NPS

Exam Review

Neonatal/Pediatric Specialty Exam

Supplemental Study Guide

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Patient Data

Fetal & Maternal Patient Data

I Patient Information (LEVEL 1)

A. Maternal History

Assessment of the mother is primarily intended to assess and prepare for risks and problems that may occur in the newborn. Knowing risk factors can help the therapist anticipate some types of problems.

1. Immunizations

   Children may receive immunization agents to help prevent future disease conditions. Some immunizations are required by law. Examples of immunizations include:

   a. Chickenpox (Varicella)
   b. Flu (Influenza)
   c. Hepatitis A.
   d. Hib.
   e. Polio.
   f. Pneumococcal
   g. Rotavirus
   h. Whooping cough (Pertussis)

Neonatal & Infant Patient Data

A. Temperature

a. Therapeutic hypothermia
   1) Also called targeted temperature management
   2) Takes advantage of the body's response to slow metabolism and decrease tissue oxygenation consumption when core body temperature is reduced below normal.

   3) Especially helpful in retarding inflammation processes and allowing the body to recuperate after an event such as cardiac arrest. The hypothermic condition decreases demands on the heart.

B. Bedside Patient Data

1. Upper airway cultures
   a. Nasal swabbing
   A sterile swab is inserted into the rear nasal area to obtain a sample of secretions to be analyzed for pathogenic organisms and viruses. This is the key method of diagnosing RSV (respiratory syncytial virus).

   b. Tracheal aspirate
   When sputum analysis is desired

2. Capillary blood gases (CBG)
   a. Blood can be extracted from an external bleeding site, usually created purposefully.

   b. Most often done on infants, a common site is the heel of the foot, often called a heel stick.

   c. The heel is cut or pricked to cause blood to rise to the surface. It is then collected in a small glass tube.

   d. CBG values
      1) used to assess CO2 and pH values mostly.

      2) CO2 and pH values are the same as arterial – therefore, the adequacy of ventilation can be assessed.

      3) CBG values should not be used to evaluate blood oxygenation as the O2 value is unreliable. This is because capillary blood oxygen levels represent a mixing of blood - blood absent of oxygen due to consumption at the tissue level as well as new blood flowing to the area. Equilibrium has not been

achieved in a capillary sample and thus the reported oxygen level from a CBG should neither be trusted nor utilized to make change in patient care related to oxygenation.

3. Neonatal abstinence syndromes (NAS)
   a. Caused by withdraws from the removal of a drug

   b. Two kinds
      1) Prenatal NAS
         Withdraw in the infant caused when a pregnant mother stops taking a drug prior to delivery.

      2) Postnatal NAS
         Withdraw from removing a drug that has been given directly to the infant.

   c. Treatment depends on the drug involved.

Pediatric
Patient Data

I Patient Information (LEVEL 3)

A. Laboratory Exams

1. Hgb electrophoresis
   a. Type of blood test that can detect different types of hemoglobin
   b. Especially useful in detecting HbS, which is associated with sickle-cell anemia (sickle-cell disease).

B. Imaging

1. Cardiac catheterization and angiography
   a. The purpose is to assess the patency of cardiac blood vessels and look for blockages or impedance of blood flow to specific areas of the heart.

   b. A tiny catheter is inserted into major cardiac vessels while being observed by a live radiographic procedure called fluoroscopy (produces a movie-like x-ray).

   c. If blockage is noted, a balloon on the end of the catheter can be inflated and vessels can be expanded. This is called angiography.

Equipment

I. Resuscitation Devices

A. Resuscitation Devices

1. T-piece resuscitator
    a. Device used to provide resuscitation without squeezing a bag.
    b. Can be attached directly to a flowmeter
    c. Has PIP (peak inspiratory pressure) and PEEP controls

    d. A breath is given to the infant by simply occluding an exhaust port, which momentarily exposes the infant to the PIP.

    e. Respirations (ventilation) is accomplished by intermittently placing and removing the occluding finger over the exhaust port. The rate at which this is done is the respiratory rate. The duration at which the port is occluded constitutes the inspiratory time (I-time).

    f. Ideally suited for neonates 10 Kg or less (fairly small neonates).

    g. Initial Settings
        1) The flowmeter should be set from 5-15 L/min – 10 L/min is a good starting place.

        2) PIP should be set to 20 cm H2O (initially) and can be determined prior to attaching to the infant by occluding the exhaust port and the inspiratory port simultaneously. PIP controls on some devices are proximal to the flowmeter, while others are closer to the patient interface.

