2018 UPDATE

INFECTION PREVENTION and CONTROL

ISOLATION PRECAUTIONS
&
BLOODBORNE PATHOGENS

Catherine D. Bacheller, M.D.
Medical Director, KMC & GVMC Infection Prevention and Control
Assistant Professor of Medicine,
Boonshoft School of Medicine, WSU

WORKING IN HEALTHCARE...

...can be more dangerous than you think.

13,700,000 healthcare workers = **11%** of the U.S. workforce in 2010

- **9.1 million** employees are outside of hospitals, with less health and safety support
- Hospitals reported **258,200** injuries/illnesses, highest of any sector
- Private healthcare incident rate = **1.5X** general industry average
- Private hospitals injuries/illnesses rate = almost **double** the national average
- Private nursing homes injuries/illnesses rate = more than **2.2X** the national average

Employees in the healthcare industry are more likely to be injured on the job than workers in:

CONSTRUCTION

TRANSPORTATION

MINING

UTILITIES

HEALTHCARE WORKERS

92,000 ILLNESSES

716,800 INJURIES

3X more likely to incur a workplace illness

More than **1.6X** more likely to be injured at work than the national average

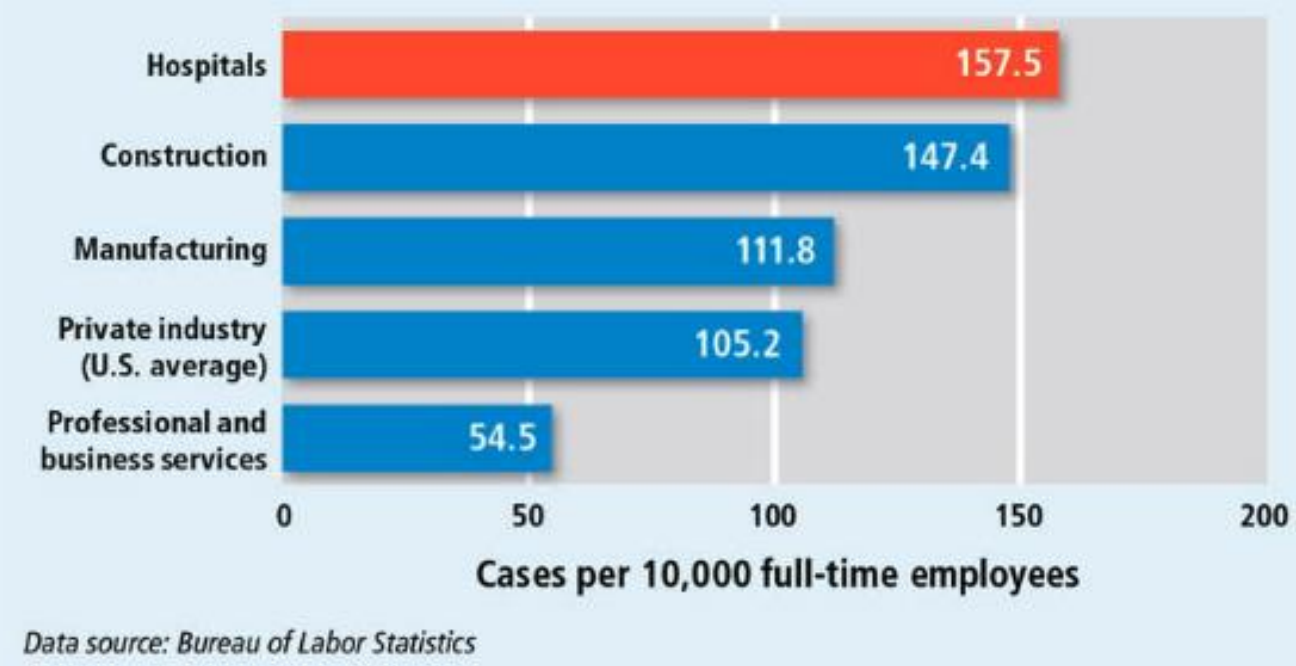
13.7% of ALL workplace illnesses were suffered by healthcare workers

9.3% more likely to suffer a skin condition from exposure than the national average

Healthcare respiratory conditions are almost **2X** the national average

15% of ALL workplace injuries were suffered by healthcare employees

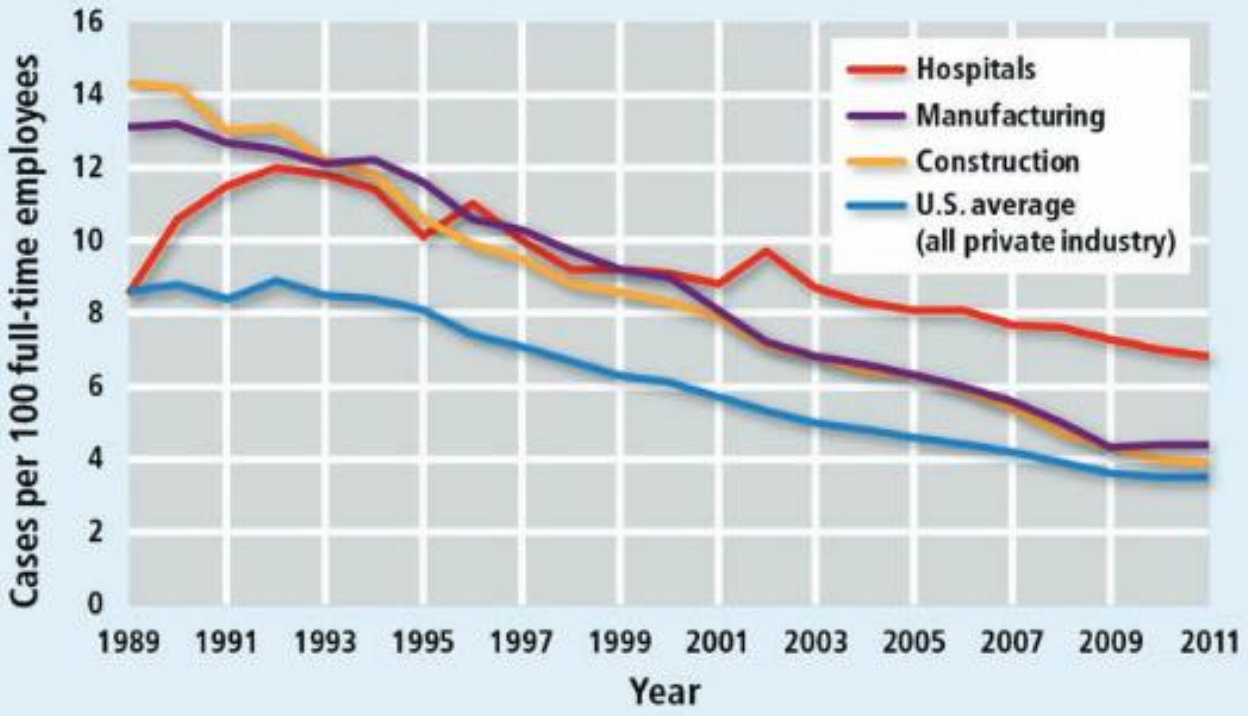
Figure 2. Injuries and Illnesses Resulting in Days Away from Work, 2011[3]



