

THE BURDEN OF INFLUENZA IN CHRONIC ILLNESS

**Clinician Outreach and Communication
Activity (COCA)
Conference Call
December 2, 2010**



Objectives

At the conclusion of this hour, each participant should be able to:

- ❑ List current Advisory Committee on Immunization Practices (ACIP) recommendations for influenza vaccination
- ❑ Identify the types of vaccines and antiviral coverage that are appropriate for people with diabetes
- ❑ Describe key sick day rules healthcare providers should emphasize to people with diabetes
- ❑ Identify indications & contraindications for influenza vaccination in individuals with cancer
- ❑ Discuss the vulnerability of the Chronic Kidney Disease (CKD) population to influenza

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TODAY'S PRESENTERS



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TODAY'S PRESENTERS



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Influenza and People with Chronic Health Conditions

December 2, 2010

Joseph Bresee, MD

Chief, Epidemiology and Prevention Branch

Influenza Division

National Center for Immunizations and Respiratory Disease

Centers for Disease Control and Prevention



Seasonal Influenza Impact in U.S.

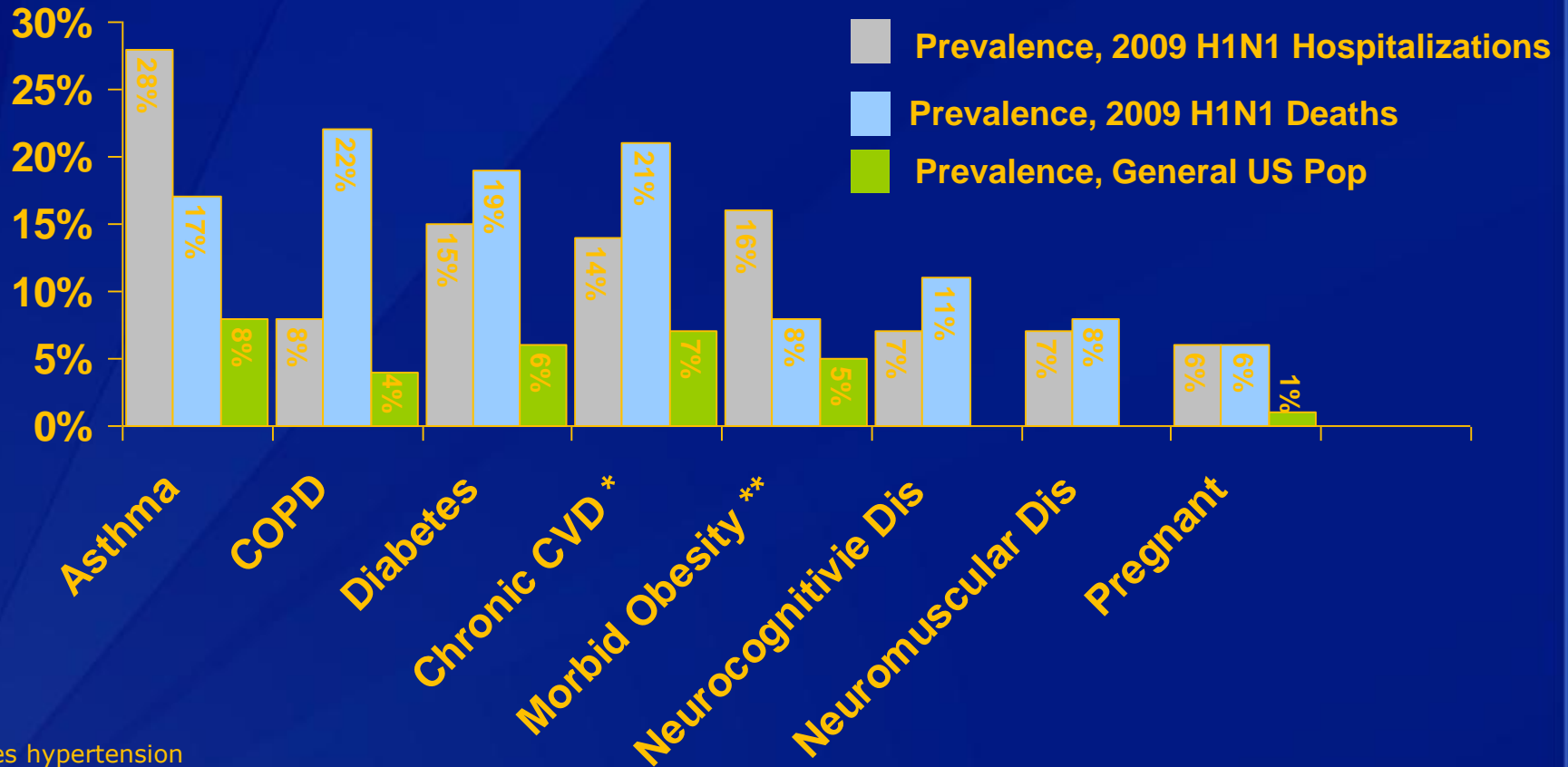
- **Vary substantially from year to year**
- **Difficult to predict severity or timing**
- **5% - 20% of US population infected**
 - highest illness rates in children
- **Range of 3,349-48,614 (average 23,607) influenza-related deaths annually in the US**
 - 2.7 times higher when H3N2 prominent
 - ~90% among 65 and older
 - Recently updated 1976-2007 in MMWR (Aug 20, 2010)
- **Annual average of 220,000 hospitalizations**
 - About 50% in 65 and older

Groups at Increased Risk of Severe Influenza

Those at higher risk for flu complications include:

