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EVALUATION OF PULSE OXIMETER ACCURACY IN NEONATES
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The Nellcor 100C pulse oximeter was studied with the following objectives: 1) to compare its reading with functional and fractional arterial oxygen saturation (SaO₂), and 2) to establish 95% prediction intervals for individual pulse oximeter readings. Four arterial samples were obtained from each of 16 neonates less than 7 days of age, and compared to simultaneous pulse oximeter readings. Fetal hemoglobin was quantified on each infant (range 19-99%). Fractional SaO₂ was measured on the IL 282 co-oximeter and corrected for carboxyhemoglobin (Clin Chem 1983;29:1555). Fractional SaO₂ was converted to functional SaO₂:

$$\text{Functional SaO}_2 = \frac{\text{Fractional SaO}_2 \times 100}{100 - (\text{COHb} + \text{MetHb})}$$

We found: 1) the pulse oximeter reading was closer to fractional SaO₂ (p < 0.001). Agreement must be reached on whether to use fractional or functional SaO₂ as the gold standard with which to compare pulse oximeter readings. 2) The width of the prediction interval was 12-13%. Thus with a reading of 90%, the SaO₂ could be as low as 85%, or as high as 98%. The wide span of this prediction interval must be considered when using the pulse oximeter to control oxygen therapy in neonates.

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ACQUIRED IMMUNODEFICIENCY SYNDROME IN CHILDREN: OUTCOME FOLLOWING ASSISTED VENTILATION. Ann Di Maio-Hunter, Daniel A. Notterman, James D. Wilkinson, Bruce M. Greenwald, Keith Krasinski. Dept. of

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The outcome of children with the Acquired Immunodeficiency Syndrome (AIDS) with acute respiratory failure (ARF) requiring assisted ventilation (AV) was evaluated. All admissions <18 yrs who met CDC criteria for AIDS, were HTLV-III antibody positive, and received AV were analyzed. Two groups resulted: 1) AV for ARF and 2) AV for non-ARF (lung biopsy, bronchoalveolar lavage, shock, apnea). 20 PICU admissions met study criteria; 8 for ARF (40%) and 12 for non-ARF (60%). Mortality from ARF (7/8, 88%) was significantly higher than for non-ARF (3/12, 25%; p=0.02, Fishers 2-tailed). From lung biopsy or lavage in 17 patients, pneumocystis carinii (PCP) was the most frequently identified pathogen (11 of 17, 65%). The incidence of PCP did not differ significantly between ARF (3/8, 38%) and non-ARF patients (8/12, 67%) nor between survivors (5/10, 50%) and nonsurvivors (6/10, 60%). Children with AIDS who develop ARF requiring AV have a very poor prognosis compared to those receiving AV for other reasons. These results may be important to decisions regarding institution of AV in children with AIDS who develop ARF.

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THE EFFECT OF BLOOD TRANSFUSION THERAPY (Tx) ON OXYGEN UTILIZATION (O₂U_t) IN INFANTS WITH CHRONIC LUNG DISEASE (CLD). Verena H. Isken, Dale C. Alverson, Ronald S. Cohen (spon. by William Berman, Jr.) Univ. of Heidelberg, Heidelberg, FDR, Univ. of New Mexico, Dept. of Pediatrics, Albuquerque, New Mexico, 87131.

To assess the impact of Tx on O₂U_t in infants with CLD, we measured non-invasively oxygen consumption (VO₂) and the variables of systemic oxygen transport (SOT) pre and 24 hr post Tx in ten O₂ dependent infants with CLD. The infants had been born with a mean gestational age of 27.6 wks and a mean birth weight of .88 kg. Study weight averaged 1.24±.35 kg and study age averaged 5.5±2.4 wks. F_iO₂ requirements averaged .41±.15 to maintain an O₂ saturation (S_aO₂) of .93±.02. VO₂ was measured using a commercially available analyzer (MGM Jr) via a flow-through circuit and pump connected to a hood or in-line with the ventilator. Cardiac output (Q) was calculated using pulsed Doppler ultrasound technique. S_aO₂ was measured using transcutaneous pulse oximetry. Hemoglobin concentration [Hb] was determined using standard spectrophotometry methods. The coefficient of O₂U_t was calculated as VO₂/SOT, where SOT=Q x [Hb] x S_aO₂ x 1.34ml O₂/gm Hb. Tx consisted of packed RBC's, 10cc/kg. Summary of results of Tx are shown in the table: (Mean ± SD)

| | [Hb] (gm/dl) | S _a O ₂ | Q (ml/min/kg) | SOT (mlO ₂ /min/kg) | VO ₂ (mlO ₂ /min/kg) | O ₂ U _t (VO ₂ /SOT) |
|---------|-----------------|-------------------------------|------------------|-----------------------------------|---|---|
| pre Tx | 11.2±.09 | .93±.02 | 263±74 | 36.2±9.5 | 10.4±2.6 | .31±.13 |
| post Tx | 14.8±1.3 | .93±.02 | 229±55 | 42.9±12.5 | 9.4±1.7 | .24±.10 |
| p | <.001 | NS | NS | <.05 | <.01 | <.01 |

O₂U_t fell in all subjects, except one, after transfusion. Subjects with higher coefficients of O₂U_t fell more substantially, suggesting a physiologic benefit of Tx in selected patients.