Data source: Bureau of Labor Statistics

Facts About Hospital Worker Safety
September 2013
U.S. Department of Labor
www.osha.gov

Figure 1. Injury and Illness Rates by Industry, 1989–2011[2]



Facts About Hospital Worker Safety
September 2013
U.S. Department of Labor
www.osha.gov

Infections in the NEWS...

Dangerous infections now spreading outside hospitals

Liz Szabo, USA TODAY 7:27 p.m. EST February 25, 2015

Peter Eisler, USA TODA

Understa
superbug

By JESSICA FIRGER / CBS NEWS / March 26, 2014, 5:39 PM

In U.S., hospital-acquired infections run rampant

The infections at York Hospital, explained

Dylan Segelbaum, dsegelbaum@ydr.com 5:37 p.m. EST November 10, 2015

OUTBRE
CD
pre
Published

Peter Eisler, USA TODAY 4:40 p.m. EST March 6, 2013

A USA TODAY review finds that deadly CRE bacteria are showing up in hospitals and other health care facilities across the country and there is virtually nothing to stop these "superbugs" at this point.

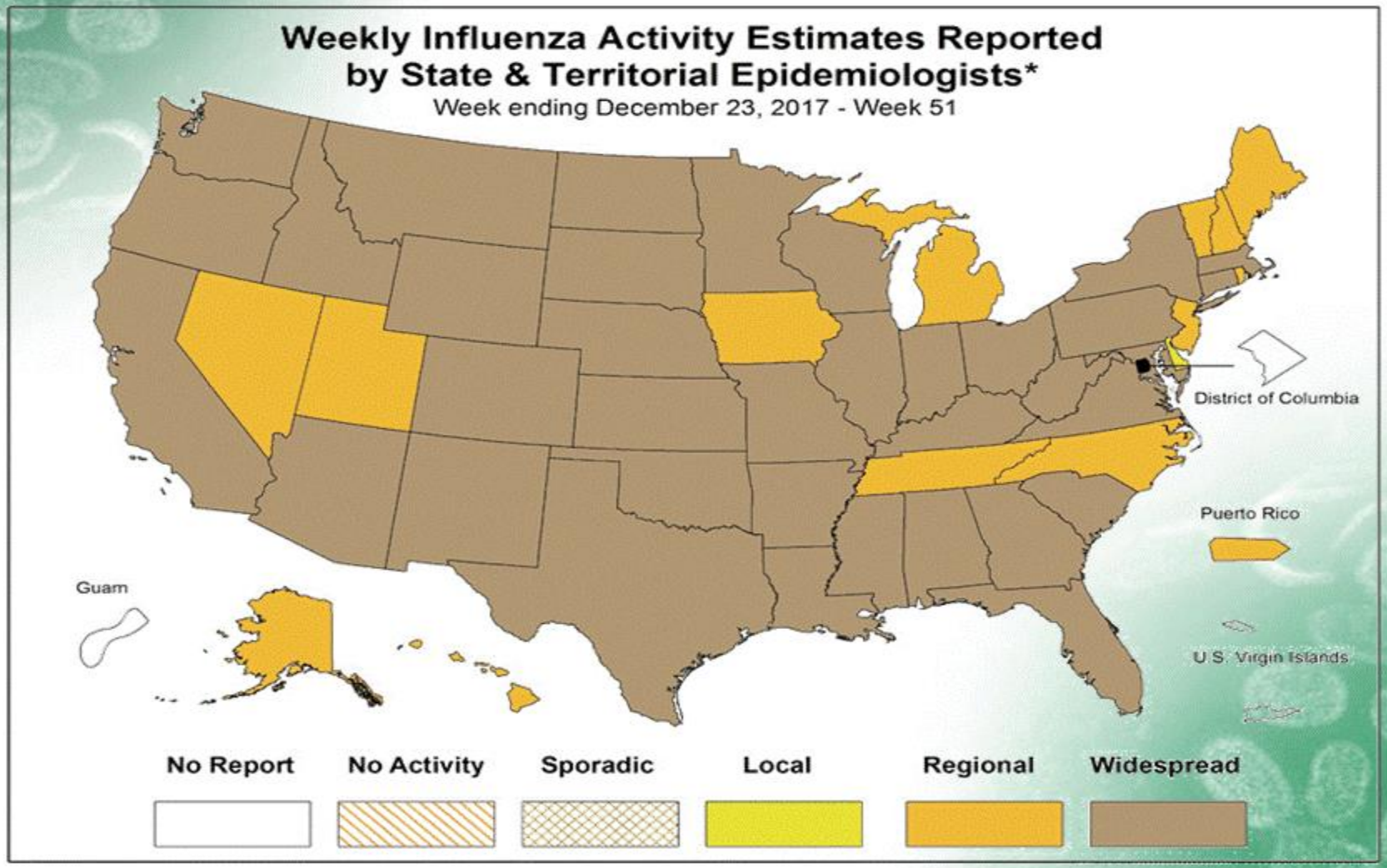
ths

Welcome to FLU SEASON 2017-18!