- **Children younger than 5 years old, but especially children younger than 2 years old**
- **Persons aged 65 years and older**
- **Pregnant women**
- **American Indians and Alaskan Natives**
- **People who have medical conditions including:**
 - **Asthma**
 - **Neurological and neurodevelopmental conditions [including disorders of the brain, spinal cord, peripheral nerve, and muscle such as cerebral palsy, epilepsy (seizure disorders), stroke, intellectual disability (mental retardation), moderate to severe developmental delay, muscular dystrophy, or spinal cord injury].**
 - **Chronic lung disease (such as chronic obstructive pulmonary disease [COPD] and cystic fibrosis)**
 - **Heart disease (such as congenital heart disease, congestive heart failure and coronary artery disease)**
 - **Blood disorders (such as sickle cell disease)**
 - **Endocrine disorders (such as diabetes mellitus)**
 - **Kidney disorders**
 - **Liver disorders**
 - **Metabolic disorders (such as inherited metabolic disorders and mitochondrial disorders)**
 - **Weakened immune system due to disease or medication (such as people with HIV or AIDS, or cancer, or those on chronic steroids)**
 - **People younger than 19 years of age who are receiving long-term aspirin therapy**
 - **People who are morbidly obese (Body Mass Index, or BMI, of 40 or greater)**

Underlying conditions among hospitalized patients and those who died from H1N1 compared to the general population



*Excludes hypertension

** Morbid obesity is defined as BMI of 40 or higher. For Hospitalized H1N1 patients, BMI calculation was performed on non-pregnant adults ≥ 20 years ($n=119$). 45% of 119 non-pregnant hospitalized adults ≥ 20 years were missing height and weight information. For Novel H1N1 Deaths, morbid obesity % was calculated for adults only. Prevalence for US non-pregnant adults is based on NHANES (JAMA. 2006;295(13):1577)

Source O Morgan, et al.



2010: 50th Anniversary of First Influenza Vaccine Recommendation

Burney LE.
Public Health Rep.
1960
Oct;75(10):944.
First Influenza
Vaccine
Recommendation

STATEMENT

By Leroy E. Burney, Surgeon General,
Public Health Service

Influenza Immunization

Two outbreaks of influenza swept the United States in the fall of 1957 and the winter of 1958, resulting in 60,000 more deaths than would be expected under normal conditions. There were, in addition, more than 26,000 excess deaths during the first 3 months of 1960 which also were considered to be the result of influenza.

These departures from the usually predictable norms prompted the Surgeon General's Advisory Committee on Influenza Research to analyze the cause and to seek measures to prevent such an occurrence in the future.

The committee found that a new antigenic variant, the Asian strain, because of its widespread introduction and the general lack of resistance to it, was the direct cause of the excess number of deaths, not only in the total population but most markedly among the chronically ill, the aged, and pregnant women. As a result of these findings, the Public Health Service is urging a continuing program to protect these high-risk groups in order to prevent a recurrence of this excess mortality.

The high-risk groups who contribute most to the excess deaths and who the Public Health Service believes should be routinely immunized each year are:

1. Persons of all ages who suffer from chronic debilitating disease, in particular: (a) rheumatic heart disease, especially mitral stenosis; (b) other cardiovascular diseases, such as arteriosclerotic heart disease or hypertension—especially patients with evidence of frank or incipient insufficiency; (c) chronic bronchopulmonary disease, for example, chronic asthma, chronic bronchitis, bronchiectasis, pulmonary fibrosis, pulmonary emphysema, or pulmonary tuberculosis; (d) diabetes mellitus; (e) Addison's disease.
2. Pregnant women.
3. All persons 65 years or older.

The adult dosage recommended by the advisory committee for initial immunization is 1.0 cc. (500 oca units) of polyvalent vaccine, administered subcutaneously on two occasions separated by two or more months. Preferably, the first dose would be given no later than September 1 and the second no later than November 1. Persons previously immunized with polyvalent vaccine should be reinoculated with a single booster dose of 1.0 cc. subcutaneously each fall, prior to November 1. The only contraindication to vaccination would be a history of food allergy to eggs or chicken or a prior history of allergic reaction to an egg-produced vaccine, such as the commercial influenza product.

The time to start such a program is before the onset of the influenza season this fall. In the past, influenza vaccination has been sparse and sporadic, and primarily in response to an epidemic or the threat of an epidemic. The unpredictability of recurrence of influenza and its continued endemic occurrence are well known. Therefore, the Public Health Service strongly recommends that immunization of these high-risk groups be started now and continued annually, regardless of the predicted incidence of influenza for specific years.

The members of the Surgeon General's Advisory Committee on Influenza Research are: Colin M. MacLeod, M.D., chairman, University of Pennsylvania, Fred M. Davenport, M.D., University of Michigan, Morris Schaeffer, M.D., bureau of laboratories of the City of New York Health Department, George Burch, M.D., Tulane University, Dorland J. Davis, M.D., National Institute of Allergy and Infectious Diseases, Public Health Service, Thomas F. Sellers, M.D., Georgia State Department of Health, and Glenn S. Usher, M.D., Communicable Disease Center, Public Health Service.

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Burney LE.
Public Health Rep. 1960
Oct;75(10):944.
First Influenza Vaccine
Recommendation

