NEONATAL RESUSCITATION

(WHAT THE ANAESTHESIOLOGIST NEEDS TO KNOW)

An essay submitted for partial fulfillment of master degree in anaesthesia

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TO:
MY DEAR FATHER
MY BELOVED MOTHER

ALL MEMBERS OF MY FAMILY AND FRIENDS

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ABBREVIATIONS

ACOG	American College of Gynaecologists and Obstetricians
AFI	Amniotic Fluid Index
AHA	American Heart Association
AM	Alveolar Macrophage
ASA	American Society of Anesthesiologists
ATP	Adenosine Triphosphate
BLS	Basic Life Support
BP	Blood Pressure
bpm	Beat per minute
C	Capillary
CDH	Congenital Diaphragmatic Hernia
CP	Cerebral Palsy
CPAP	Continuous Positive Airway Pressure
CPR	Cardio-pulmonary resuscitation
CSF	Cerebro-spinal fluid
CST	Contraction Stress Test
E	Epinepherine
EFM	Electro-foetal monitoring
ENDO	Endothelial cells
ERY	Erythrocyte
ET	Endo-tracheal
ETT	Endo-tracheal tube
EXP	Expiration
FFA	Free Fatty Acids
FHR	Foetal Heart Rate
g	Gram
HIE	Hypoxic Ischaemic Encephalopathy

HIV	Human Immuno-defeciency Virus
hr	Hour
IA	Intermittent Auscultation
ICU	Intensive Care Unit
IM	Intramuscular
INSP	Inspiration
IV	Intravenous
kg	Kilogram
L	Liter
LGA	Large for Gestational Age
LM	Lamellar bodies
LMA	Laryngeal Mask Airway
MAP	Mean Arterial Pressure
MAS	Meconium Aspiration Syndrome
mEq	Milli Equivelant
MES	Mesenchymal cells
mg	Milligram
mL	Milli Liter
N	Nucleus
NE	Norepinepherine
NEC	Necrotizing Enterocolitis
NIH	National Institutes of Health
NST	Non Stress Test
OR	Operating Room
PBI	Protein Binding Iodine
PGE_2	Prtostaglandin E_2
PIH	Pregnancy Induced Hypertension
PPHN	Persistent Pulmonary Hypertension of Newborn
PPROM	Preterm Premature Rupture of Membrane

PPV	Positive Pressure Ventilation
PROM	Premature Rupture of Membrane
REM	Rapid Eye Movement
REP	Rough Endoplasmic Reticulum
RH	Rhesus Factor
SGA	Small for Gestational Age
SIADH	Syndrome of Inappropriate Antiduretic Hormone
SP	Surfactant Protein
SQ	Subcutaneous
TSH	Thyroid Stimulating Hormone
***u*g**	Microgram

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INTRODUCTION

The resuscitation of newborns at birth is different from the resuscitation of all other age groups and knowledge of the relevant physiology and pathophysiology is essential. The transition from foetal to neonatal life at birth involves a number of dramatic physiologic changes. In the majority of cases, this transition occurs smoothly and rapidly, without the need for any resuscitative efforts. However, a number of adverse maternal and foetal conditions that may interfere with the neonates's ability to make this adaptation successfully develop in approximately 5% to 10% of all deliveries **(Saugstad et al, 1998)** and approximately 1% to 10% born in the hospital area reported to require assisted ventilation **(Palme-Kilander, 1992).** In these instances, resuscitative efforts must be initiated quickly. Because the need for assistance cannot always be predicted accurately, all personnel involved in the delivery room care of the newborn should be adequately trained in neonatal resuscitation **(Wolkoff and Davis, 1999).**

The manner in which a depressed newborn is cared for in the first few minutes of life can directly affect the quality of his or her life and have lifetime consequences. It is estimated that in 50% of the cases of intrapartum asphyxia, prompt resuscitation

could prevent long-term injury **(Wimmer, 1994)**. Even in neonates without an initial heart rate, 66% could be resuscitated and leave the delivery room. For optimum resuscitation success, all the equipments necessary for a complete resuscitation must be in the delivery room and fully operational at the time of all deliveries. Also, at every delivery, there should be at least one person who has the skills required for neonatal resuscitation. Should this person be the anaesthiologist who is responsible for the care of the mother? **(Gaiser et al, 2001).**

The American Society of Anaesthiologists (ASA) has published guidelines for anaesthesia in obstetrics. Qualified personnel other than the anaesthiologists attending the mother should be immediately available to assume responsibility for resuscitation of the newborn. It provides further clarification by stating, "The primary responsibility for the anaesthisiologist is to provide care to the mother. If the anaesthesiologist is also requested to provide brief assistance in the care of the newborn, the benefit to the child must be compared to the risk of the mother". The American College of Obstetricians and Gynaecologists (ACOG) also concur with this opinion, stating; "A qualified person who is skilled in neonatal resuscitation should be in the operative delivery room, with all equipments needed for neonatal resuscitation, to care for the neonate. The duties of the

surgical and anaesthetic team may prevent them from performing immediate neonatal care of the newborn". Although both of these stances clearly favour that the responsibility of resuscitating the newborn belongs to an individual other than anaesthesiologist, anaesthesiologists may occasionally become involved in neonatal resuscitation. Despite the existing guidelines, studies demonstrated that anaesthesiologists continued to provide neonatal resuscitation **(Hawkins et al, 1997) (Gaiser et al, 2001).**

NEONATAL ADAPTATION TO EXTRAUTERINE LIFE

By the end of normal-term gestation, the foetus and its lungs are well prepared to assume responsibility for extrauterine gas exchange. The alveoli are developed by the 25^{th} week of gestation, and, by the 35^{th} week, the type II great alveolar pneumocyte has begun to produce adequate quantities of the surface-active material on which alveolar stability will later depend, once air breathing commences. In utero, the alveoli are open and stable at nearly the normal neonatal lung volume because they are "inflated" by a foetal lung liquid, probably produced by ultrafiltration of pulmonary capillary blood as well as secretion by alveolar cells **(Higuchi et al, 1987) (Nelson, 1999).**

The pulmonary and bronchial circulations are well developed and thoroughly admixed by multiple connections at the alveolar level. This combined circulation is characterized by high pressure and low flow because of a high degree of both passive and active pulmonary vascular resistance. The passive resistance most likely relates to compression of pulmonary capillaries by the foetal lung liquid **(Walker et al, 1988),** but there also is a high degree of active vasomotor tone resulting from the hypoxic level (PO_2 of 25