positive pressure ventilation immediately

Heart rate

- The heart rate may be evaluated with a stethoscope or by palpation of the pulse at the base of the umbilical cord
- Umbilical pulse is readily accessible and it does not require interruption of ventilation such as during auscultation

Heart rate

If the heart rate is below 100 beats per minute, even if the newly born is breathing:

Positive pressure ventilation with 100% oxygen

Colour

- Colour at birth may vary from normal acrocyanosis to pallor to central cyanosis
- Pallor may indicate a low cardiac output, severe anemia, hypovolemia or acidosis
- Central cyanosis (face, trunk and mucous membranes) indicates hypoxaemia

Colour

If central cyanosis is present in the spontaneously breathing newborn

100% free-flow O_2

Prematurity

- ✓ Increased likelihood of need for resuscitation
- ✓ Asphyxia is much more frequent than the term neonate
- ✓ Major risk of heat loss, respiratory distress and intraventricular haemorrhage
- ✓ Minimising heat loss in preterm infants improves survival

A- AIRWAY
Clearing the airway

- ✓ Positioning of the infant and removal of secretions as needed
- ✓ Secretions should be cleared first from the mouth and then from the nose
- ✓ Neutral or slightly extended position by placing a towel under the infant's shoulders

B - BREATHING & STIMULATION

- ✓ Routine drying and suctioning
- ✓ Alternative methods:
  - rubbing the back
  - flicking the soles of the feet

- ✓ If no response to tactile stimulation occurs within few seconds:

Bag and mask ventilation with 100% oxygen

B - BREATHING
Meconium

- ✓ Meconium staining of the amniotic fluid 10 to 15% of all pregnancies
- ✓ About 5% of newborns with meconium in the amniotic fluid may suffer mild tachypnoea to severe pneumonitis and persistent pulmonary hypertension

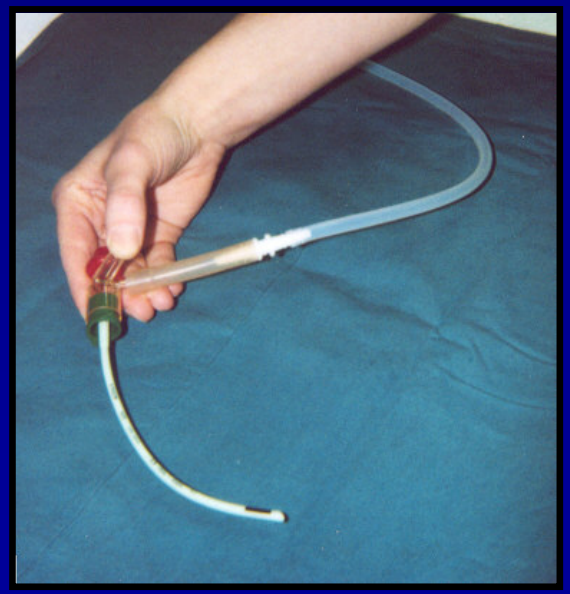
Meconium

Efforts to remove meconium from the oropharynx and trachea must precede any other intervention when assisting a ***depressed newly born***

- absent or inadequate respiration
- heart rate < 100 bpm
- poor muscle tone

Meconium

- ✓ Suctioning of the hypopharynx under direct vision
- ✓ Repeated tracheal intubation and direct suction via the endotracheal tube

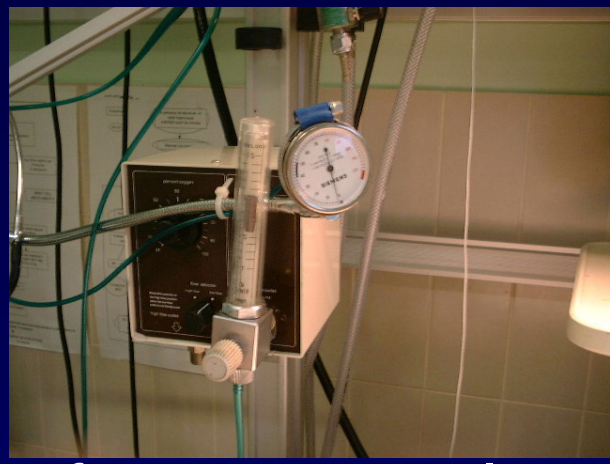


Meconium

Key point

The infant's level of activity, rather than the consistency of meconium, indicates the need for direct tracheal suctioning

