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Detection of Respiratory Viruses in Nasal Aspirates of Infants Hospitalized for Reasons other than Influenza-Like Illness: Implications for Prevention of Nosocomial Viral Transmission

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Revised Abstract

Background: Preventing nosocomial spread of respiratory viruses poses many challenges to pediatric healthcare practitioners. Routinely, children admitted with common respiratory symptoms are cohorted and screened for respiratory viruses including respiratory syncytial virus (RSV) and influenza virus. Whether screening children without common respiratory symptoms can reduce nosocomial transmission of viruses is unknown.

Objective: To determine whether screening all hospitalized children will identify an unrecognized reservoir of respiratory viruses and reduce nosocomial transmission.

Methods: Between October 15, 2007 and March 15, 2008, all children had a nasal aspirate at the time of admission to The Johns Hopkins Hospital (JHH) infant and toddler unit. Samples were tested for respiratory viruses using immunochromatography, direct fluorescent antibody assay, shell vial and viral culture. We performed a retrospective chart review to determine whether children who tested positive for RSV, influenza A (Flu A), influenza B (Flu B), parainfluenza 1, 2, or 3 (PIV1, PIV2, PIV3), adenovirus (ADV) or human metapneumovirus (hMPV) had respiratory symptoms or fever. The number of patients with nosocomial RSV as a percent of all patients admitted with RSV was trended over time.

Results: Nasal aspirates were sent from 926 of the 1101 patients (84%). One hundred and sixty-seven patients had a virus identified (114 RSV; 23 Flu A; 2 Flu B; 11 ADV; 3 PIV1; 4 PIV2; 1 PIV3; 7 hMPV; and 1 co-infection with ADV and PIV1). Thirteen of the 167 patients (8%) had no report of fever or respiratory symptoms at the time of presentation (2 RSV [2%], 2 Flu A [9%], 5 ADV [45%], 1 PIV1 [33%], 1 PIV2 [25%], 1 PIV3 [100%], and 1 ADV/PIV1 [100%]). After the screening program was initiated, the number of patients with nosocomial RSV as a percent of all patients admitted with RSV was as its lowest level in ten years.

Conclusions: Our results suggest that infants and toddlers admitted to the hospital for reasons other than influenza-like illness can harbor respiratory viruses. Whether universal screening of children admitted to select areas can reduce transmission of respiratory viruses and prevent hospital acquired infections remains unknown. More research is needed to assess the potential benefits and risks of detecting viruses in children without common symptoms of a respiratory viral infection.

Introduction

- Preventing nosocomial transmission of respiratory viruses remains a challenge for pediatric healthcare workers.
- Current strategies to identify children with respiratory viral illnesses rely on testing children with common clinical symptoms, such as fever, runny nose, or cough.
- Early detection of neonates and infants with respiratory viruses enables appropriate isolation and cohorting of contagious patients
- Whether screening all patients for common respiratory viruses can reduce nosocomial transmission is unknown.
- The role of children with asymptomatic shedding of respiratory viruses in nosocomial virus transmission is unknown.

Objective

•To determine whether screening all hospitalized children will identify an unrecognized reservoir of respiratory viruses and reduce nosocomial respiratory virus transmission

Methods

- Study population: All patients admitted between October 15, 2007 and March 15, 2008
- Setting: The JHH Infant and Toddler Floor

- Laboratory testing included direct fluorescent antibody (DFA) on all NPA specimens to detect RSV, Flu A, Flu B, PIV1, PIV2, PIV3, ADV and hMPV. Shell vial culture and viral culture were performed on all samples with a negative DFA. During the period of highest prevalence, immunochromatography was performed for RSV, Flu A, and Flu B.
- Medical records were reviewed to determine if patients with an identified respiratory virus had fever or respiratory symptoms at the time of admission.
- Definitions: Influenza-like illness (ILI) - upper or lower respiratory symptoms, unexplained fever; Obvious symptoms - consistent report of upper or lower respiratory symptoms with or without fever, unexplained fever; Subtle symptoms - inconsistent report of upper or lower respiratory symptoms, or presence of other non-respiratory symptoms associated with influenza
- The number of patients on the Infant Toddler Floor with nosocomial RSV as a percent of all patients admitted with RSV was trended over time.

Results

Nasopharyngeal aspirates were sent from 926 of the 1101 admitted patients (84%)

Virus identified in 167 children (18%) at the time of unit admission

Viral Infections in Children Hospitalized with Varying Clinical Symptoms

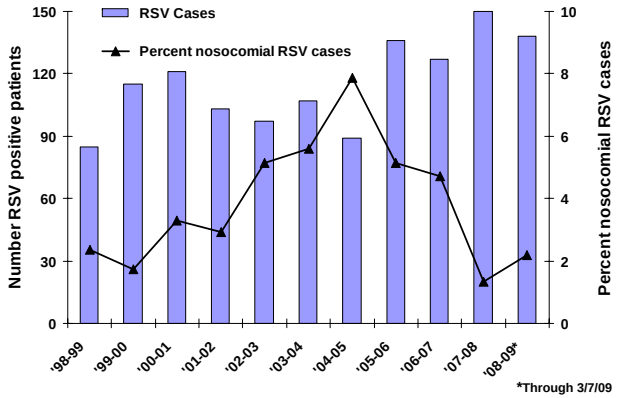
Virus	Patients admitted for ILI	Patients admitted for reasons other than ILI			All patients
		Obvious symptoms	Subtle symptoms	No symptoms	
ADV	5 (54%)	0	2 (10%)	5 (45%)	11
ADV / PIV 1	0	0	0	1 (100%)	1
Flu A	17 (74%)	3 (13%)	1 (4%)	2 (9%)	23
Flu B	2 (100%)	0	0	0	2
PIV 1	2 (66%)	0	0	1 (33%)	3
PIV 2	2 (50%)	1 (25%)	0	1 (25%)	4
PIV 3	0	0	0	1 (100%)	1
RSV	103 (90%)	6 (5%)	3 (3%)	2 (2%)	114
hMPV	7 (100%)	0	0	0	7
All	138 (83%)	10 (6%)	6 (3%)	13 (8%)	167

Patients with no symptoms were positive by immunochromatography (15%), DFA only (8%), and culture (77%)

Patients with subtle symptoms were positive by immunochromatography (50%) and culture (50%)

Results

Number of Patients with Nosocomial RSV as a Percent of all Patients Admitted with RSV



*Through 3/7/09

Screening program initiated for '07-'08 season.

There have been no significant changes in infection control practices at JHH since 1998.

Conclusions

- Infants and toddlers admitted to the hospital for reasons other than influenza-like illness can harbor respiratory viruses.
- These asymptomatic children with a positive test may reflect asymptomatic infection, infection with uncommon symptoms, prolonged shedding following previous infection, developing infection, or a false positive test. Most asymptomatic children had a virus detected by viral culture, making a false positive result less likely.
- Whether universal screening of children admitted to high risk units can reduce transmission of respiratory viruses and prevent hospital acquired infections requires further study.
- More research is needed to assess the potential benefits and risks of detecting viruses in children without common symptoms of a respiratory viral infection.

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