

CAROLYN: Hello and thank you for attending today's conference.

CAROLYN: Today I will be providing an overview of influenza illness and epidemiology, focusing on the impact of influenza in young children and influenza vaccine recommendations for children 6-23 months and household contacts of children <2 years. In addition, I will discuss vaccination of health care workers against influenza. Dr. Roy will be discussing the use of LAIV later in the broadcast.

CAROLYN:

- **Influenza viruses circulate mostly during the winter months**
  - In temperate climates in the Northern Hemisphere, activity most often peaks during the month of February but can peak as early as November in some years. Sporadic influenza activity can occur even in the summer months. In tropical regions, influenza can occur year round.
- **Influenza illness characterized by**
  - Abrupt onset fever, body aches, headache, and fatigue;
  - Respiratory symptoms include: cough, runny nose, and sore throat.
- **Complications**
  - Respiratory: bacterial or viral pneumonia with secondary bacterial pneumonia being more common. Other complications include sinusitis, otitis media, and bronchitis.
  - Other non-respiratory complications can include, but are not limited to: myocarditis, encephalitis, and encephalopathy, and worsening of underlying conditions such as congestive heart failure and asthma.
- **Because the symptoms of influenza can overlap with illnesses caused by other viruses and some bacteria, it is difficult to diagnose influenza based on symptoms alone.**

CAROLYN: This slide illustrates the circulation of influenza in relationship to some other common causes of respiratory illness, including respiratory syncytial virus (abbreviated RSV) and parainfluenza. RSV is an especially important cause of lower respiratory tract illness in children and circulation of influenza and RSV overlap in most years. In addition to these viruses, rhinoviruses and adenoviruses circulate year round. Illnesses caused by these and many other pathogens can cause illness similar to that caused by influenza virus. Influenza-specific testing is needed to confirm influenza illness.

CAROLYN: The clinical presentation of influenza in children can vary, adding to the difficulty in distinguishing influenza illness from that caused by other respiratory pathogens. This is data from the New Vaccine Surveillance Network. This 3-site network conducts active surveillance among children <5 years of age who are hospitalized with fever or acute respiratory symptoms. Of the children hospitalized who

had laboratory confirmed influenza, common clinical diagnoses were influenza, febrile seizure, rule/out sepsis, pneumonia, bronchiolitis, croup, and asthma exacerbation.

CAROLYN: There are 2 **main types of influenza. Influenza type A and influenza type B.**

- Type A viruses are subtyped based on the surface hemagglutinin and neuraminidase proteins. The Hemagglutinin is often abbreviated HA and the neuraminidase is abbreviated NA.
  - The influenza A subtypes currently circulating widely among humans include: H3N2, H1N1, and H1N2.
- Type B viruses are not subtyped.

**Because antibody to one type or subtype does not provide protection against other types or subtypes:**

- A person can get >1 influenza infection in a year.
- Vaccine contains one strain of each circulating type and subtype.

CAROLYN:

**Influenza viruses are characterized by their ability to undergo change. Influenza viruses change in 2 different ways, antigenic drift and antigenic shift. Antigenic 'drift' is due to point mutations that occur during viral replication**

- This drift results in the continual development of new strains
- It also allows for yearly epidemics to occur and for a person to get several influenza infections in a life time with the same type or subtype of influenza

**Antigenic 'shift'** is a much more drastic, abrupt change in the influenza virus.

- This type of change is associated with pandemics and
- Results in novel influenza A viruses with new HA or HA & NA
- Occurs sporadically.
- If the shifted virus results in a novel influenza A virus that can be easily transmitted from person to person and if a large proportion of the population is susceptible to the virus, a pandemic may occur.
- There were 3 pandemics during the 20th Century

I will focus my remaining remarks on the epidemiology of yearly epidemic influenza and not on pandemic influenza

CAROLYN:

**Influenza has substantial impact on health nearly every year**

- **10-20% of the U.S. population may be infected with influenza yearly.**
  - Higher infection rates in children
- **114,000 hospitalizations annually**
  - About half among those >64 years
  - Rates of influenza hospitalization in children <2 years of age are similar to rates in adults >64 years of age.
- **36,000 deaths annually**
  - Greater than 90% occur in adults >64 years of age

- Average 92 deaths in children <5 years of age
- 152 deaths among children <18 years of age were reported to CDC in 2003-04.

CAROLYN: This slide illustrates influenza infection rates by age groups from 2 different multi-year community-based studies conducted in Houston, represented by the yellow line, and Tecumseh Michigan represented by the red line. As you can see, the highest rates occur among children with lower rates among adults. These studies were conducted in the late 1960's and 1970's in the U.S. With a higher proportion of children in daycare, it is likely that one may see higher influenza illness rates in children <5 years of age than were observed in these two studies.

CAROLYN: Data for this slide comes from Dr. Bill Thompson at CDC and illustrated the substantial number of influenza-related hospitalizations each year. The highest rates occur among persons aged 65 years and older followed by children <5 years of age and then adults 50-64 years.