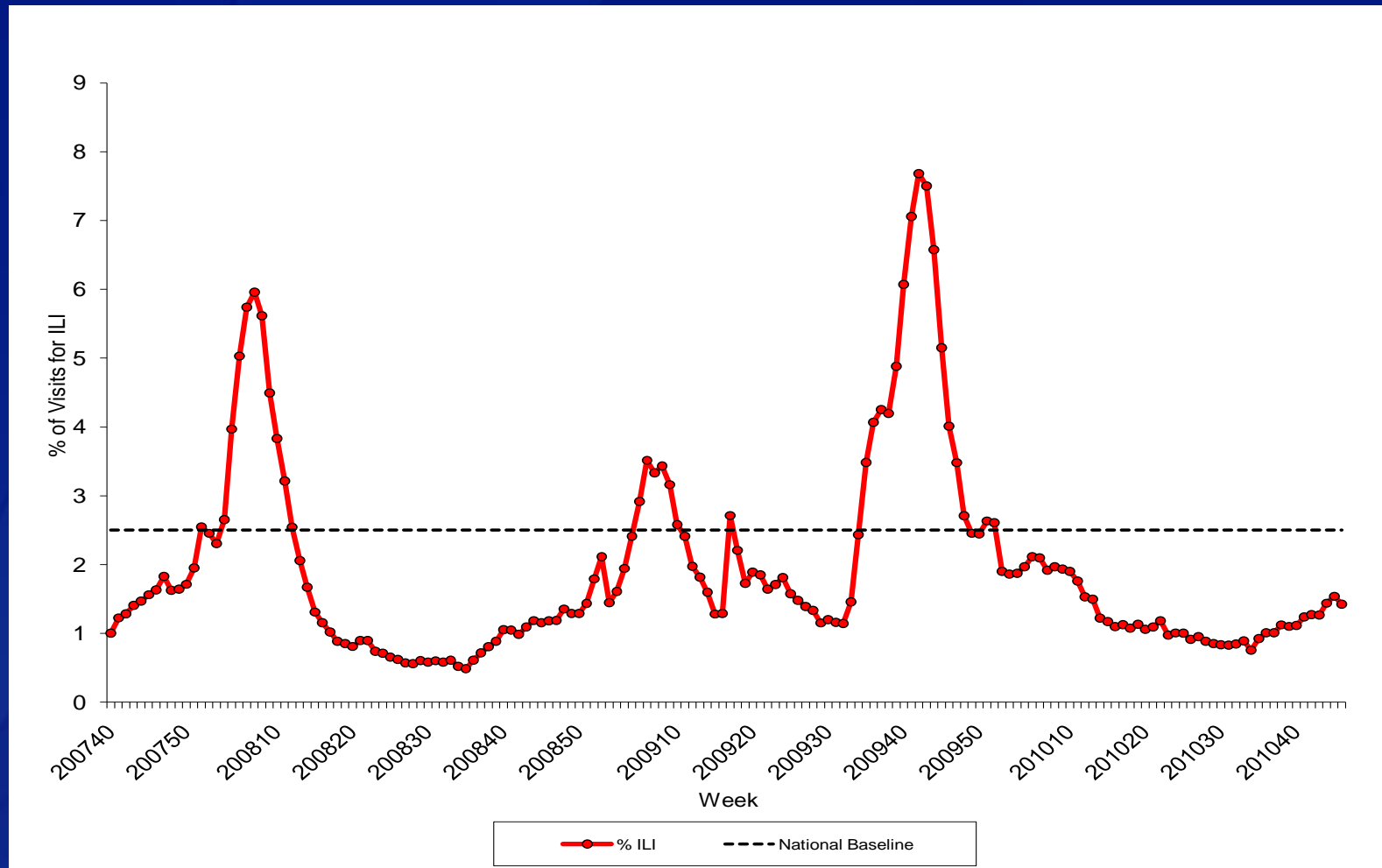
Seasonal influenza vaccination recommendations: Toward a universal recommendation

- Before 2000:**
- Persons aged 65 or older
 - Persons with high-risk chronic medical conditions
 - Pregnant women in the second or third trimester
 - Household contacts of the above
 - Health care workers
- 2000:**
- Adults 50 and older
- 2004:**
- Children aged 6—23 months
 - Household contact of children aged 0--23 months
 - Women who will be pregnant during influenza season
- 2006:**
- Children aged 6—59 months
 - Household contacts of children aged 0—59 months
- 2008:**
- All children aged 6 months—18 years
- 2010:**
- All persons in the US aged 6 months and older

2010-11 Influenza Vaccine Composition

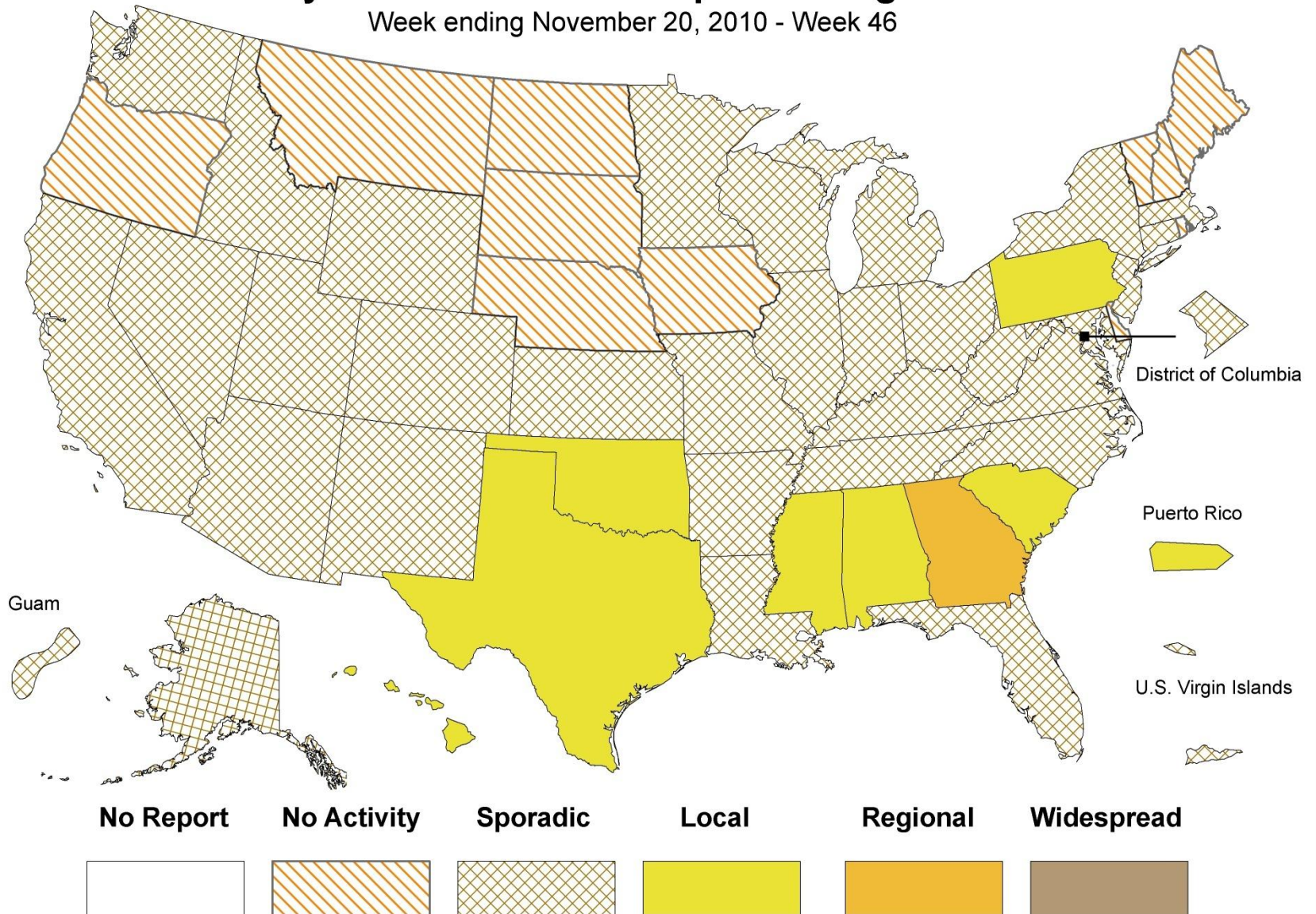
- ❑ Only one vaccine this year, not two
- ❑ First year: all 6 months and older recommended for annual vaccination
- ❑ Vaccine strains:
 - A/California/7/2009-like H1N1
 - Same strain as 2009 monovalent vaccine
 - A/Perth/16/2009-like H3N2
 - New H3N2 strain for Northern Hemisphere
 - B/Brisbane/60/2008
 - Was in 2009-10 seasonal vaccine
- ❑ All 3 strains circulating in U.S. and internationally

