Controlling Pediatric Respiratory Infections
Laurie Streitenberger, Marion Yetman & Anne Augustin
A Webber Training Teleclass

Respiratory Infection In Pediatrics

Renee Freeman
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Marion Yetman
Anne Augustin
Members of the Pediatric Interest Group of CHICA-Canada

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Agenda

- Viral Respiratory Infections
  - Transmission and Placement
- RSV
- Prevention of pneumonia - Neonatal ICU

Viral Respiratory Infections:
Transmission and Placement

Laurie Streitenberger RN, BSc, CIC
Infection Control Practitioner

Outline

- Mode of Transmission
- PPE required
- Patient Placement

Mode of Transmission

Droplet
- large droplets (> 5 microns in diameter)
- released during coughing, sneezing, speaking, crying or during procedures such as suctioning or bronchoscopy
- propelled short distances (< 1 m)
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Mode of Transmission

Contact
- once expelled, organisms can settle on objects in the person’s immediate environment (< 1m) and can be transmitted by unwashed hands to other individuals

Droplet Precautions

Initiated when:
- patients have symptoms of droplet transmitted infections and/or;
- patients have laboratory confirmed droplet transmitted infections

Personal Protective Equipment (PPE)

Donning of PPE
- Hand Hygiene
- Gown
- Fluid resistant procedure mask with eye protection (or mask and then visor/goggles)
- Gloves

Removal of PPE
- Gloves
- Gown
- Hand hygiene
- Fluid resistant procedure mask with eye protection (or visor/goggles and then mask)
- Hand Hygiene

Patient Placement

Gold standard = private/single room
Cohorting
- practice of grouping patients and staff with the same infection together in order to prevent transmission to other patients and staff
- usually considered when bed or staffing limitations necessitate consideration of alternatives other than the ideal, and often microbiological data are not available

Cohorting

Overriding principles:
- Patients are not infected with other potentially transmissible microbes, and
- It is unlikely that the patients will get reinfected by the same organism, and
- None of the patients are severely immunocompromised

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Other Considerations

- Staffing cohort issues
- Dedicated patient equipment
- PPE for family/visitors
- Visiting restrictions
- ?Discontinuing precautions

Respiratory Syncytial Virus

Respiratory Syncytial Virus - (RSV)

Marion Yetman RN, BN, MN, CIC
Infection Control Nurse Coordinator

Objectives

- Understand the disease process of RSV
- Epidemiology
- Pathophysiology
- S/S
- Risk Factors, Diagnosis
- Prevention
  - ICP Role
  - Prophylaxis

Epidemiology

- Seasonal epidemics
- Humans are only source of infection
- Infects all children by age 3
- Incubation period 4-6 days
- Viral shedding – usually 3-8 days
- Peak incidence is 2-6 months of age
- Re-infection may occur, but is less severe

Pathophysiology

- Diffuse airway obstruction in the small bronchi
- Airway swelling, sloughing of necrotic debris, loss of cilia
- Increased mucous production
  - Leads to partial obstruction - hyperinflation
  - complete obstruction - atelectasis

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Pathophysiology

- Anatomical features
  - Airway smaller than adults
  - Greater number of mucous glands
  - Fewer pores of Kohn

RSV Positive Cases, by Month 2005-2006

Upper Respiratory Tract Symptoms

- Cough
- Runny nose
- Wheeze
- Decreased feeding
- Breathing difficulties
- Irritable
- Fever (2-4 days)
- Listless

Lower Respiratory Tract Symptoms

- Increased coughing
- Dyspnea
- Increased respiratory rate
- Retraction of intercostal muscles
- Hypoxemia
- Cyanosis (rare)
- Apnea – premature babies

Risk Factors for Disease

- Male
- Age < 6 months
- Birth during the first half of the RSV season
- Crowded living quarters/Siblings
- Day Care
- Passive cigarette smoke exposure
- Lack of breast feeding
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High Risk Population
- History of prematurity/BPD
- Congenital heart disease
- Immunosuppressed

Transmission
- Direct or indirect contact with the respiratory secretions
- RSV lives on countertops/bedrails for 7 hours, hands/gloves – 1 hour.

