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Pediatric Physiology for Anesthesiologists

NPO	Hours	Fetal Circulation Feature	Reason	Estimated Blood	Volume
Clears	2	Low SVR	Placenta	Premature	90-100 ml/kg
Breast Milk	4	High PVR	Fluid in lungs, hypoxic environment	Term neonate	80ml/kg
Formula, Milk	6	High Pulm artery pressure		1 year old	75 ml/kg
Full Meals	8	Ox blood from the umb vein directly to brain & heart	Bypasses RV & liver via for. ovale & ductus venosus respectively	Adult	70ml/kg

Drug Interactions with ADHD Stimulants	Effects	Resp Equations	
Sympathomimetics	Inc CV effects	Alveolar Ventilation	$V_A=\frac{(P_B-47)xVco_2}{PaCO_2}$
Methylphenidate, Dexamphetamine	Increase Anesthesia Requirements	Physiologic Dead Space	$Vd/Vt=\frac{Paco_2-P_{ETCO_2}}{Paco_2}$
Tramadol, SSRIs, Tricyclics	Exacerbates Seizure activity	Diffusion Capacity of CO	$DLCO=\frac{Vco}{P_{ACO}-Pcco}$

LMA	Weight (kg)	Neonatal Wt.	ETT Size	Blade
1	<5	<1 kg	2.5mm	Miller 0
1.5	5-10	1-2kg	3.0mm	Miller 0
2	10-20	2-3kg	3.5mm	Miller 0/1
2.5	20-30	>3kg	3.4-4mm	Miller 0/1

Age	Birth	6 months	12 month	2-10 years
RR	47	38	26	30 (2-6yo), 25 (6-10)
Awake HR	100-180	80-150	80-150	70-110

Severity of Dehydration	Mild	Moderate	Severe
Fluid deficit (ml/kg)	50	100	150
Urine Flow (ml/kg/hr)	<2	<1	<0.5
Spec. Gravity	1.02	1.020-1.030	>1.030
Hypernatremia ICFV (intracellular Fluid Volume)	May lead to underestimation	Due to loss of ICFV to preserve ECFV	Sx- Doughy, velvety skin, lethargy, seizures

Water Deficit	Former TBW-Current TBW
Current TBW (Total Body Water)	Ex. 65% of body weight (kg)
Former TBW	$\frac{\text{Current Na x Current TBW}}{\text{Desired Na}}$

Blood Gas	Approx Pao_2	Approx $Paco_2$	Approx Sat	pH
Woman at Term Preen	87	32	96	7.4
Umb V.	31	4	71	7.35x
Umb A.	19	51	37	7.29
1st Hour of life (artery)	62	28	95	7.36

Equations		Equation	
$V_E=V_T xf$	Ventilation=Tidal vol. x frequency	Cao2=[Sao2/100xHbx1.34]+Pao2x 0.003ml O2/mmHg	Oxygen content
$R=8l\eta/\pi r^4$	Resistance Formula	BP=COxSVR	Blood Pressure
VA=(PB-47)xVC02/Paco2	Alveolar Ventilation	SVR=MAP-CVP/CO x80	Systemic Vascular Resistance

Age	Response to Hypoxemia
2-3 wk of life	Transient increase in ventilation then sustained depression
32-27 wk of life	Initial hyperpnea is abolished by cool environment
after 3 wk of life	Hypoxemia induces sustained hyperventilation
Premature infants	Biphasic response exists after 25 days

Hepatic Clearance	CLH=QH x EH	QH= Liver Blood Flow	EH= Hepatic Extraction Ratio
High QHx (CL dep. on QH)	lidocaine, fentanyl	propofol	sufentanil
Low QHx (CL dep more on metabolism not so much QH)	methadone	diazepam	alfentanil

References

Smith's Anesthesia for Infants and Children, 2011 Eight Ed. P.21, 27,34,57,101