FLUVIEW

A Weekly Influenza Surveillance Report Prepared by the Influenza Division

CDC
Centers for Disease Control and Prevention

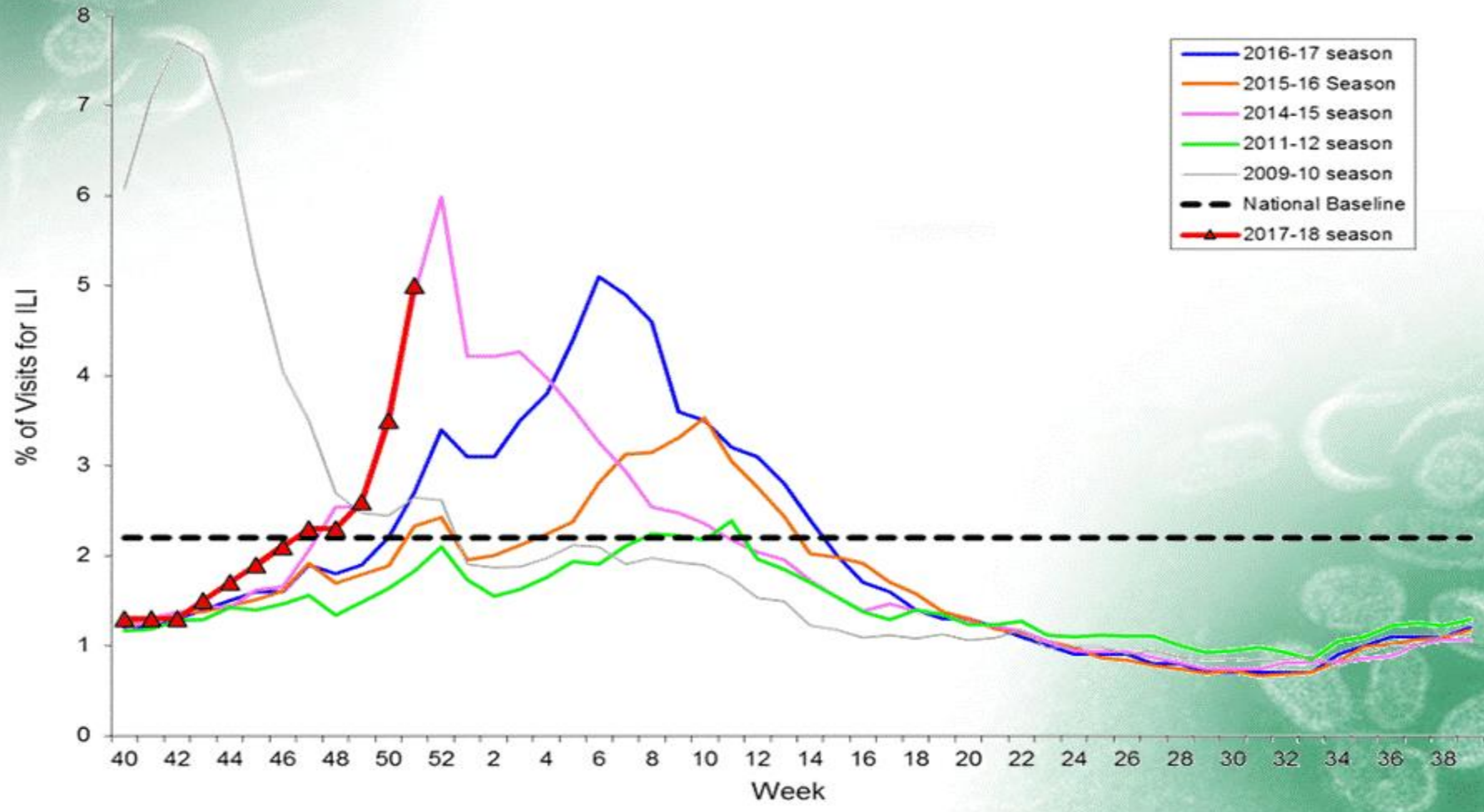


* This map indicates geographic spread & does not measure the severity of influenza activity