B - BREATHING
Oxygen



- ✓ The optimal concentration of oxygen for neonatal resuscitation is still uncertain
- ✓ Increasing data on the use of room air during positive pressure ventilation as an alternative to 100% O_2
- ✓ Further work is needed before making new recommendations

B - BREATHING
Positive Pressure Ventilation

- ✓ Adequate expansion of the lung is often the only and most important measure needed for successful resuscitation
- ✓ Indications for positive pressure ventilation:

- Apnoea or gasping breath
- Heart rate <100 bpm
- Persistent central cyanosis

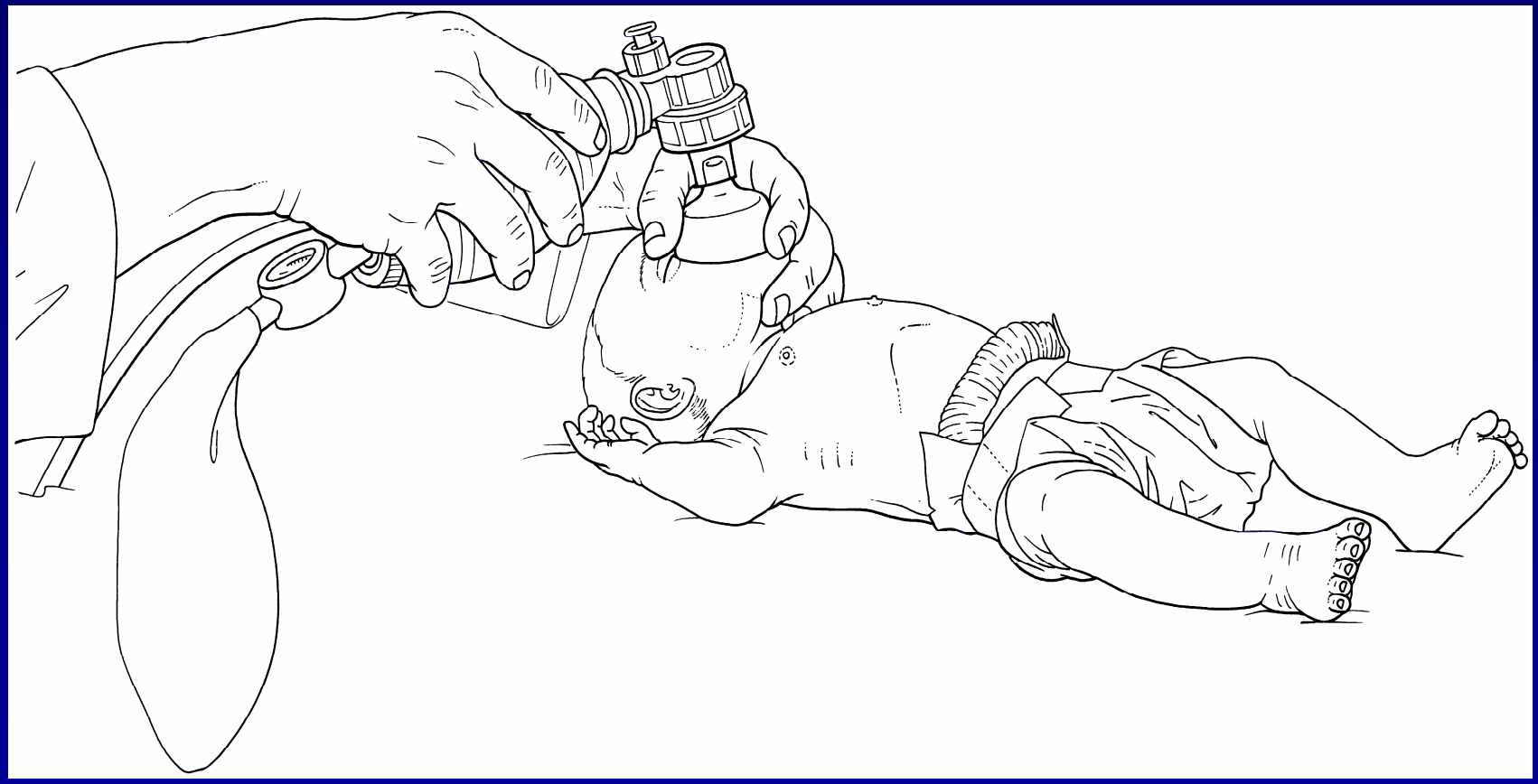
B - BREATHING
Artificial Ventilation

- ✓ Most newborns who require positive-pressure ventilation can be adequately ventilated with a bag and mask

- ✓ BMV should be mastered by all healthcare providers who may be asked to deal with an emergency delivery

Bag and Mask Ventilation

Face masks of various size, with cushioned rims and low dead space



Bag and Mask Ventilation

- If the heart rate is less than 60 bpm, chest compressions must be started while continuing assisted ventilation
- Progress to endotracheal intubation should be considered

Endotracheal intubation

Indications for endotracheal intubation may occur at several points during neonatal resuscitation:

- Tracheal suctioning for meconium (depressed baby)
- BMV ineffective or prolonged
- Chest compressions needed
- Tracheal administration of medications