CAROLYN: When the age groups are divided into those with medical conditions that increase the risk of influenza-related complications (also called high risk conditions) compared with those who do not have a high risk condition, one can see that the rates of hospitalization are 5-10 times higher if one or more of these high risk conditions is present. For example, among children 0-4 years of age, the hospitalization rate was 100 per 100,000 for children without a high-risk condition compared with 500 per 100,000 among children with a high risk condition such as asthma.

CAROLYN: However, when one dissects the hospitalization rates for the younger age groups, one can see that particularly high rates of hospitalization occur among children < 2 years of age with the highest rates among the youngest children. This data is from 3 separate studies, 2 conducted in the US and the third study conducted in Hong Kong. The first study illustrates that children with high risk conditions such as asthma have much higher rates of illness than those without underlying medical conditions, but that the rates for all children <2-3 years of age are substantial. The second study looked only at children without any underlying conditions while the third study combined high risk and non-high risk children. The third study conducted in Hong Kong found much higher rates than either of the 2 US studies and illustrates the importance of establishing influenza disease burden and hospitalization rates in individual settings and that there may be differences between countries and populations.

CAROLYN: In contrast to illness and hospitalization rates, the large majority of influenza deaths occur in persons aged 65 years and older, as illustrated in this graph from data published by Thompson, et al. However, although rates are highest in the elderly, some deaths occur in all age groups, even young children.

CAROLYN: In addition to recommendations to vaccinate all adults aged 50 years and older and adults with high risk conditions, the Advisory Committee on Immunization Practices also recommends influenza vaccination for many children and contacts of these

children. Specifically the Advisory Committee on Immunization Practices (or ACIP) recommends that all children 6 months and older with chronic medical conditions including heart or lung disease, including asthma, diabetes, sickle cell disease, or other anemias, kidney disease or immune suppression be vaccinated yearly. In addition children on long-term aspirin therapy should be vaccinated yearly since these children are at risk of Reye's Syndrome if they are infected with influenza. Also, all children 6-23 months are now recommended for annual influenza vaccination.

CAROLYN: The recommendation to vaccinate children 6-23 months has been gradually introduced over the past 2 years. In 2002, the ACIP encouraged vaccination in this group when feasible. Then in 2003, influenza vaccination was approved for inclusion in the VFC or Vaccines for Children Program. Then, beginning with the 2004-2005 influenza season, influenza vaccination is recommended for all children 6-23 months.

CAROLYN: Vaccination is also recommended for household contacts and out-of-home caregivers, including health care workers, of

- Children <2 years of age; and
- High risk children and adults of any age.

Vaccination of household contacts and out of home caregivers of children, <6 month of age is especially important because children <6 month old

- Cannot get vaccinated against influenza; and
- Are the pediatric age group at highest risk influenza-related complications.

CAROLYN: Health care workers are often

- 1) Implicated in introducing influenza into and causing outbreaks among patients in health care settings. Outbreaks among patients have been reported in a number of healthcare settings including:
  - ICU, neonatal intensive care units, and nursing homes.
- 2) HCW often work while ill, exposing vulnerable patients and their coworkers to influenza.
- 3) In addition, healthcare workers may be able to spread influenza even if they are not symptomatic since influenza viruses
  - Can be shed 1 day before symptoms develop; and because
  - About half of influenza infections are asymptomatic. So even someone who never does develop symptoms or has very mild symptoms may be able to give influenza to another person.

CAROLYN: Vaccination of health care workers has been associated with

- Reductions in death among nursing home residents based on 2 randomized studies (Potter 1997, Carmen 2000).
- Vaccination of healthcare workers is also associated with reductions in overall illness in nursing home residents (Oshitani 2000).

Vaccination can also reduce the risk of influenza infection, illness and illness-related absenteeism among adults which has been shown in a number of randomized trials

CAROLYN: However, despite known benefits to patients and HCW, only 38% US HCW were vaccinated in 2002

Steps to encourage healthcare worker vaccination may include:

- Reduction of financial and time barriers;
- Education about the need to protect themselves and patients;
- Role modeling and support by institutional leaders;
- Incorporating influenza vaccination programs into the institution's patient; safety and occupational health programs;
- Monitoring and reporting of vaccination rates in the institution;
- As well as other incentives.

CAROLYN: In conclusion , influenza causes considerable illness, hospitalizations and even deaths in children

Influenza vaccine is the primary means to prevent influenza and is recommended for

- All children 6-23 months of age;
- Children of all ages with one or more high risk conditions, such as asthma; and
- Household contacts, out-of-home caregivers and healthcare workers who have contacts with children <2 years of age and high risk children of any age.
- In addition, the vaccine continues to be recommended for the traditional adult groups including all person 50 years and older, high risk adults < 50 years including pregnant women, and their contacts.

**Vaccination of contacts of children 0-5 months of age is particularly important in order to protect this high risk group because children <6 months of age cannot get vaccinated against influenza.**

**Finally, all healthcare workers should be vaccinated against influenza to protect themselves, their families and their patients.**