FLUVIEW

A Weekly Influenza Surveillance Report Prepared by the Influenza Division

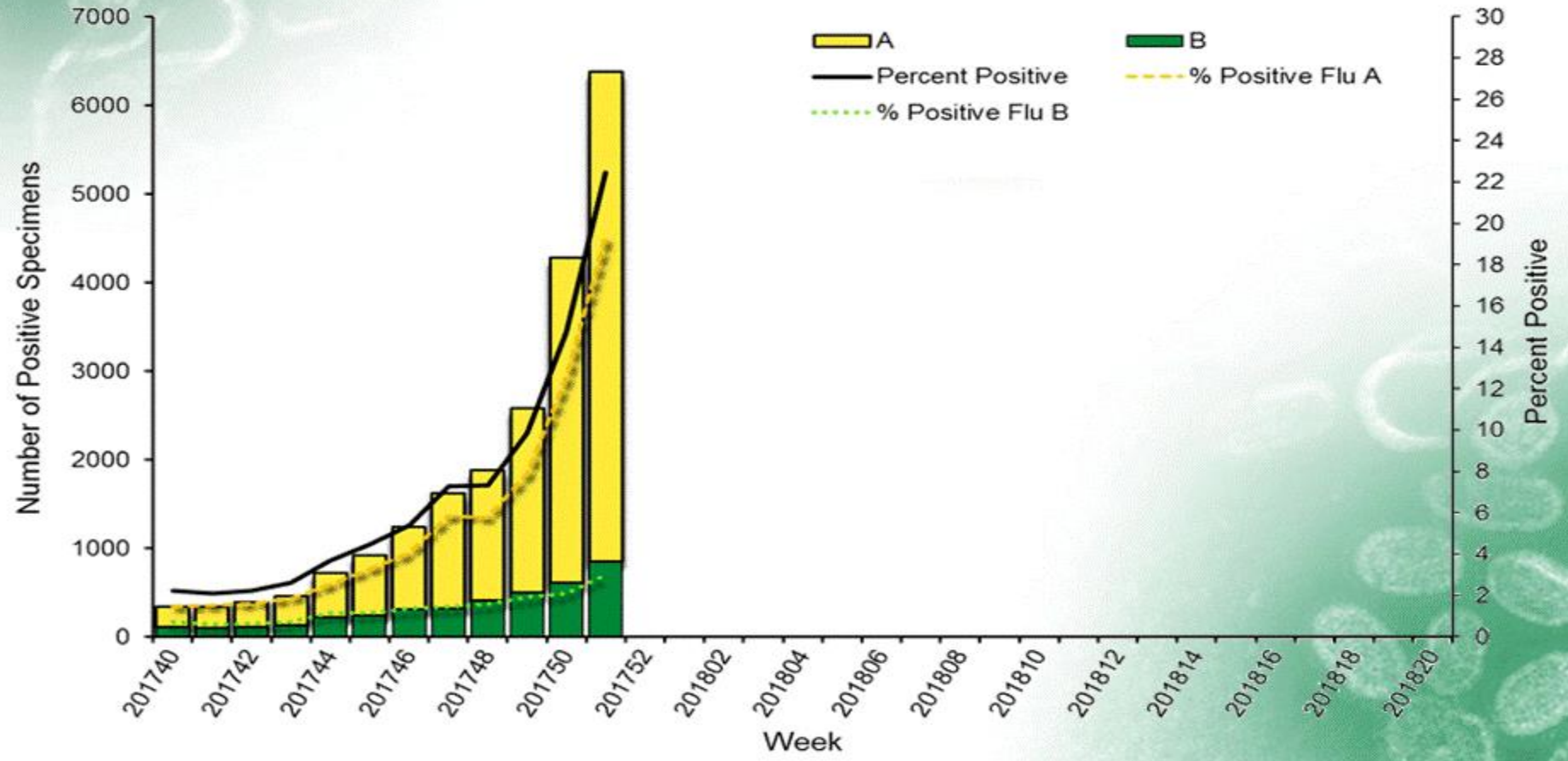
Percentage of Visits for Influenza-like Illness (ILI) Reported by the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Weekly National Summary, 2017-2018 and Selected Previous Seasons



FLUVIEW

A Weekly Influenza Surveillance Report Prepared by the Influenza Division

Influenza Positive Tests Reported to CDC by U.S. Clinical Laboratories, National Summary, 2017-2018 Season

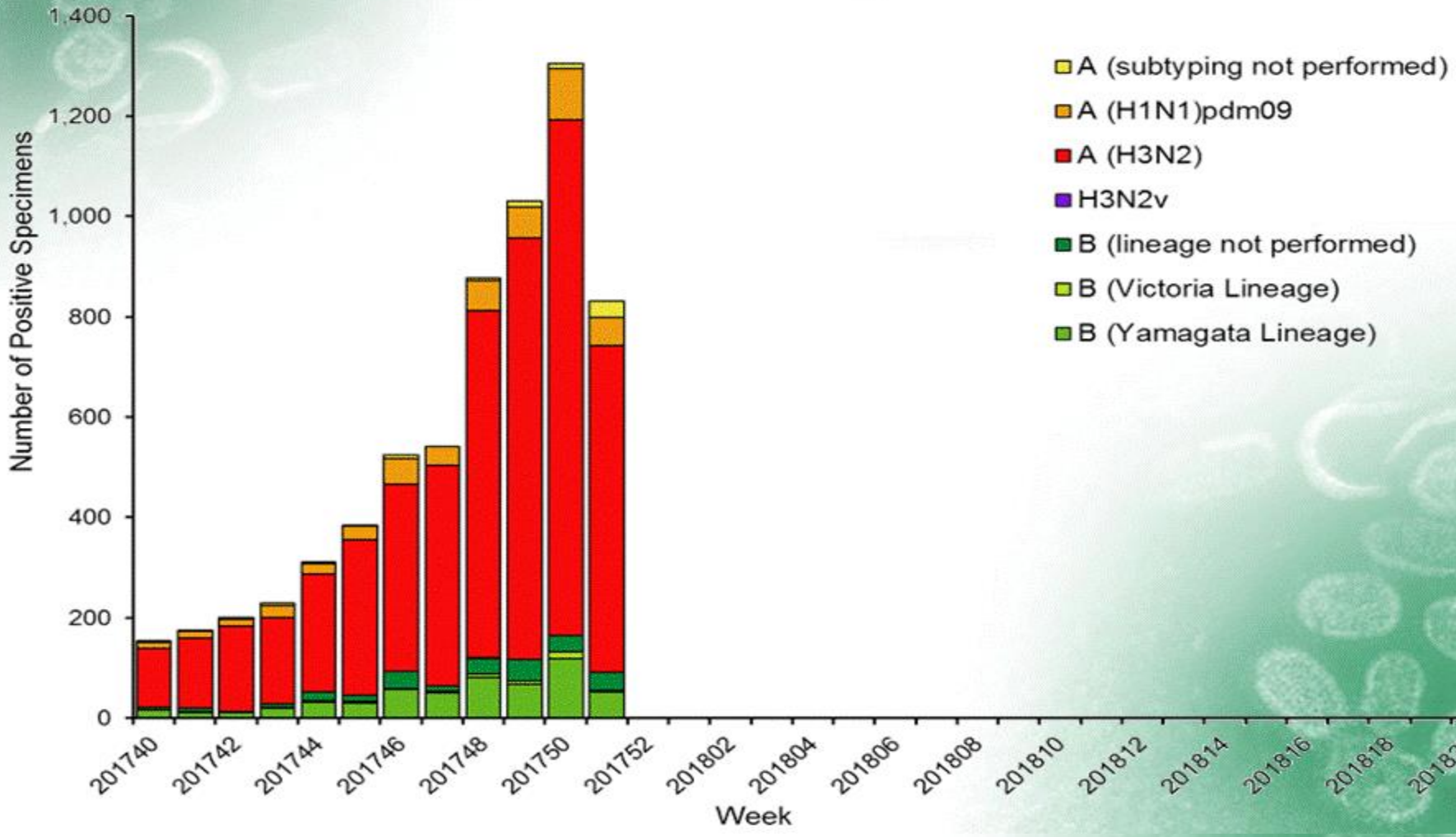


FLUVIEW

A Weekly Influenza Surveillance Report Prepared by the Influenza Division

CDC
Centers for Disease Control and Prevention

Influenza Positive Tests Reported to CDC by U.S. Public Health Laboratories, National Summary, 2017-2018 Season