- Congenital diaphragmatic hernia
- Extreme prematurity
- Transport

Endotracheal intubation

- ✓ A straight blade should be used (size 0 for premature infants, size 1 for term infants)

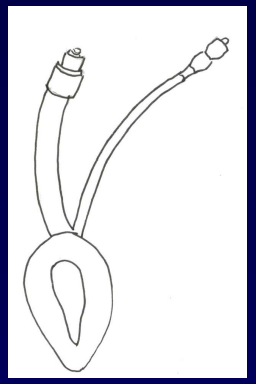
- ✓ An estimate for the correct oral insertion distance of the ET tube use the following formula:

Weight in kilograms + 6 cm
=
insertion depth at lip in cm

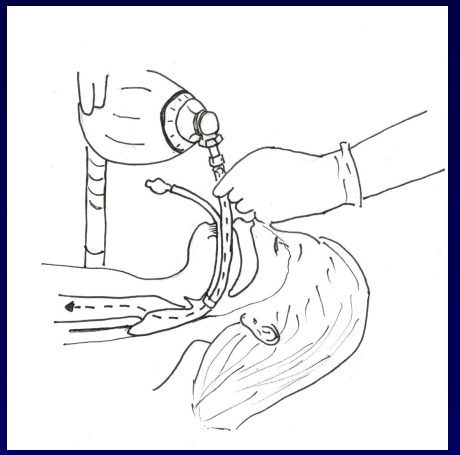
Endotracheal intubation

After the procedure, check successful intubation and correct positioning of the ET tube by the following:

- Normal and symmetric chest wall movements
- Equal breath sounds (axillae)
- Absence of breath sounds or distension over the stomach
- Condensation in the tube during exhalation
- Improvement in heart rate, colour and spontaneous respirations
- Exhaled-CO_2 monitor



Laryngeal mask airway



- Successfully used in the resuscitation of term and near term infants at birth
- Little experience in small preterm infants and in newborns with meconium
- May be an alternative in the case of ineffective BMV or failed endotracheal intubation

C - CIRCULATION
Chest compressions

- ✓ 0.03 to 0.12% of newly borns require chest compressions
- ✓ Bradycardia and asystole are virtually always a result of respiratory failure, hypoxaemia and tissue acidosis
- ✓ Adequate ventilation and oxygenation will be sufficient to restore vital signs in the vast majority of infants