Percentage of Visits for Influenza-like Illness (ILI) Reported by the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Weekly National Summary, September 30, 2007 – November 20, 2010



Weekly Influenza Activity Estimates Reported by State & Territorial Epidemiologists*

Week ending November 20, 2010 - Week 46



* This map indicates geographic spread & does not measure the severity of influenza activity

Key Points - influenza vaccines for influenza prevention in people with chronic medical conditions

- **People with chronic medical conditions are at higher risk of severe complications from influenza, including hospitalization and death**
 - **Many people in these groups do not realize that their medical conditions increase their risk**
- **Universal vaccine recommendation this year will encourage everyone to get vaccinated - will increase coverage among close contacts of people with high risk conditions**
 - **Additional protection for those at higher risk of complications**
- **Vaccine coverage among persons with chronic medical conditions remains too low**
- **Influenza circulation still low in most parts of the country – so good time to be immunized**

Diabetes and Influenza

What Clinicians Need to Know and Do

Clinician Outreach and Communication Activity (COCA)
Conference Call

Pamela Allweiss MD, MPH

December 2, 2010

Objectives

- ❑ This presentation will show you
 - The impact of Influenza on People with Diabetes
 - 4 Actions to reduce the impact
 - Tools you can use

Diabetes and Seasonal Influenza

- ❑ Influenza can be especially dangerous for adults and children with diabetes, who are more likely to get very sick and even die with influenza infection.
- ❑ People with diabetes are six times more likely to be hospitalized with influenza complications and almost three times more likely to die from influenza.
- ❑ Over 10 percent of deaths related to influenza and pneumonia are attributed to diabetes.
- ❑ Influenza can interfere with efforts to control blood sugar levels, putting those with diabetes at increased risk of high or low blood sugar, and those with type 1 diabetes, in particular, at an increased risk of diabetic ketoacidosis.

What can Health Providers Do?

- ❑ Increase Vaccination Rate
- ❑ Use Antiviral Drugs Early
- ❑ Make sure your patients know “Sick Day Rules”
- ❑ Encourage Your Patients to take Everyday precautions

ACIP Recommendations: 2010 Trivalent Influenza Vaccine

- Who should get vaccinated?
 - Everyone*!



But Especially YOU!



*except infants less than 6 months old, and a few with medical contraindications

Influenza vaccination . . .

- ❑ ... is associated with 72% reduction in hospitalizations and death in persons with diabetes.
- ❑ ... is the most effective intervention for reducing the impact of influenza.
- ❑ People with diabetes should get the injection vaccine, NOT the “live” attenuated nasal mist vaccine.

**Only 32% of people
with chronic conditions
(including diabetes)
got a flu shot in 2008-2009**

MMWR October 9, 2009 / 58(39):1091-1095

Influenza Vaccination: An Unmet Need in Patients With Diabetes Clinical Diabetes 25:145-149, 2007

Vaccination: Part of the Diabetes Management Plan

- ❑ Vaccination is especially important for people with diabetes and close household contacts and out-of-home caregivers of anyone with diabetes.
- ❑ Getting a regular flu vaccine is part of an overall diabetes management plan.
- ❑ A pneumococcal vaccine is also recommended.

Increase Your Patients' Vaccination Rate

Action Steps You Can Take

- ❑ Make sure you and everyone who works in the practice is vaccinated, and let your patients know it.
- ❑ Recommend the flu shot at every patient encounter, especially for patients with diabetes.
- ❑ Use reminders and recalls.



Increase Your Patients' Vaccination Rate

Action Steps You Can Take

- ❑ Hold vaccine-only clinics
- ❑ Continue vaccination into December, January and beyond.
- ❑ Issue standing orders to vaccinate anyone with diabetes, even in the absence of a physician

Antiviral Medication Therapy

- ❑ If a patient with diabetes has influenza symptoms, they should seek medical care for evaluation and possible early antiviral treatment of influenza.
- ❑ Laboratory test confirmation of influenza is not necessary.
- ❑ Antiviral drugs are most effective when started within 48 hours of the onset of symptoms, so every minute counts.
- ❑ Clinical judgment should be an important component of outpatient treatment decisions.