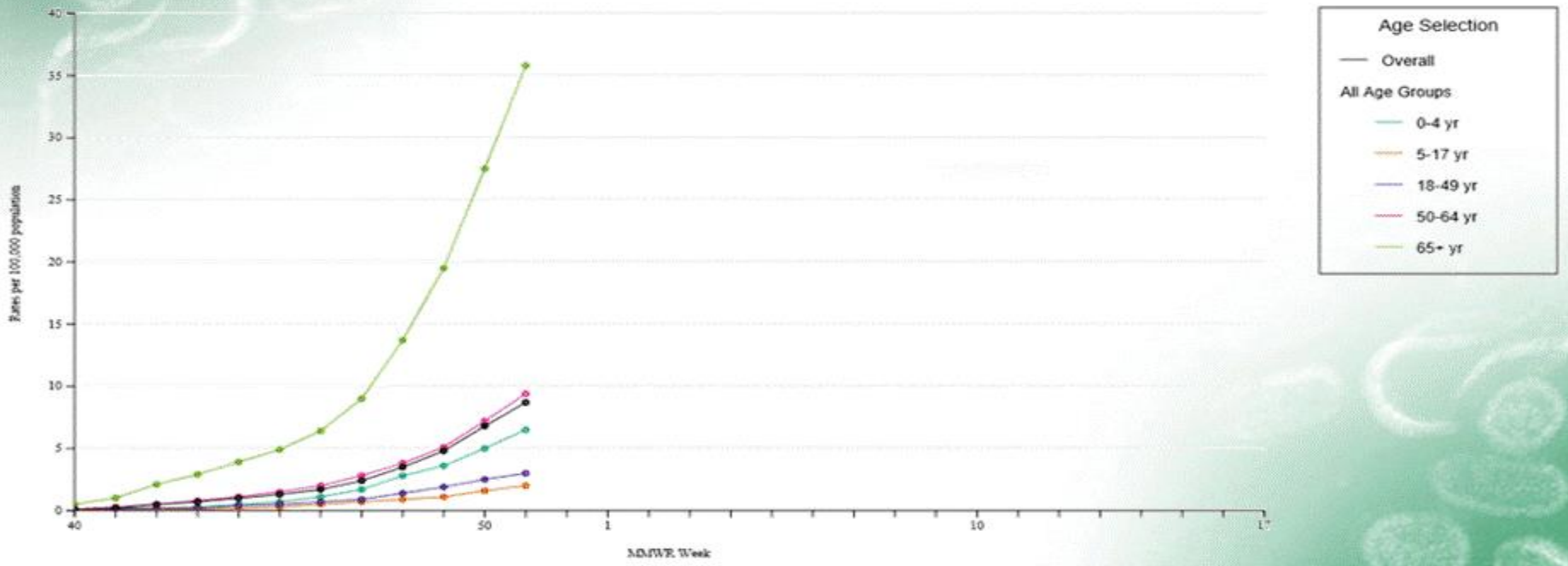
FLUVIEW

A Weekly Influenza Surveillance Report Prepared by the Influenza Division

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

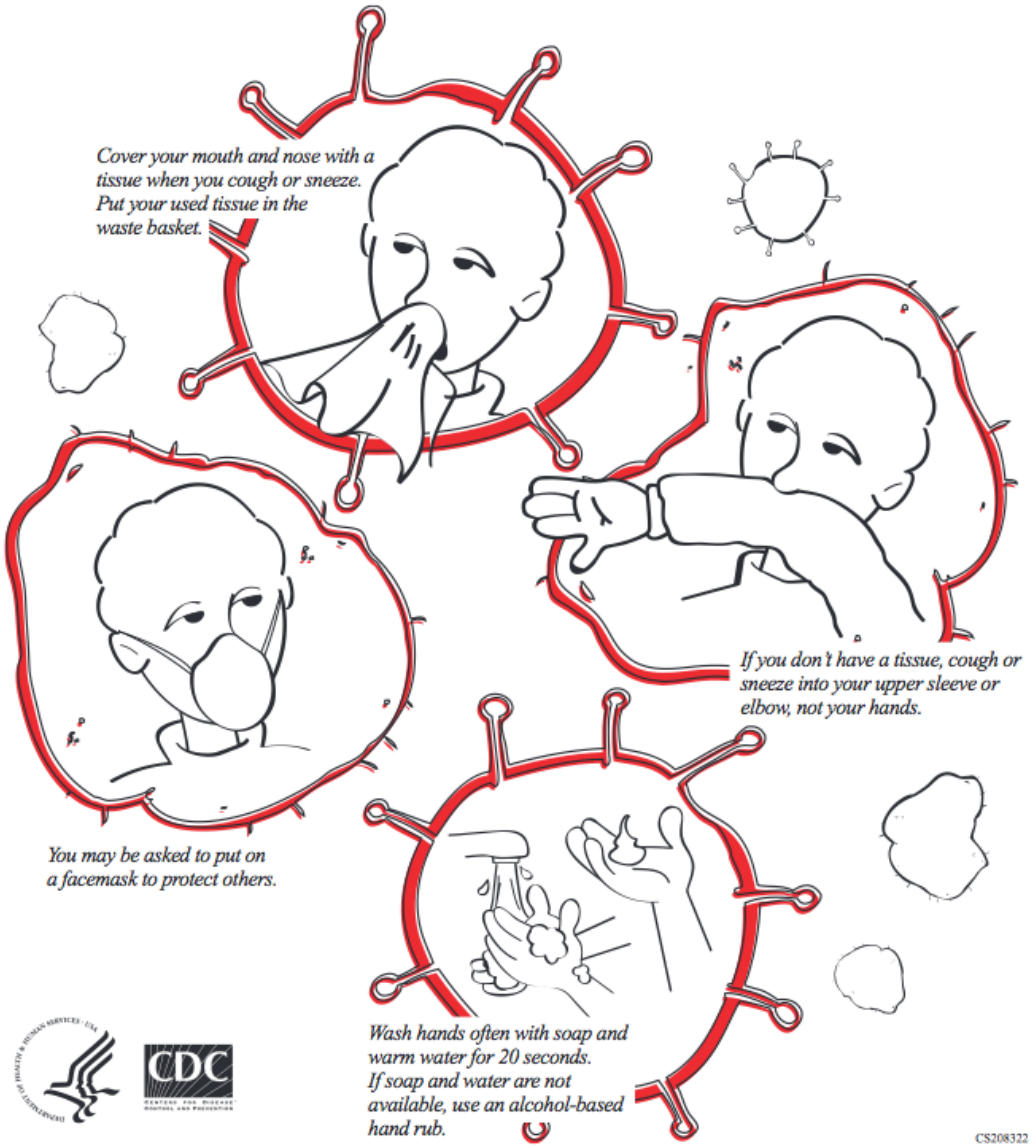
Laboratory-Confirmed Influenza Hospitalizations

