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Clinical Paper

Auditing resuscitation of preterm infants at birth by recording video and physiological parameters☆

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ABSTRACT

Objective: To evaluate compliance with neonatal resuscitation guidelines during resuscitation of preterm infants by video recording of delivery room management and monitoring physiologic parameters.
Methods: The delivery room management of preterm infants at birth was recorded by an independent researcher. Physiological parameters (airway pressures, gas flow, tidal volume, heart rate and oxygen saturation) were measured, use of supplemental oxygen was noted and a video of the resuscitation was recorded. All signals were digitised and recorded using specially designed software. The delivery room management was then evaluated and compared with the local resuscitation guidelines.
Results: Thirty-four infants were included with a mean (SD) gestational age of 30.6 (3.2) weeks and birth weight of 1292 (570) g. Time from birth to initial evaluation was longer than recommended (65 (15) s). Respiratory support was started at 70 (23) s. In 7/34 infants (21%), interventions were performed according to guidelines. In 25/34 infants (74%), one or more respiratory interventions were not performed according to guidelines. In 10/34 infants (29%), one or more non-respiratory interventions (mainly related to the prevention of heat loss) were not performed according to guidelines. The presence and adequacy of spontaneous breathing was difficult to judge clinically. In almost all occasions (96%) the information from the respiratory function monitor was not used.
Conclusions: Neonatal caregivers often deviate from resuscitation guidelines. Respiratory function monitoring parameters were often not used during resuscitation. A difficult part of neonatal resuscitation is subjectively assessing spontaneous breathing.

1. Introduction

National and international guidelines with step-by-step flow charts on how to perform optimal resuscitation are available for caregivers to improve neonatal resuscitation and outcome. Although caregivers are recommended to follow guidelines, the stressful and sometimes unpredictable character of resuscitation can make it difficult to strictly follow guidelines. One study found a significant number of deviations from the Neonatal Resuscitation Program guidelines.[1] Video recording is considered useful for monitoring[2] and the detection of problems during resuscitation and it is believed to be helpful to improve resuscitation practice.[3] However, video monitoring is subjective and it is difficult to judge the adequacy and effect of ventilation on video. Studies have shown that the judgment of characteristics such as colour, heart rate by auscultation and chest excursions shows large inter- and intrapersonal variability.[4,5]

In Leiden, recording physiological parameters simultaneously with video during neonatal resuscitation is considered as standard of care and is performed when time is available to set up the equipment. With the parent's consent, the recordings are used for training, audit and research purposes. This approach makes it possible to evaluate resuscitation more objectively.

The aim of this study was to evaluate the delivery room management of preterm infants by the team in our unit by recording video and physiological parameters and comparing it with the local resuscitation guidelines. We hypothesise that caregivers deviate

Abbreviations: PPV, positive pressure ventilation; PIP, peak inspiratory pressure; PEEP, positive end expiratory pressure.

