Objectives

- Explain the role the NICU can play in the public health protection of neonates
- Describe NICU-based administration of influenza vaccine
- Describe protocols for Tetanus, Diphtheria, Acellular Pertussis, (TDap) Vaccines

Influenza Virus

- A single-stranded RNA genome.
- Eight separate segments of (RNP).
- Matrix protein MP 1: Lines the inside of the envelope and is bound to RN.
- Neuraminidase (NA), Box-shaped protein on the lipid bilayer
- Trimeric protein hemagglutinin (HA) — Facilitates attachment to infected cell membranes

Influenza: Life Cycle

- Receptor-bound viruses & endocytosis.
- In low pH environment, RNP is released from MP1.
- RNP released cytoplasm
- New viral RNA is encased in the capsid protein.
- Hemagglutinin and neuraminidase components are incorporated into the cell membrane.
- Progeny virions released

10% Hospitalization Rate

Morbidity of Influenza

Neuzil et al. NEJM 2000;342:225–231

10% Hospitalization Rate

Influenza Mortality

Neuzil et al. NEJM 2000;342:225–231

Influenza Mortality is highest in infants <6 months old


Influenza Mortality is highest in infants <6 months old


Influenza Mortality is highest in infants <6 months old


Stony Brook

Influenza Vaccine

Influenza vaccine is also recommended:

- Caretakers for people at high risk for influenza-related complications.
- Health care providers
- Household contacts and caregivers of infants from birth up to 5 years of age.

Effectiveness of Maternal Influenza Immunization in Mothers and Infants

Figure 2. Cumulative Cases of Laboratory-Confirmed Influenza in Infants Whose Mothers Received Influenza Vaccine, as Compared with Control Subjects. Testing for influenza antigen was performed from December 2004 to November 2005.

63% Reduction in Proven Influenza in Infants
Review

- Influenza common respiratory pathogen in children and adults
- Increased severity in children < 23 months of age
  - Hospitalization (10%)
  - Outpatient visits (2-3x)
  - Antibiotic Use (5-15%)
- Vaccination of those who can spread influenza to high-risk children and healthcare workers is indicated
- Vaccination rates remain low: 25.5-32%

Low Adult Vaccination Rates

- Logistic Constraints to Immunization:
  - Limited Vaccine Quantity
  - Reimbursement Issues
  - Cost
  - Personnel Demands
  - Recall Systems
  - Convenience

NICU Considerations

- Premature Infants, <6 months of age, increased risk for morbidity from influenza
- Family-centered care
  - Emphasizes Parental Involvement
- Access to Parents, Availability
  - Liberal visiting hours
  - 24/7
- Economics
Eyeore Complaint #1

WHY CAN’T WE JUST EDUCATE PARENTS ABOUT INFLUENZA AND LEAVE IT TO THEMSELVES TO BE IMMUNIZED?

92% of Parents Indicated they would obtain TIV.

Eyeore Complaint #2

IT WON’T WORK – WE ARE TOO BUSY, PARENTS WILL REFUSE OR THEY WILL ALREADY BE IMMUNIZED.

BY THE TIME YOU GET AROUND TO VACCINATING, THE CHILD WILL BE SET FOR DISCHARGE.
Methods
• Surveyed parents of admitted patients to NYU NICU – (11/3/05-3/1/06)
  – Flu Vaccine History
  – Risk Factors Requiring Influenza Vaccination
• Screened, Consented and Given Flu Shot

Results
111 Mothers; 109 Fathers
Avg. Age: 34.5yrs (15-54)
BW 2548g (675-4420g) 33 1/7 wks (24-42 2/7)

- 273 Parents
  - 158 Infants
  - Flu Vaccine History
  - Risk Factors Requiring Influenza Vaccination
  - Screened, Consented and Given Flu Shot

- 157 Parents
  - Immunized in NICU (71.3%)
  - Refused Immunization (5%)
  - Immunized Prior to Admission (23.6%)

OVERALL IMMUNIZATION RATE OF 94.9%

Parents Immunized in NICU

157 Parents
BW 2548g
GA 33 1/7 wks

119 Parents (75.5%)
1st Recipients of Influenza Vaccine

37 Parents (21%)
> 1 Risk Factor

14 Smokers; 17 Child
1 Rheumatoid Dis.; 5 Asthma

8 Parents (21%)
> 1 Risk Factor

2 Occupation; 1 Smoker
3 Child; 1 Age; 1 Asthma

38 Parents (34.2%)
Received TIV in past 4 yrs 8

Efficiency of Immunization Delivery

Significant p < 0.05

Previous Immunized Parents

Percentage of Parents Already Immunized per
Month

0% 5% 10% 15% 20% 25% 30% 35%
November January 2005 vs 2006

Gestational Age

PERCENTAGE OF PARENTS IN SURVEY GROUPED BY
GESTATIONAL AGE

Significant for NICU Immunization
p< 0.02

PERCENTAGE OF COHORT

GESTATIONAL AGE (WKS)
Patients Who Refused Immunization

11 Parents Refused Immunization (5%)

- 5 (45%) “Don’t Believe In it.”
- 2 (18%) “I’ll Become Autistic”
- 1 (9%) “No More Shots”
- 1 (9%) “Too Late in Season”
- 1 (9%) “Allergic to Eggs”
- 1 (9%) “Religious Objection”