Preliminary cumulative rates as of Dec 23, 2017



Cover your Cough

Stop the spread of germs that can make you and others sick!



CDC

CS208322

Visitor Restrictions

During flu season, help us protect our patients, their families and our employees.
Please follow these guidelines when visiting:

No children under 14 years old should come to the hospital unless they need medical care.
If you feel you have special circumstances, please talk to one of our nursing supervisors.

All visitors should be healthy. Do not visit if you feel sick or have symptoms of a cold, flu or another illness.

Cover your cough. Please request a mask if you are coughing frequently. Otherwise, when you sneeze or cough, cover your nose and mouth with a tissue, then throw the tissue in the trash, or cough or sneeze into your sleeve.

Wash your hands frequently.

Kettering Health Network

GDAHA
Greater Dayton Area Hospital Association
The Link to Quality Care

Thank you for your understanding and cooperation!

"I have the test results on whether you're contagious."

1996 CDC ISOLATION GUIDELINES
STANDARD PRECAUTIONS

Reduce risk to HCP & patients of transmissible infectious agents.

Apply to any healthcare encounter:

- -blood
- -body fluids
- -secretions
- -excretions (except sweat)
- -nonintact skin
- -mucous membranes

The Centers for Disease Control & Prevention says

"the most common mode of transmission of pathogens is via the hands"

