

## **GUIDELINE 13.7**

### **MEDICATION OR FLUIDS FOR THE RESUSCITATION OF THE NEWBORN INFANT**

Medications and fluids are rarely indicated for resuscitation of newborn infants.<sup>1-3</sup> Bradycardia is usually caused by hypoxia and inadequate ventilation. Apnoea is due to insufficient oxygenation of the brainstem. Therefore establishing adequate ventilation is the most important step to improve the heart rate. However, if the heart rate remains less than 60/min despite adequate ventilation (chest is seen to move with inflations) and chest compressions, adrenaline may be needed. As adrenaline exerts its effect by action on the heart it is important to give it as close to the heart as possible, ideally as a rapid bolus through an umbilical venous catheter.

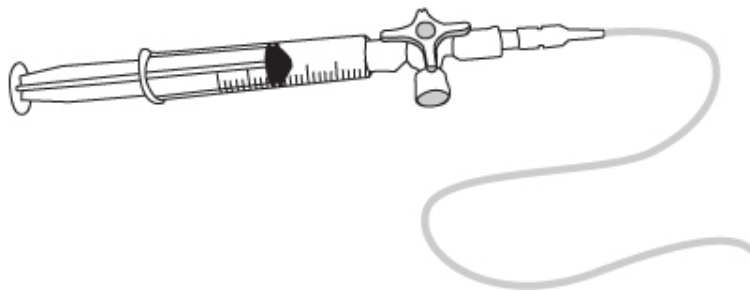
**Be careful that administration of medications or fluids does not detract from the efficiency and continuity of ventilation and chest compressions.**

#### **ROUTES OF ADMINISTRATION**

##### **Umbilical vein**

An umbilical vein catheter (UVC) is the most rapidly accessible intravascular route for adrenaline and it can also be used for fluid administration. It can also be used for continued vascular access until an alternative route is established after admission to a neonatal unit. Blood gases obtained from the UVC during resuscitation are sometimes useful in guiding treatment decisions.

Before insertion, a three-way tap should be attached, and both the catheter and three-way tap should be primed with saline.



UVC, three-way stopcock & syringe prepared for use.

##### **Endotracheal tube**

Only adrenaline (and artificial surfactant) should be given via the endotracheal tube. Adrenaline is given in a higher dose (e.g. 50-100 mcg/kg) than when given I.V. There is little research to inform and there are concerns this dose may still result in a lower level of adrenaline than the intravenous route.<sup>4,5</sup>

### **Peripheral vein**

Inserting a peripheral venous cannula can be very difficult in a shocked neonate and can take too long.

### **Intraosseous lines**

Intraosseous lines are not commonly used in neonates because of the more readily accessible umbilical vein, the fragility of small bones and the small intraosseous space, particularly in a premature infant. However, depending on operator training and experience, this route can be used as an alternative, especially if umbilical or direct venous access is not available [Class B, LOE IV<sup>6,7</sup>].

### **Umbilical artery**

The umbilical artery is not recommended for administration of resuscitation drugs. There are serious concerns that complications may result if vasoactive or hypertonic drugs (e.g. adrenaline or sodium bicarbonate) are given into an artery.

## **TYPES AND DOSES OF MEDICATIONS**

### **Adrenaline**

#### **Indications**

If adequate ventilation and chest compressions have failed to increase the heart rate to > 60 beats per minute within about a minute, then adrenaline should be given intravenously as soon as possible [Class A, expert consensus opinion<sup>1,2,8</sup>]

However, if intravenous access is not available, and adequate ventilation and chest compressions have failed to increase the heart rate to > 60 beats per minute, then it is reasonable to administer endotracheal adrenaline [Class B, LOE IV<sup>9,10</sup>]. If the intratracheal dose is not effective, an intravenous dose should be administered as soon as possible [Class A, expert consensus opinion<sup>1,2,8</sup>]

#### **Dosage**

The recommended intravenous dose is 10-30 microgram/kg (0.1-0.3 mL/kg of a 1:10,000 solution) by a quick push [Class A, expert consensus opinion]. (1 mL contains 0.1mg of adrenaline, so 0.1 mL = 10 microgram of adrenaline). It should be followed by a small saline flush. This dose can be repeated every few minutes if the heart rate remains <60 beats per minute despite effective ventilation and cardiac compressions. The studies in newborn infants are inadequate to recommend routine use of higher doses of adrenaline. Based on studies in children and young animals, higher doses may increase risk of post-resuscitation mortality and risk of intracranial haemorrhage and are not recommended [Class A, expert consensus opinion<sup>11-13</sup>].

There is insufficient evidence for the use of endotracheal adrenaline, but it is likely that a higher dose will be required to achieve similar blood levels and effect. If the tracheal route is used, doses of 50-100 microgram /kg (0.5-1 mL/kg of a 1:10,000 solution) should be used [Class B, extrapolated evidence<sup>14,15</sup>]. The efficacy and safety of these doses has not been studied.<sup>8</sup>

## **Volume Expanding Fluids**

### **Indications**

Intravascular fluids should be considered when there is suspected blood loss, the infant appears to be in shock (pale, poor perfusion, weak pulse) and has not responded adequately to other resuscitative measures [Class A, expert consensus opinion]. Isotonic crystalloid (normal saline) should be used in the first instance, but may need to be followed with blood suitable for emergency transfusion, in the setting of massive blood loss.<sup>8</sup>

Since blood loss may be occult, in the absence of history of blood loss, a trial of volume administration may be considered in babies who are not responding to resuscitation [Class B, expert consensus opinion<sup>8</sup>]. However, in the absence of history of blood loss, there is limited evidence of benefit from administration of volume during resuscitation unresponsive to chest compressions and adrenaline [LOE IV<sup>16</sup>], and some suggestion of harm from animal studies [LOE extrapolated evidence<sup>17, 18</sup>].

### **Dosage**

The initial dose is 10 mL/kg given by IV push (over several minutes) [Class B, expert consensus opinion]. This dose may be repeated after observation of the response.

### **Other Drugs**

Very rarely, a narcotic antagonist (naloxone) or sodium bicarbonate may be useful after resuscitation.<sup>8</sup>

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