Chest compressions

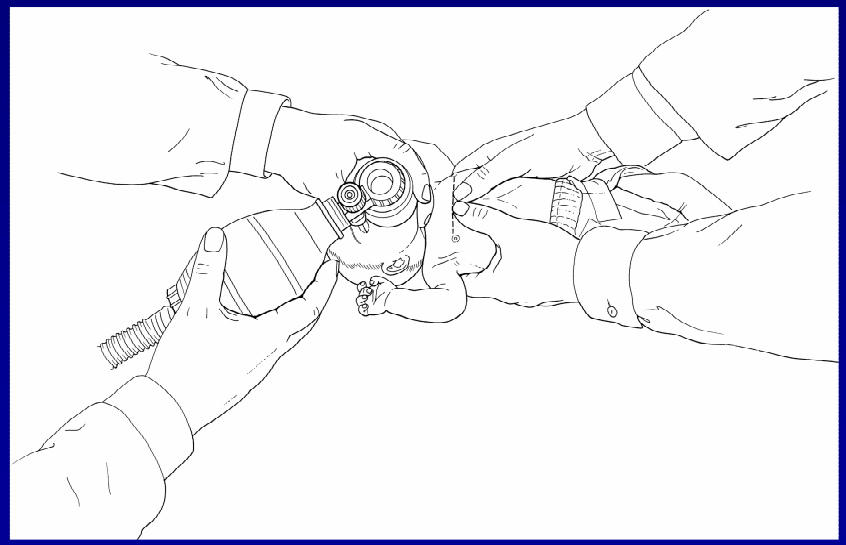
If the heart rate is less than 60 bpm despite 30 seconds of effective positive pressure ventilation with 100% oxygen:

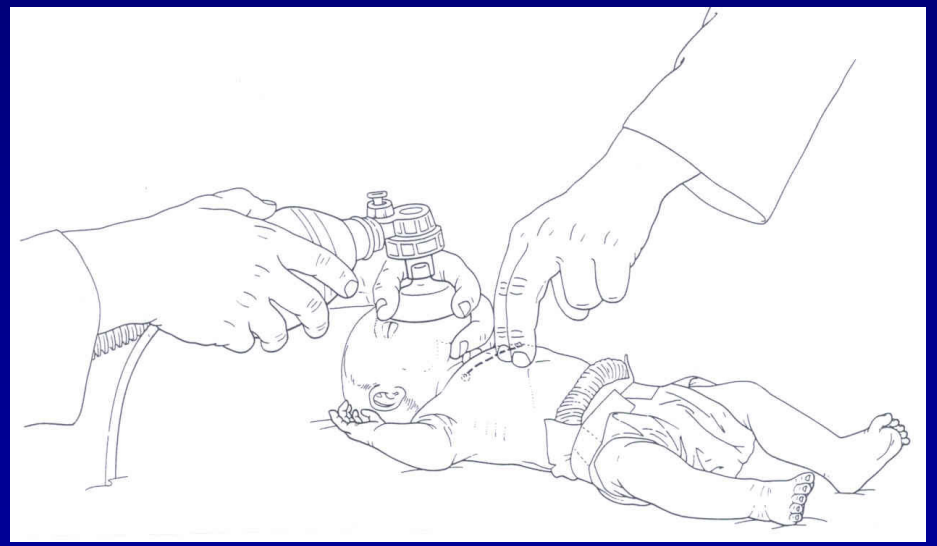
Start chest compressions

Chest compressions

Chest compressions performed in conjunction with ventilation with 100% oxygen

(3 to 1 ratio ➲ 90 compressions and 30 breaths per minute)