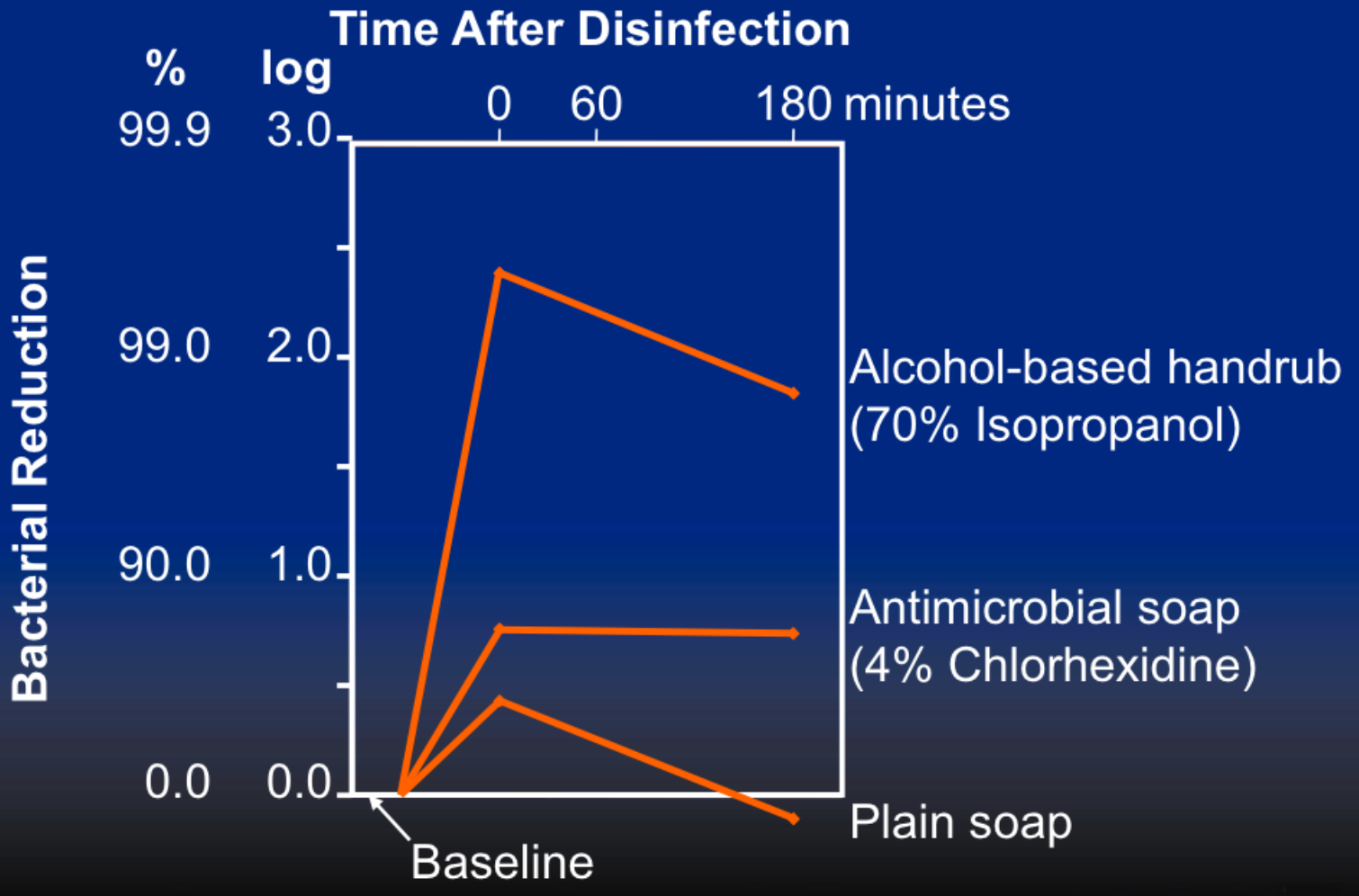
Take The Time To Wash Your Hands

Seconds Count – Save A Life

OHIO HOSPITAL ASSOCIATION

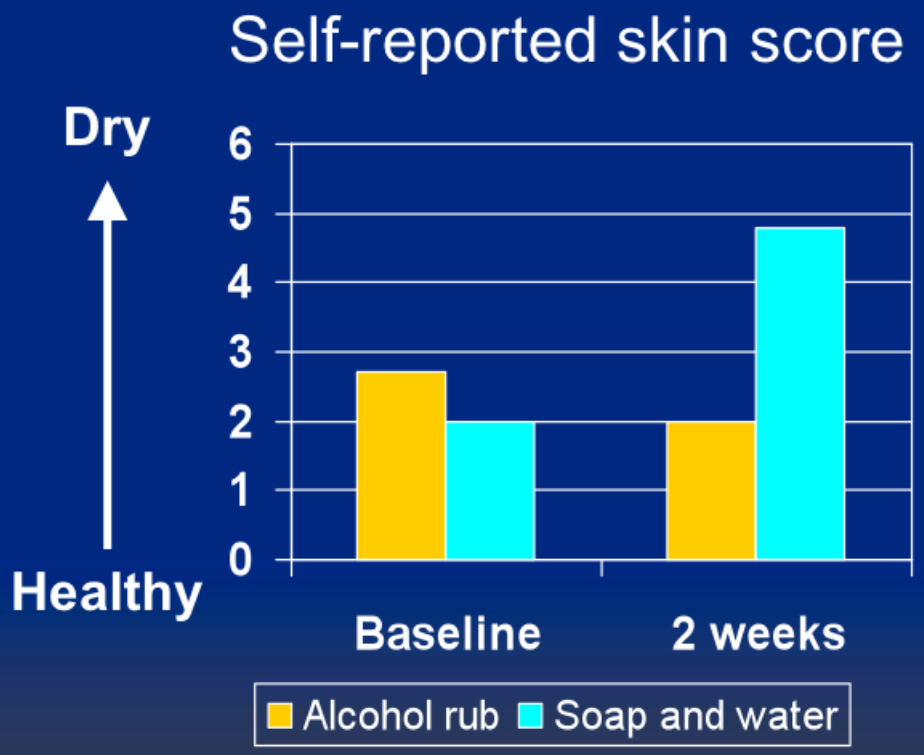

Use of Alcohol foam:
use enough to cover your hands well.

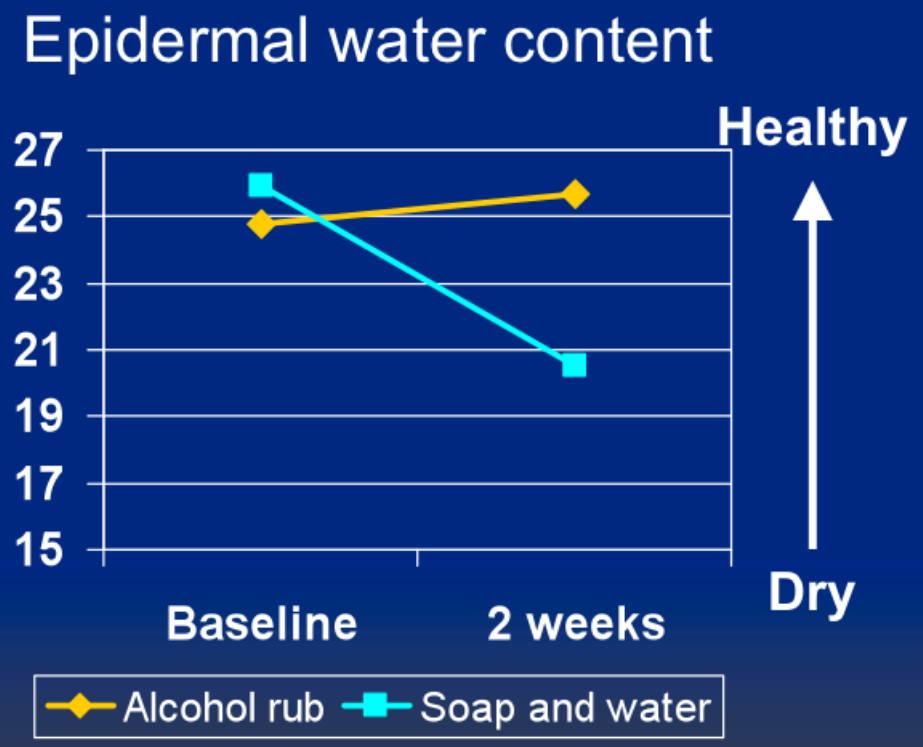
Ability of Hand Hygiene Agents to Reduce Bacteria on Hands



Adapted from: *Hosp Epidemiol Infect Control*, 2nd Edition, 1999.

Effect of Alcohol-Based Handrubs on Skin Condition





~ Alcohol-based handrub is less damaging to the skin ~

Boyce J, *Infect Control Hosp Epidemiol* 2000;21(7):438-441.

Dozens of studies indicate, hand hygiene is only achieved 50% of the time

November 2016 KMC Gemba Walk showed 58% Hand Hygiene Compliance.

HAIs are:

1. 4th leading cause of death in America.
2. Cost the US healthcare system between $30 – 40 billion dollars each year.
3. Every year, an estimated 2,000,000 patients get a hospital-related infection.
4. 90,000 people die from their infection.
5. The HAI problem is closely related to Hand Hygiene.