        3) PEEP can be controlled by a dial and should initially be set to 5 cm H2O.

B. Oximeters

1. Cerebral Oximetry
    a. Also called near-infrared spectroscopy (NIRS)
    b. Used to assess oxygen saturation in localized areas
    c. For cerebral assessment, sensors are placed on the cranium and cerebral oxygenation can be evaluated.

General Care Techniques

A. Bronchoscopy
Bronchoscopy is considered a special procedure that is **both diagnostic and therapeutic**.

1. **Diagnostic value**

a. Biopsies and Brushes

1) The scope is equipped with tools that can be advanced from the end of the scope and used for extraction of tissue, which can then be analyzed for a variety of purposes including an evaluation for malignancy of suspected cancerous cells, etc.

2) A brush device can be extended from the end of the scope which is effective at mobilizing pathogenic organisms, allowing them to be suctioned into a trap for further culture, study, and evaluation.

B. Disaster preparedness

1. Transporting patients
While transporting patients, the same level of care (ventilatory support and monitoring) should be maintained throughout the transport compared to the normal care provided when the patient is not being moved. This is true regardless of the destination (in hospital or to another facility).

C. Types of Ventilation

e. NAVA (neurally adjusted ventilatory assist)

1) Works by sensing electrical signals from the diaphragm
2) Sensors are located on what looks like a nasal gastric tube

3) Sensors signal the ventilator to modify frequency and pressure of delivered breaths.

4) The form of ventilation is called Electrical Activation of the Diaphragm (EAdi).
5) The catheter is placed in the esophagus.
6) The length or size of the catheter is determined by measuring the distance from the bridge of the nose, to the earlobe, and then to the xyphoid process.

7) An x-ray should be used to confirm position immediately after insertion. It is positioned properly if the tip of the Edi catheter is in the stomach (the same positioning as a traditional gastric tube.

8) In some instances, the Edi catheter may be used as a gastric tube as well.

Care of the Pediatric Patient

I. Airway Management and Assessment

A. Airway Establishment

1. Bag-mask ventilation
2. Oral airway placement
3. Nasal airway placement

B. Intubation Techniques (Assisting and Performing)

1. **Difficult intubation -** Mallampatti Classification
   a. Anatomical inspection of the upper airway patency
   b. 4-point score classification of the tongue size relative to the size of the oral cavity

   c. The larger the number, the larger the tongue size, the MORE OBSTRUCTED.

   d. Score interpretation
      1) Score of 1 or 2 = normal upper airway

      2) Score of 3 or 4 = problematic airway – likely difficult to intubate. Should use a device to assist intubation, such as a bronchoscope or video assisted intubation device.

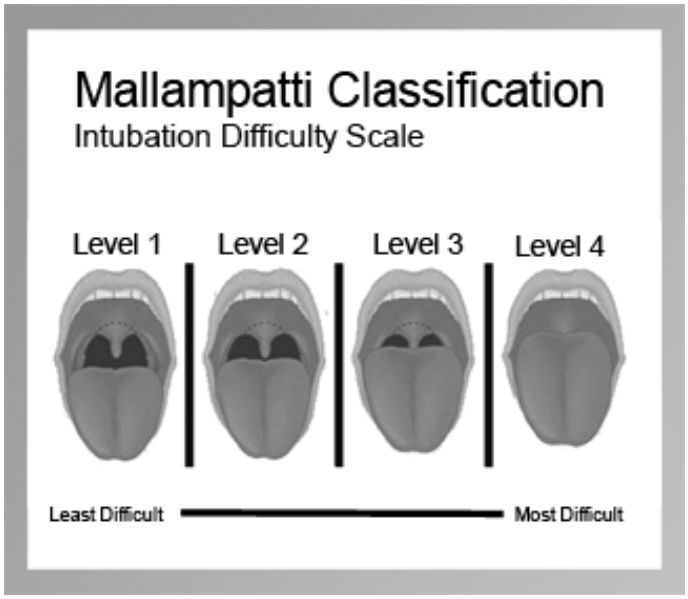
   e. **MALLAMPATTI CLASSIFICATION SCORES**
      1 – full visibility of tonsils, uvula, and soft palate – OPEN

      2 – can see the uvula, hard palate, soft palate, and upper portion of the tonsils only – SOMEWHAT OPEN