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STATIC ELECTRICITY (SE) IN NEONATAL INTENSIVE CARE UNIT (NICU) ENVIRONMENT. Lucky Jain, Dharmapuri Vidyasagar. University of Illinois at Chicago, Department of Pediatrics, Chicago, Illinois.

The presence of SE and its potential hazard to infants in NICU is not well recognized. We therefore quantified the SE generated on equipment, patients and personnel in our NICU. A specially designed isolated plate monitor was used consisting of a 6" square steel plate whose potential is monitored by an electrostatic field meter probe. (SIMCO CORP HATFIELD, Pa). The monitor is chopper stabilized to provide drift free readings. 45 sets of SE measurements taken on different days in our NICU are shown in Kilovolts (KV). $\bar{x} \pm \text{SD}$. Relative humidity ranged from 40 to 62% during study.

| Personnel | Equipment | Patients |
|-------------|--------------|------------|
| St. Clothes | Scrubs | Monitors |
| 1.1±0.52 | 0.54±0.16 | 0.08±0.01 |
| | Vent. Tubing | Isolette |
| | 0.44±0.09 | 0.58±0.12 |
| | | NICU |
| | | 0.04±0.009 |

Wiping isolettes, monitors, tubing, saran wrap, etc, increased SE many folds. Static changes of upto 14 KV were recorded from isolettes and saran wraps wiped with dry cloth. We further studied effects of discharge of SE from surface charged up to 1KV on skin of 3 premature baboons under continuous monitoring of central BP, CVP and EKG. No recordable changes were produced in these. A study into effects of sudden discharge of larger amounts of SE in the vicinity of indwelling catheters in sick premature baboons is now in progress. We conclude that large amounts of SE exist in the NICU. Besides having the potential for causing injury to sick newborns, SE promotes collection of dust particles in close proximity to the newborn, thus increasing the risk of nosocomial infections. Precautions should be taken to decrease SE in NICU.

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BASE DEFICIT DURING CARDIAC ARREST SECONDARY TO RESPIRATORY FAILURE IN IMMATURE PIGS. Larry Jefferson, David Fisher, John Rosborough,

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Recent studies suggest that NaHCO₃ may be detrimental in treatment of cardiac arrest from ventricular fibrillation. The American Heart Association (AHA) recommends limited use of NaHCO₃ (initial dose 1 mEq/kg). In children respiratory failure is the major cause of cardiac arrest; so these studies may not apply. The purpose of our study was to determine base deficit (-BE) at the time of cardiac arrest due to respiratory failure in immature pigs. 10 minipigs (8.0-9.5kg) were anesthetized with pentobarbital and ventilated. Catheters were placed in the aorta and pulmonary artery. The endotracheal tubes were clamped (9.3±3.1 min) to produce asphyxia causing electromechanical dissociation (EMD) (Aortic pressure (PAO) <30 mmHg). (PAO), arterial blood gases and lactates were measured during a baseline (BL), at time of EMD and 3 min of EMD (EMD3)

| | pH | -BE (mEq/L) | Lactate (mg/dl) | Heart Rate (beats/min) | PAO:systolic (mmHg) |
|------|------------|----------------|--------------------|---------------------------|------------------------|
| BL | 7.41±0.05 | 1.8±2.2 | 31.9±9.8 | 185±36 | 142±21 |
| EMD | 6.81±0.22* | 19.5±9.5* | -- | 50±19* | 30±0* |
| EMD3 | 6.81±0.18 | 22.0±7.7 | 83.9±23.1* | 28±20* | 11±8* |

* different from preceding value p < 0.001

All piglets developed metabolic acidosis that would require at least 6 mEq/kg of NaHCO₃ for partial correction (-BEx Weight in kg x 0.3). We conclude that cardiac arrest secondary to respiratory failure results in a -BE which is not treated with resuscitation practiced according to current AHA guidelines.

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ANATOMY OF FEMORAL VESSELS IN INFANTS AND GUIDELINES FOR VENOUS CATHETERIZATION. Robert K. Kanter, Jan M. Gorton, Kathy Palmieri, Joy M. Tompkins, Frank Smith, (Spon. by Roger E. Spitzer). SUNY, Health Science Center, Departments of Pediatrics and Surgery, Syracuse, N.Y.

An ultrasound study was performed to formulate and validate guidelines for femoral venous catheterization. 36 infants (2 wk to 20 mo) were evaluated in a supine, straight leg position. The sector scan transducer was oriented vertically and perpendicular to the axis of the femoral vessels, 1 cm below the groin skin crease. No difference was detected in distance between central points of veins and arteries bilaterally and distance between vessels was not related to age, height, or weight (p>.05). Because symmetry was demonstrated, further evaluation was performed on the right side only. Guidelines were formulated from observations in half the patients, and independently validated by inspection of scans of the others, with random selection of groups. For 18 patients, the central point of femoral veins lay 5.3mm medial to the central point of the artery. Hypothetical success in catheterization of the other 18 patients was evaluated by assuming that successful catheterization requires entering the central half of the vein's horizontal diameter. It was also assumed that the central point of the artery corresponds to the palpable pulse. Successive needle insertion attempts first at 5.3mm, then 6.3mm, and finally at 4.3mm medial to the pulse would result in cumulative successful IV catheterization in 11/18 (61%), 12/18 (67%), and 14/18 (78%), respectively. No arterial punctures would result from the first 2 attempts, but 2/18 (11%) would occur from the attempt closest to the artery. Among both extremities in all 36 patients, the vein was located inaccessibly behind the artery in 2/72 in 2 different infants.