Primary Antiviral Agents for Treatment of Influenza

- ❑ Neuraminidase inhibitors are recommended for early antiviral treatment of influenza:
 - (NIs): oseltamivir (Tamiflu®) , zanamivir (Relenza®)
- ❑ **Active against both influenza A and B viruses**
- ❑ Know the side effects
- ❑ Chemoprophylaxis with antiviral medications is not a substitute for influenza vaccination when vaccine is available. All persons aged 6 months and older, and especially

Sick Day Rules

Tell Your Patients to:

- ❑ Keep taking their usual dose of pills or insulin as close as possible to the same time as usual even if they can't eat. Illnesses like the flu can lead to fluctuations in blood sugars.
- ❑ Their health care provider may advise them to take more insulin during sickness.
- ❑ If they can't eat their usual diet, they should eat enough soft foods or drink enough liquids to take the place of the fruits and starchy foods they usually eat.

Sick Day Rules

Tell Your Patients To:

- ❑ Drink extra calorie-free liquids, like water, diet soda or tea, 4-6 ounces every hour in small sips
- ❑ Check your temperature every 4 hours. If your temperature is over 101° F, call the office
- ❑ Check your urine for ketones
- ❑ Call your health care provider or go to an emergency room if you have moderate or large amounts of ketones in your urine and your blood glucose is 250mg/dl or higher.
- ❑ Follow healthy habits, such as covering your mouth & nose when sneezing, handwashing, and staying home when you're sick

Division of Diabetes Translation

www.cdc.gov/diabetes

www.cdc.gov/diabetes/news/flu.htm

www.cdc.gov/flu

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



Influenza Vaccination and Cancer

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Influenza Vaccination in Cancer Patients

- Mortality rate from influenza can reach 9%
- Evidence that fewer than 50% of patients are vaccinated
- Influenza may also result in secondary and more severe conditions
- Universally well tolerated
- Therefore, benefit >> risk

Influenza: Signs and Symptoms

- Even in patients with malignancies, influenza most frequently presents with symptoms suggestive of viral illness.
 - These include: Fever, myalgias, constitutional symptoms, and Upper and/or Lower respiratory tract symptoms.
- Diagnosis can be rapidly made by nasal wash with quick viral detection methods

Different groupings within cancer patients

- Pediatric
- Adult with solid tumors
- Adult with hematologic malignancies
- Patients who received HSCT
 - Allogeneic
 - Autologous
- Those currently receiving immunotherapy

Pediatric Setting

- Higher incidence of influenza
- Greater morbidity and mortality
- Can interrupt/delay therapy up 80% of time
- Vaccination associated with suboptimal immunogenicity, but all studies showed some immunological response
- 2009 Cochrane Review –vaccine demonstrated a potential for efficacy and excellent safety profile
 - Routine administration was recommended

Adults with Solid Tumors

- Demonstrate an ability to mount protective antibody titers
- Most not receiving treatment at time
- Recommend vaccinating even if receiving therapy
- In a study by Earle, demonstrated decreased rates of influenza, treatment delays and morbidity/mortality in vaccinated group (retrospective)

Patients with Hematologic Malignancies

- Don't respond as well as healthy controls or patients with solid tumors
- However, patients not receiving treatment were equivalent to controls in mean antibody response to influenza antigens (suggests treatment causes decreased response, not disease)
- Despite this, patients still mount protective responses after vaccination

Patients with Hematologic Malignancies cont.

- Typical response time to vaccination is 2-4 weeks (general population)
- In a study by Mazza and Yale, found NHL patients took up to 12 weeks to demonstrate a response
- Demonstration of long term response was also noted in NHL patients at 1 and 6 months

Patients with HSCT

- Limited by a lack of uniformity in timing of vaccination relative to HSCT
- Larger studies have demonstrated evidence of efficacy and a protective effect from this intervention
- Timing is crucial in this population (no benefit in first 6 months following HSCT).
- Vaccine recommended in this population

Patients Receiving Immunotherapy

- Immunotherapy and biologic agents – advancement in cancer therapy
- Rituximab – integral for the treatment of B-cell lymphoproliferative disorders
- Mechanism suggests interference with immunogenic responses to vaccination
- Studies are mixed – some recommend, others conclude unlikely to be effective

Timing of Vaccination

- Recommendations
 - vaccinate 2 weeks before initiation of chemotherapy or after WBC recovers to greater than 1,000 cells/mm.
 - 2 months after completion of chemotherapy or before flu season
 - For actively treated patients, the furthest possible time point away from treatment during a given cycle

Vaccination of Close Contacts

- Most important management step includes prevention by vaccination
- Immunize all close contacts
- This is underutilized in recent studies - <45% among family members of cancer patients
- All healthcare workers need to vaccinated

Treatment

- Prevention – use of trivalent inactivated vaccine
- Use of pneumococcal vaccine
- Anti-influenza antiviral agents
 - Zanamivir + rimantidine
 - Oseltamivir + rimantidine

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Chronic Kidney Disease: A Population Vulnerable to Influenza

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Impact of Influenza

- Estimated that 10-20% of U.S. population infected with influenza yearly
- ~226,000 hospitalizations annually ¹
 - About half among those ≥ 65 years of age
 - Rates of influenza hospitalization in children < 5 years similar to rates in adults ≥ 65 years
- $> 36,000$ deaths during each influenza season ²
 - More than 90% in adults ≥ 65 years
- **Hospitalization and death rates are highest in elderly and those with certain chronic medical conditions**

¹ Thompson WW et al. JAMA 2004;292:1333-1340

² Thompson WW et al. JAMA 2003;289:179-186

Influenza and End-Stage Renal Disease

- > 500, 000 Americans diagnosed with End-Stage Renal Disease
 - Estimated 710,000 by year 2015
- Complications of Influenza
 - Pneumonia
 - Pulmonary infectious mortality is tenfold higher in ESRD patients
 - Primary influenza
 - Secondary bacterial
- CNS complications including Reye Syndrome
- Myocarditis / myositis / rhabdomyolysis
- Exacerbations of underlying medical condition's
- Death
 - Second leading cause of death among ESRD

Clin J Am Soc Nephrol 3: 1487–1493, 2008.