Routes of drugs administration

- ✓ Umbilical vein still widely recommended in the delivery room

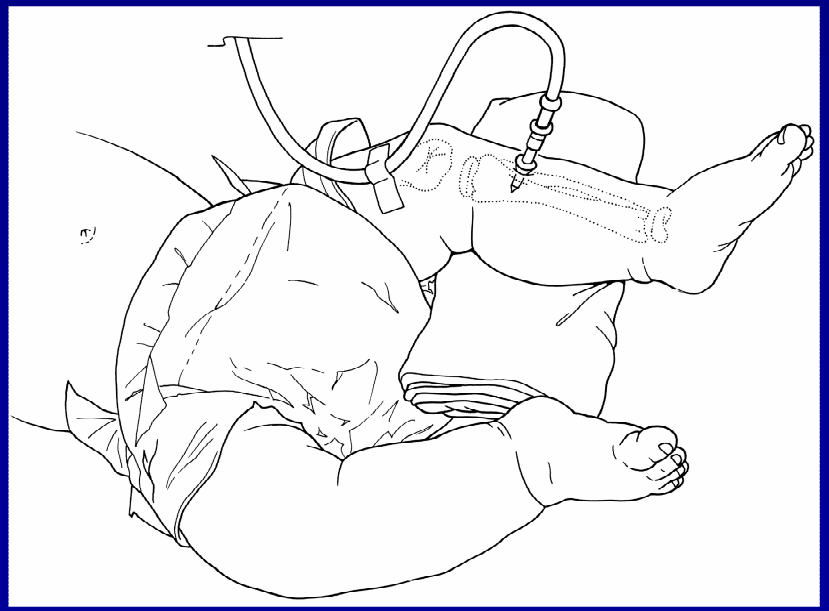
- Umbilical catheterisation may be a challenge for physicians not skilled in neonatal resuscitation

- Tracheal route is a rapid accessible route for drug administration during resuscitation

Intraosseous access

- If fluids and drugs are required and no vascular access is obtained, intraosseous lines may be an effective alternative

- Intravenous access may be required if:
  - no response to adrenaline via ETT
  - need for volume expansion



Emergency drugs and fluids

If heart rate is less than 60 bpm after 30 seconds of adequate ventilation and chest compressions, or in the presence of asystole

Adrenaline

Emergency drugs and fluids

Adrenaline

Dose (I.V., ET or I.O.):

- 0.1 to 0.3 mL/kg of a 1:10.000 solution (0.01 to 0.03 mg/kg)
- repeat every 3 to 5 minutes as indicated

Emergency drugs and fluids

Volume expanders

- ✓ Cristalloids (normal saline or Ringer's lactate) are the fluids of choice for volume expansion
- ✓ If blood loss is likely, O-negative red blood cells

10 ml/kg i.v. over 5 to 10 minutes

Algorithm of resuscitation at birth

Initial assessment of the newly born

- Clear of meconium
- Breathing or crying
- Good muscle tone
- Pink
- Term

YES

- Warm and dry
- Clear the airway

Initial assessment of the newly born

- Clear of meconium
- Breathing or crying
- Good muscle tone
- Pink
- Term

NO

- Warm and dry
- Position
- Clear the airway (*)
- Stimulate
- Give oxygen (if needed)

(*) consider endotracheal intubation

Continue evaluation

- Respiratory activity
- Heart rate
- Colour

- Breathing
- Heart rate > 100
- Pink

- Apnoea or gasping
- Heart rate < 100

Standard care

- **Positive pressure ventilation (*)**
- **Oxygen**

Positive pressure ventilation and oxygen

- Ventilating
- Heart rate > 100
- Pink

→ Ongoing support

Heart rate < 60

- **Positive pressure ventilation (*)**
- **Chest compressions**

Positive pressure ventilation and chest compressions

- Heart rate > 60

→

- Positive pressure ventilation(*)
- Oxygen

- Heart rate < 60

Adrenaline (*)

(via intravenous, endotracheal, intraosseus)

Transport of the newly born

- ✓ Infants transferred under controlled conditions with skilled assistance do arrive at destination in better clinical conditions:
  - warmer
  - less hypotensive
  - less acidotic
- ✓ With such assistance mortality, morbidity and duration of intensive care stay are reduced

Ethics

- Indication for initiation or suspension of resuscitation are debatable in
  - extremely premature infants
  - severe congenital abnormalities
  - infants who do not respond to prolonged resuscitative efforts
- In many countries, non-initiation of resuscitation in the delivery room is appropriate
  - infants with confirmed G.A. <23 weeks or B.W. <400 g
  - anencephaly
  - confirmed trisomy 13 or 18

Ethics

Discontinuation may be appropriate if resuscitation of an infant does not result in spontaneous circulation within 15 minutes