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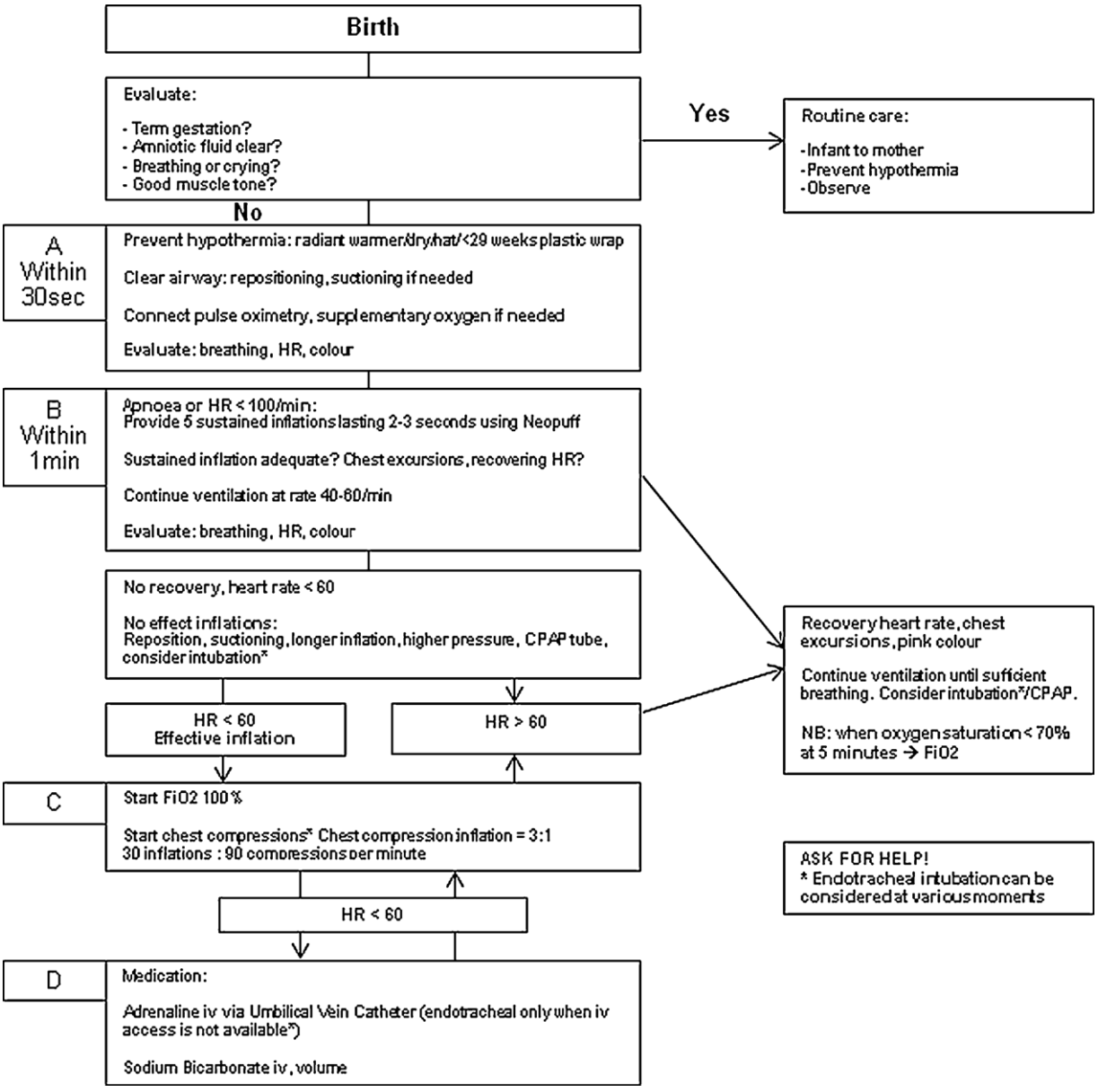

Fig. 1. Leiden University Medical Center flow algorithm for resuscitation of neonates at birth. HR: heart rate, CPAP: continuous positive airway pressure, FiO_2: fractional inspired oxygen.

from the guidelines during neonatal resuscitation and that the subjective, clinical assessment of the condition of the infant is often inaccurate.

2. Methods

This prospective observational study was performed in the department for neonatal intensive care of the Leiden University Medical Center, a tertiary level perinatal care centre in Leiden, the Netherlands, with an average of 650 admissions per year.

During the study period our local neonatal resuscitation guidelines were based on international guidelines (ILCOR 2006, European Resuscitation Council 2005),[6,7] and national guidelines (Dutch Organisation for Paediatrics 2008 guidelines).[8] The resuscitation algorithm of our local guideline used at the time of the study is shown in Fig. 1.

To provide respiratory support, it was recommended to start with five initial sustained inflations of 2–3 s and if necessary followed by consecutive inflations, using a peak inspiratory pressure (PIP) of 20 cm H_2O and a positive end expiratory pressure (PEEP) of 5 cm H_2O, a gas flow rate of 8 L/min and air.[6,8]

Resuscitation was performed by neonatologists, neonatal fellows or supervised registrars using a flow resistor T-piece infant resuscitator (Neopuff; Fisher & Paykel Healthcare, Auckland, New Zealand) in combination with an appropriate sized Laerdal silicone round mask (Laerdal, Stavanger, Norway) or nasopharyngeal tube (endotracheal tube cut at 7 cm) to deliver non-invasive ventilation. When intubation was required an appropriate sized endotracheal tube was inserted nasally.

A Florian respiratory function monitor (Acutronic Medical Systems, AG, Switzerland) was used to record respiratory parameters. It uses a small hot wire anemometer as a sensor to detect gas flow. The flow sensor was placed between the T-piece and the