Special Considerations in ESRD

- Patients are “sicker”,¹ often with dysfunctional immune systems²
 - Greater disease burden – cardiovascular, infectious, inflammatory, uremic
 - Increased susceptibility for infection
 - Decreased response to vaccination
 - Decreased maintenance of protective antibodies
- Implications:
 - Results of studies in the general population do not always apply
 - Vaccines need to be evaluated individually
 - Risks and benefits (and cost issues) need to be weighed
 - There is a great need to prevent infections in ESRD

¹ USRDS ADR 2007

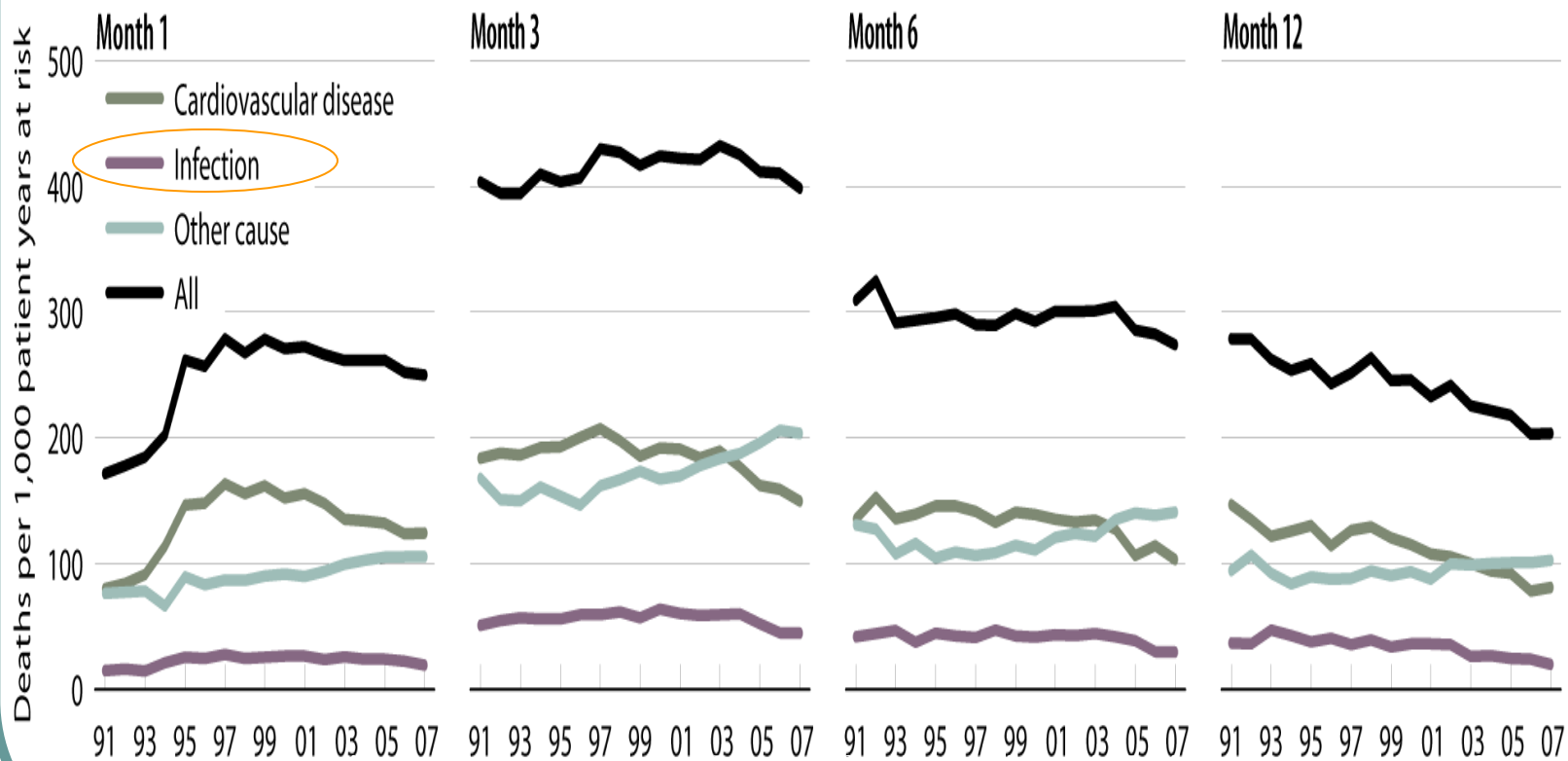
² Pesanti EL. Infections in CRF. Infect Dis Clin North Am. 15: 1-15, 2001