Diagnosis
- Clinical symptoms
- N-P swab
- Chest x-ray
  - hyperinflation
  - peribronchial thickening
  - interstitial infiltration

Prevention – ICP Role
- Awareness Campaign
  - Early
    - Media
    - Prenatal Classes
    - Family Doctors/Obs Staff
  - Late
    - Case Room/OBS Unit
    - Neonatal Unit
    - Community Health

Prevention – ICP Role
- Key Messages
  - What is RSV/Transmission/Who is at risk?
  - Parental role in prevention
    - Improve Handwashing
    - Avoid second hand smoke
    - Promote breastfeeding
    - Avoid crowds
    - Focus on respiratory etiquette

RSV Prophylaxis
- Palivizumab (Synagis)
  - Monoclonal antibody
  - Monthly IM injections during RSV season
  - Cost - $7,000 - $9,000/per child
  - Cost absorbed by Provincial Health Depts

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NACI Recommendations 2003

- Premature infants <32 weeks GA
- Less than 6 months by RSV Season
- Children <24 months with CLD or significant heart disease
- Children 33 – 35 weeks in remote communities who are < 6 mon by RSV Season

NL Experience

- Initially as per NACI guidelines
- Regional re-hospitalization determines cost effectiveness
- Palivizumab discontinued in Health Infants
  29 –32 weeks

Retrospective Cohort Study

- Sample
  - All infants <32 weeks GA June 01, 1999 – December 31, 2004
  - Infants ‘High Risk”
    - CLD or CHD
    - Healthy Infants 29 –32 weeks

Outcome of “Healthy” Babies
29-32 weeks GA N=100

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Palivizumab YES</th>
<th>Palivizumab NO</th>
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<tbody>
<tr>
<td>Number of infants</td>
<td>28</td>
<td>72</td>
</tr>
<tr>
<td>Number RSV Deaths</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Readmitted with respiratory disease</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Number RSV@</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Number ventilated</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>With respiratory disease</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total Cost of RSV-RH</td>
<td>43,054</td>
<td>37,183</td>
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</table>

P=0.310

Cost of Prophylaxis versus Readmission for Respiratory Distress

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<tr>
<td>Cost of Prophylaxis</td>
<td>$700,000.00</td>
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<td>for 100 infants</td>
<td></td>
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<tr>
<td>Cost of Readmission</td>
<td>80,237</td>
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<tr>
<td>For 6 Children</td>
<td></td>
</tr>
<tr>
<td>Cost Saving in 5 years</td>
<td>619,763.00</td>
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Conclusions

- Based on local evidence, it is reasonable and safe to withhold Palivizumab for healthy infants 29 – 32 weeks gestational age in NL
- Cost of the prophylaxis for “healthy infants” (29 -32 weeks GA) could be better utilized for Prevention

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Prevention of pneumonia - Neonatal ICU

Anne Augustin, MLT, CIC
Infection Prevention & Control Coordinator

Outline

- The Problem
- Risk Factors
- Prevention Recommendations

Pneumonia Prevention – NICU

- Clinical presentation
  - Difficult to diagnosis
  - Non-infectious processes may show same clinical presentation
  - Underlying lung conditions -> difficult to interpret
  - Culture from endotracheal tube may be helpful
  - Often colonized
  - Often treated empirically

Pneumonia Prevention – NICU

- Common causative agents
  - Early onset
    - Usually associated with intraparum infection and early-onset sepsis
    - Group B Streptococcus
  - NNIS data from 1986 to 1994
    - St. aureus (18.7%)”
    - Coag. Negative Staph (16.6%)
    - Pseudomonas aeruginosa (12.9%)
    - Enterobacter (9.5%)
  - Respiratory Viruses

CDC pneumonia definition < 1 year old

- Worsening gas exchange
  - And at least 3 of the following
  - Temperature instability
  - Leukopenia or leukocytosis
  - New onset of purulent sputum, change in character, increased respiratory secretions, increased suctioning requirements
  - Apnea, tachypnea, nasal flaring with retraction of chest wall or grunting
  - Wheezing, rales or rhonchi
  - Cough
  - Bradycardia or tachycardia