Conclusions

- Rapid Medical Screening, Consent and Administration of TIV is possible in a tertiary-care Level III NICU
- Implementation of such a program increases compliance up to 94.5%
- Majority of parents vaccinated within 3 days of admission to the NICU

Eyeore Complaint #3

IT IS TOO EXPENSIVE

Eyeore Complaint #4

SHOULDN’T WE FOCUS INSTEAD ON IMMUNIZING THE HEALTHCARE WORKERS?

Computer-Based Multivariate Economic Analysis of Neonatal-Intensive-Care-Unit-Based Influenza Vaccine Administration to Parents in a Low-Socio-Economic, Urban Setting

TABLE 1. Overall Vaccination Rate of the 112 Healthcare Workers (HCWs) Surveyed for the Study Year and for the Previous Year

<table>
<thead>
<tr>
<th>Year</th>
<th>No. (%) of HCWs vaccinated outside of NICU</th>
<th>No. (%) of HCWs vaccinated in NICU</th>
<th>No. (%) of HCWs who refused vaccination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study year</td>
<td>25 (22)</td>
<td>50 (45)</td>
<td>36 (32)</td>
</tr>
<tr>
<td>Previous year</td>
<td>20 (18)</td>
<td>16 (14)</td>
<td>9 (8)</td>
</tr>
</tbody>
</table>
WAKE UP!!!!!!

Pertussis

- Catarhal (0-21 days)
  - Cold-like symptoms
  - Sneezing, low grade fever
  - Non-productive cough
- Paroxysmal
  - Spells of quick, short machine gun coughs
  - Gagging, Choking, Hypoxia
  - "WHOOP" sound
- Convalescent
  - Gradual recovery
  - Residual coughing can last months

Eyeore Complaint #5

Why bother doing all this for four months a year?

Pertussis Infection severe in our population

- Infants (≤ 1 yr)
  - 65% hospitalization rate
  - 90% less than 4 months old
  - 76% younger than 2 months

Aerobic Gram negative Rod
Pertussis is on the Rise

Why is infection increasing?

Transmission

Nearly 50% of Pertussis Sources are Parents

Grandparents 8%
25% Others (Childcare workers, friends, etc.)

Siblings 20%
Mothers 32%
Fathers 15%

Transmission

Tdap Vaccine

• Effective @ preventing transmission
• IM injection 20% "mild" pain
• 12% experience local reaction @ site
• Rec. for mothers post delivery
• $44.13 per dose

Implementation

COMMENTS
Rationale for the administration of acellular pertussis vaccine to parents of infants in the neonatal intensive care unit

S. Shah, D. K. Capron, P. Nally and S. Brentz
Department of Pediatrics, State University of New York at Stony Brook, NY, USA

Consent, Medically Screen and Administer @ NICU bedside
15-minute observation period
NSAID for pain relief over next 24 hours
Mothers and Fathers both eligible unless previously vaccinated
Contra-indications

**Tdap not recommended:**
- Hemophiliacs
- Bleeding Disorders
- Latex Allergy
- History of Encephalopathy
- Seizure Disorder
- History of Previous allergy to Childhood Dtap vaccine

FIGURE 1: 495 parents were offered immunization. Overall immunization rate was 86.9%.

FIGURE 2: Immunization efficacy with Tdap on the basis of gestational age. All available parents with infants <32 weeks' gestation were immunized in the NICU. Parents of infants born >36 weeks' gestation had the highest rate of missed immunization opportunities.

Future Directions

- Smoking Cessation
- Depression Screening

Take Home Messages

- **INFLUENZA** is a “NEONATAL DISEASE”
  - Administration of vaccines to parents in the NICU is worthwhile, cost effective and improves healthcare worker vaccination
- **PERTUSSIS** is a “NEONATAL DISEASE”
  - The tools to preventing this disease in our NICU graduates are already at our disposal

Evaluations

Please visit www.phlive.org to fill out your evaluation and post test.

Nursing Contact Hours, CME, CHES are available.

Thank you!