Rationale for Vaccination

Prevent Infection

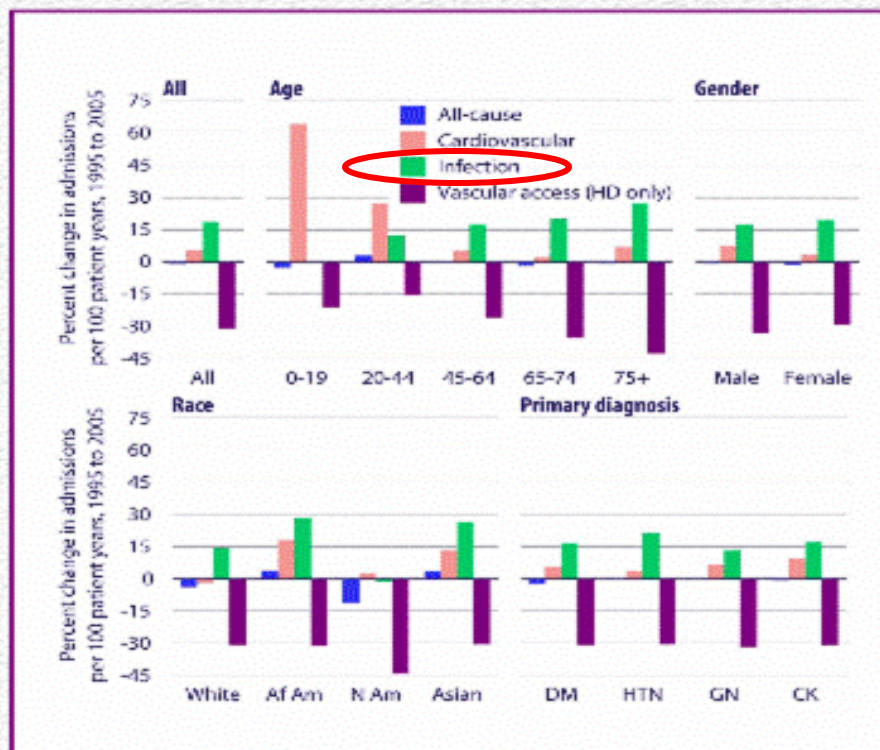
- Decrease Morbidity
 - Avoiding Co-infections or Superimposed infections
 - Decrease Disease Burden and Hospitalization
 - Decrease severity of illness for breakthrough infections
- Decrease Mortality

Infection is the 2nd Leading Cause of Death in ESRD



Increase in Hospitalizations for Infection in ESRD from 1995 to 2005

Percent change in hospitalization rates for prevalent dialysis patients, 1995–2005, by demographic characteristics & primary diagnosis
Figure 6.6



Period prevalent dialysis patients; rates for all patients are adjusted for age, gender, race, & primary diagnosis; rates by one factor are adjusted for the remaining three. Direct comparison of adjusted rates is appropriate only within each graph, not between graphs. Dialysis patients, 2005, used as reference cohort. Vascular access data include hemodialysis patients only.

Influenza Facts

- For people 65 years and older, complications from seasonal influenza present serious health risks, with far higher fatality rates than the general population.
- More than 30,000 adults 65 years or older died each year from flu-related complications during the years 1990–1999

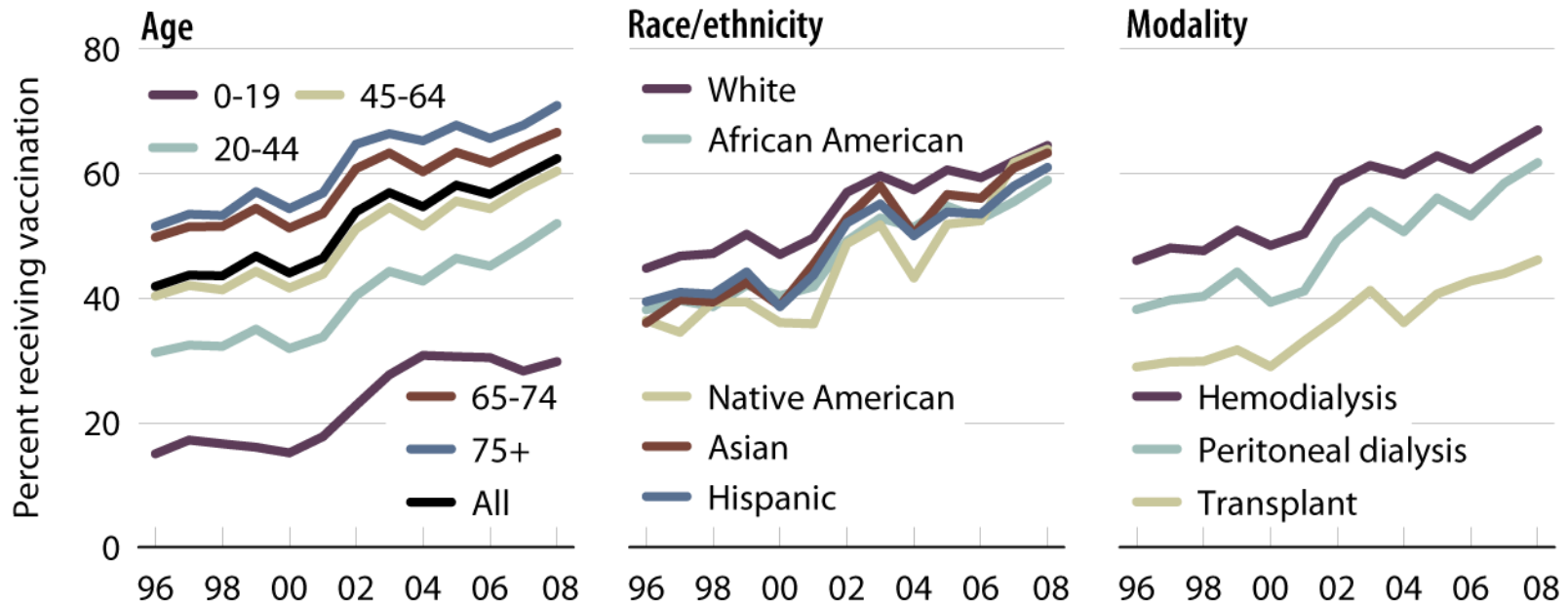
Immunizations

- Immunizations may prevent people from contracting other diseases, infections and viruses.
- The immune system of a person with CKD becomes weakened, making it difficult to fight off many diseases and infections.
- Chronic kidney disease patients may become more susceptible to illness and even death if they do not receive regular immunization treatment.
- Getting the proper immunizations is an essential part of a person's kidney care.