      3 – only the hard palate, soft palate, and base of vallecula are visible

      4 – only the hard palate is visible

      6) Mallampatti Images



II. Full Ventilatory Support

A. Initiating Mechanical Ventilation in the Pediatric Patient

1. RATE: 10-20/min

2. TIDAL VOLUME (Vt): 6-10 mL/kg

   a. must use ideal body weight

   b. May choose a VT anywhere in the range but the middle of the range is technically better.

   c. Simply using 8 mL/kg may be easy but the answer will often be at the edges of the range - so calculate the range.

   d. **Must use the CORRECTED tidal volume**

   ~ corrected VT = Set Vt - tubing compressible volume

   ~ tubing compressible volume = Tubing compliance factor X (PIP-PEEP))

   ~ Example:

PIP	35 cmH2O
PEEP	5 cmH2O
Tubing compliance factor:	1 mL/cmH2O
VT (set)	160 mL

What is the corrected VT
Tubing compressible volume = 1 mL/cmH2O x (35-5) = 30 mL

Corrected VT = Vt(set) - tubing compressible volume
= 160 mL - 30 mL
= 130 mL

e. Adequacy of tidal volume may be assessed by evaluating;
   1) Chest rise and movement
   2) Breath sounds (should hear in all fields)
   3) End-tidal CO2 (PetCO2) by capnograph
   4) Evaluating ventilator graphics (pressure volume loop should not have a big beak)

3. FIO2: 0.30-0.60

a. Use 0.30 if no pulmonary issues and the primary problem has been ventilation (not hypoxemia)

b. Use previous setting if the patient was on oxygen
c. Use 100% if the need for mechanical ventilation was caused by an emergency (post code, etc).

d. If not emergency and previous FIO2 is not known, setting oxygen anywhere between 0.3 - 0.6 is suitable.

4. PEEP: 0-2 cmH2O

a. Use any previous CPAP or BIPAP level (EPAP) if patient was on these modalities
b. Most common to start at 2 or 3 cmH2O

c. Example
   Patient was receiving Bi-level (NIPPV) ventilation with IPAP of 10 cmH2O and an EPAP setting of 4 cmH2O. Initial PEEP should be 4 cmH2O.

OXYGENATION

I Oxygen Therapy

A. Isoflurane / Sevoflurane
   1. Types of inhaled anesthetic agents that can be used on newborns
   2. May be used to put the infant to sleep, prior to surgery.

B. Home Care

   1. **Clinical Procedures at Home**

      a. Oxygen Therapy
         1) Low-flow nasal cannula often used in the home
         2) Oxygen concentrator (molecular sieve device) – Least expensive home oxygen solution.

         3) May have oxygen cylinders (E) on hand for transport and emergency power outages. May also need when there is an unexplained problem with the concentrator

         4) Portable oxygen concentrators
            Some concentrators are small enough to run off an internal battery for a duration. The patient should always, however, have access to back-up e-cylinders or other portable oxygen sources.

   2. Infant Car Seat Challenge (ICSC)
      a. Especially small infants (under 37 weeks-of-gestation) may be too small for traditional car seats.

      b. Prior to discharge, an evaluation can be done by placing the infant ing the proposed car seat to determine safety adequacy.

      c. Safety has to do with the infant's position. A semi-reclined position is associated with poor blood flow, diminished respiration, and declining oxygen levels, while a flat position is clinically best for the infant.

      d. How the challenge is performed
         1) The actual challenge is performed by placing the infant in the proposed car seat in the hospital, prior to discharge.

2) The infant's respirations and oxygen levels are then monitored for 60-90 minutes.

3) If the infant fails by showing a reduction in vitals during this period, either a different car seat is tested or the infant is retained in the hospital for a day or two and is periodically tested.

General Care

I. End-of-Life Care

A. Determination of Brain death

1. Prior to discontinuing life support measures, the presence of brain death is commonly evaluated.

2. Brain death can be determined by:

   a. EEG (electroencephalography)
   b. Cerebral perfusion studies

   c. Clinical evaluation
      1) Unresponsiveness to verbal and painful stimuli
      2) Complete apnea
      3) Absence of reflexes

   d. Reflex assessment
      1) Pupillary - eyes to do not respond to light
      2) Ocular reflexes - no eye movement is noted when irritated.

      3) Pharyngeal reflexes – no physical response when a blade is inserted into the oropharynx.

      4) Tracheal reflexes – no response when stimulating the carina