Pneumonia Prevention – NICU

<table>
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<tr>
<th>Birth Weight</th>
<th>NNIS 2001</th>
<th>NNIS 2004</th>
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<tr>
<td>&lt; 1000 g</td>
<td>4.8</td>
<td>3.5</td>
</tr>
<tr>
<td>1001 – 1500 g</td>
<td>3.6</td>
<td>2.4</td>
</tr>
<tr>
<td>1501 – 2500 g</td>
<td>2.9</td>
<td>1.9</td>
</tr>
<tr>
<td>&gt; 2500 g</td>
<td>2.6</td>
<td>1.4</td>
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</table>
**Pneumonia Prevention – NICU**

- **Risk Factors – innate**
  - Immunocompromised
  - Decreased chemotaxis and phagocytosis by macrophages
  - Lack of or abnormal "normal flora"

- **Risk factors – device & care related**
  - Nasogastric or orogastric feeding tubes
  - Endotracheal tube
    - Quickly colonized
  - Poor fitting -> secretions slide around
  - Decreased level of consciousness
  - Sedation and use of paralytics
  - Aspiration of organisms colonizing the stomach or oropharynx
  - Prior bloodstream infection for those infants that are on ventilator (hematogenous spread)

**Recommendations for Prevention**

- No ill staff, parents, family members or visitors allowed in the NICU
- Respiratory viruses
- Vomiting & diarrhea
- "funny" rash
- Influenza vaccine for all staff
  - consider developing vaccine program for parents & family members
- RSV prophylaxis

- Hand Hygiene for All
  - Point of care hand hygiene
  - Parent & family education
  - No false nails, no rings or arm jewelry
  - Category 1A

**Recommendations for Prevention**

- Cleaning, disinfection & sterilization of equipment
  - Use sterile water for rinsing reusable semicritical items after chemical disinfection
  - Category 1A
- Breathing circuits
  - Do not routinely change
  - Change when malfunctioning or visibly soiled
  - Category 1A

- Breathing-circuit-tubing condensate
  - Periodically drain and discard condensate
  - Do not allow condensate to drain toward patient (category 1B)
- Sterile water for humidifier fluids (category II)
- Change heat-moisture exchanger (HME) when it malfunctions or is visibly soiled (category II)
Recommendations for Prevention

- Oxygen humidifier-tubing (for one patient)
  - Change when malfunctions or becomes visibly soiled (category II)
- Small-volume medication nebulizers – inline and hand-held nebulizers
  - Clean, disinfect, rinse with sterile water and dry between treatments
  - Use only sterile fluids
  - Category IB

Recommendations for Prevention

- Resuscitation bags
  - Sterilize or high level disinfect between use on different patients (category IB)
- Suctioning of respiratory tract
  - Single use open – sterile catheter (category II)
  - Multiuse closed system
  - Frequency of changing (unresolved)
  - Only sterile fluids (category II)

Recommendations for Prevention

- Temperature probes
  - High level disinfect (category IB)
- Aspiration prevention
  - Before deflating cuff of ETT, ensure secretions are cleared from above the cuff (category II)
  - Elevate at an angle of 30-45 degrees the head of the bed (category II)
  - Routinely verify the placement of feeding tube (category IB)

References

- APIC Text of Infection Control & Epidemiology 2nd ed., Chapters 22 & 39, January 2005
- Guidelines for Preventing Health-Care-Associated Pneumonia, 2003, Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee
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The Next Few Teleclasses

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Instructor</th>
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<tr>
<td>June 29</td>
<td>Bloodborne Pathogen Control Across the Continuum of Care</td>
<td>Sue Sebazco</td>
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<td>July 18</td>
<td>Infection Surveillance in the UK</td>
<td>Dr. Allan Johnson</td>
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<td>July 27</td>
<td>Demal Absorption of Alcohol Disinfectants</td>
<td>Dr. Axel Kramer</td>
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<td>August 17</td>
<td>The Spectre of a Flu Pandemic – Is It Inevitable?</td>
<td>Dr. Lance Jennings, New Zealand</td>
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