Influenza Vaccination

- ESRD have significantly lower response rates to influenza vaccine
- Vaccination against influenza A and B was associated with a reduced risk for infection-related hospitalizations, hospitalizations for influenza or pneumonia, all cause mortality, infection-related mortality, and cardiac-related mortality.
- Among patients who received peritoneal dialysis, influenza vaccination was associated with a lower risk for all-cause mortality .

Influenza vaccination rates, by age, race/ethnicity, & modality



ESRD patients initiating therapy at least 90 days before September 1 of each year & alive on December 31; vaccinations tracked between September 1 & December 31 of each year.

Influenza Vaccination

- The 2010--11 trivalent vaccines will contain A/California/7/2009 (H1N1)-like, A/Perth/16/2009 (H3N2)-like, and B/Brisbane/60/2008-like antigens
- The influenza A (H1N1) vaccine virus is derived from a 2009 pandemic influenza A (H1N1) virus.
- Trivalent Inactivated Vaccine
 - 0.5 ml given IM annually at the start of each flu season (preferably October)
 - Can still be administered later into the winter
 - May be administered with pneumococcal vaccine (at a different injection site) at the same visit
 - Booster doses and Antibody titer measurements are not recommended
- Not recommended to be administered when a patient is having an acute febrile illness (may mask systemic/hypersensitivity reaction) .
- Precautions and Contraindications
 - Hypersensitivity Reactions (i.e. eggs, latex, and other vaccine components)
 - Was linked to Guillian-Barre Syndrome in 1976 (if real, est. 1/1,000,000 doses)
 - Side effect is mostly local irritation on injection site ≤ 2 days (10-64%), occ'l mild fever, malaise
 - Live attenuated vaccines (e.g. Flumist) not recommended in ESRD
- May occasionally miss out on the prevalent influenza strain during the season
- **MMWR August 6, 2010 / Vol. 59 / No. RR-8**

Influenza Vaccination & Outcomes in ESRD

Table 2. Odds ratios for the impact of vaccinations on mortality and morbidity

	Hemodialysis		Peritoneal dialysis	
	1997-1998	1998-1999	1997-1998	1998-1999
Hospitalization				
Any-cause	0.95 (0.92, 0.98)	0.93 (0.90, 0.95)	0.90 (0.83, 0.98)	1.01 (0.93, 1.11)
Influenza/pneumonia	0.88 (0.80, 0.97)	0.84 (0.77, 0.92)	0.95 (0.67, 1.37)	0.85 (0.59, 1.21)
Bacteremia/viremia/septicemia	0.83 (0.73, 0.94)	0.76 (0.67, 0.87)	0.48 (0.27, 0.86)	1.12 (0.62, 2.01)
Respiratory infection	0.93 (0.85, 1.01)	0.88 (0.81, 0.95)	0.88 (0.64, 1.21)	0.86 (0.62, 1.18)
Death				
Any-cause	0.75 (0.71, 0.80)	0.77 (0.73, 0.81)	0.70 (0.59, 0.82)	0.83 (0.71, 0.97)
Cardiac	0.84 (0.77, 0.92)	0.82 (0.76, 0.88)	0.77 (0.61, 0.98)	0.90 (0.72, 1.13)
Infection	0.75 (0.64, 0.88)	0.64 (0.56, 0.72)	0.80 (0.56, 1.15)	0.85 (0.62, 1.17)
Other	0.69 (0.62, 0.75)	0.81 (0.75, 0.88)	0.58 (0.44, 0.78)	0.78 (0.61, 1.00)
Hospitalization or death	0.91 (0.89, 0.94)	0.89 (0.86, 0.91)	0.86 (0.79, 0.93)	0.96 (0.89, 1.05)

- Gilbertson DT et al. *Kidney Int* 2003;63:738-743

- 5-15% reduction in hospitalization for pneumonia/influenza and up to 7% reduction in all-cause hospitalization
- 15-36% reduction in death from infections and 4-14% reduction in death risk (all causes)

Influenza Vaccination

- Influenza vaccination has been shown to reduce the rate of hospitalization for pneumonia and influenza up to 27% among community-dwelling elderly persons during the years 1990–2000 ³
- Administering influenza vaccine to older adults can help prevent secondary complications and reduce the risk of flu-related death and hospitalizations. One recent study showed a 58% reduction in flu-related respiratory illness among people 60 years or older

³ Heyman, AD et al, *Diabetes Care* 2004 27:2581-2584;

Conclusion

- There were nearly 100,000 new cases of Stage 5 CKD in 2005 expected to climb 76% by 2020 and cost Medicare nearly \$54 billion ¹
- acute infections seem to occur more frequently in the setting of kidney disease and are associated with poorer outcomes compared with the general population ²

1. United States Renal Data System. (2007). Incidence and Prevalence. Retrieved Aug. 14, 2008 from http://www.usrds.org/2007/pdf/02_incid_prev_07.pdf
2. Gilbertson DT, Liu J, Xue JL, Louis TA, Solid CA, Ebben JP, Collins A. Projecting the number of patients with end-stage renal disease in the United States to the year 2015. J Am Soc Nephrol. 2005 Dec;16(12):3736-41.



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Thank you for joining!

Please email us questions at coca@cdc.gov

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Burden of Influenza in Chronic Illness

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Date: Thursday, December 2, 2010
Time: 2:00 PM – 3:00 PM (Eastern Time)

Presenter(s):

-  **Pamela Allweiss, MD, MPH**
Endocrinologist
University of Kentucky Medical School
Consultant, Division of Diabetes Translation - CDC
-  **Anthony E. Brennenan, MPAS, PA-C**
Associate Professor & Associate Director
University of Iowa
Carver College of Medicine
Physician Assistant Program
-  **Joseph Bresee, MD, FAAP**
CAPT, U.S. Public Health Service
Chief, Influenza Division - CDC




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