NATIONAL AND STATE HEALTHCARE ASSOCIATED INFECTIONS

PROGRESS REPORT

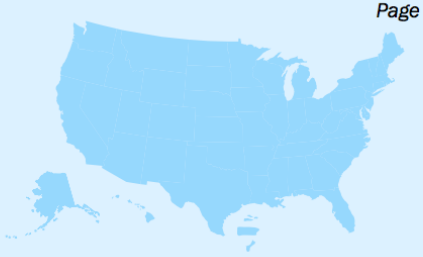
THIS REPORT IS BASED ON 2014 DATA, PUBLISHED IN 2016

Centers for Disease Control and Prevention
National Center for Emerging and Zoonotic Infectious Diseases

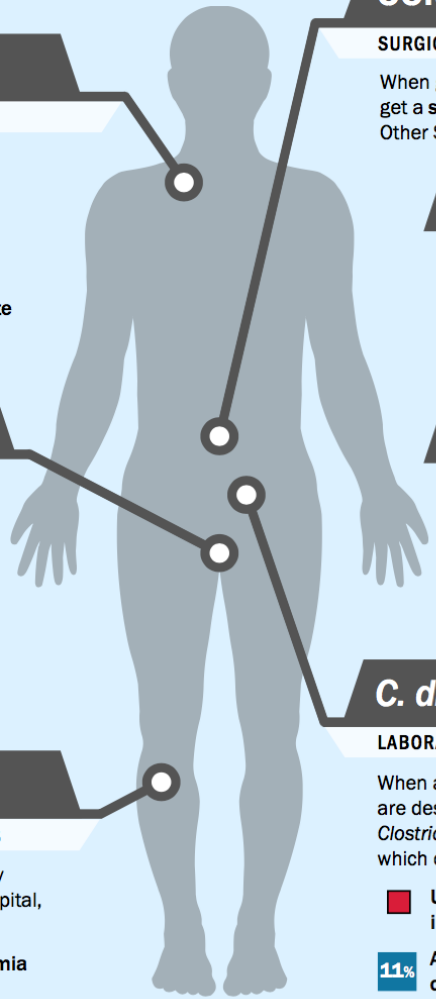
HEALTHCARE ASSOCIATED INFECTIONS PROGRESS

NATIONAL

ACUTE CARE HOSPITALS



Healthcare-associated infections (HAIs) are infections patients can get while receiving medical treatment in a healthcare facility. Working toward the elimination of HAIs is a CDC priority. The standardized infection ratio (SIR) is a summary statistic that can be used to track HAI prevention progress over time; lower SIRs are better. The infection data are reported to CDC's National Healthcare Safety Network (NHSN). HAI data for nearly all U.S. hospitals are published on the Hospital Compare website.
This report is based on 2014 data, published in 2016.



CLABSIs

↓50% LOWER COMPARED TO NAT'L BASELINE*

CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS

When a tube is placed in a large vein and not put in correctly or kept clean, it can become a way for germs to enter the body and cause deadly infections in the blood.

- **U.S. hospitals reported a significant decrease in CLABSIs between 2013 and 2014.**
- **10% Among the 2,442 hospitals in U.S. with enough data to calculate an SIR, 10% had an SIR significantly higher (worse) than 0.50, the value of the national SIR.**

CAUTIs

0% NO CHANGE COMPARED TO NAT'L BASELINE

CATHETER-ASSOCIATED URINARY TRACT INFECTIONS

When a urinary catheter is not put in correctly, not kept clean, or left in a patient for too long, germs can travel through the catheter and infect the bladder and kidneys.

- **U.S. hospitals reported a significant decrease in CAUTIs between 2013 and 2014.**
- **12% Among the 2,880 U.S. hospitals with enough data to calculate an SIR, 12% had an SIR significantly higher (worse) than 1.00, the value of the national SIR.**

MRSA Bacteremia

↓13% LOWER COMPARED TO NAT'L BASELINE*

LABORATORY IDENTIFIED HOSPITAL-ONSET BLOODSTREAM INFECTIONS

Methicillin-resistant *Staphylococcus aureus* (MRSA) is bacteria usually spread by contaminated hands. In a healthcare setting, such as a hospital, MRSA can cause serious bloodstream infections.

- **U.S. hospitals reported a significant decrease in MRSA bacteremia between 2013 and 2014.**
- **8% Among the 2,042 U.S. hospitals with enough data to calculate an SIR, 8% had an SIR significantly higher (worse) than 0.87, the value of the national SIR.**

SSIs

SURGICAL SITE INFECTIONS

See pages 3-5 for additional procedures

When germs get into an area where surgery is or was performed, patients can get a **surgical site infection.** Sometimes these infections involve only the skin. Other SSIs can involve tissues under the skin, organs, or implanted material.

SSI: Abdominal Hysterectomy

↓17% LOWER COMPARED TO NAT'L BASELINE*

- **U.S. hospitals reported no significant change in SSIs related to abdominal hysterectomy surgery between 2013 and 2014.**
- **6% Among the 794 U.S. hospitals with enough data to calculate an SIR, 6% had an SIR significantly higher (worse) than 0.83, the value of the national SIR.**

SSI: Colon Surgery

↓2% LOWER COMPARED TO NAT'L BASELINE*

- **U.S. hospitals reported a significant increase in SSIs related to colon surgery between 2013 and 2014.**
- **8% Among the 2,051 U.S. hospitals with enough data to calculate an SIR, 8% had an SIR significantly higher (worse) than 0.98, the value of the national SIR.**

C. difficile Infections

↓8% LOWER COMPARED TO NAT'L BASELINE*

LABORATORY IDENTIFIED HOSPITAL-ONSET *C. DIFFICILE* INFECTIONS

When a person takes antibiotics, good bacteria that protect against infection are destroyed for several months. During this time, patients can get sick from *Clostridium difficile* (*C. difficile*), bacteria that cause potentially deadly diarrhea, which can be spread in healthcare settings.

- **U.S. hospitals reported a significant increase in *C. difficile* infections between 2013 and 2014.**
- **11% Among the 3,554 U.S. hospitals with enough data to calculate an SIR, 11% had an SIR significantly higher (worse) than 0.92, the value of the national SIR.**

* Statistically significant

CDC

HEALTHCARE ASSOCIATED INFECTIONS PROGRESS

OHIO ACUTE CARE HOSPITALS

Healthcare-associated infections (HAIs) are infections patients can get while receiving medical treatment in a healthcare facility. Working toward the elimination of HAIs is a CDC priority. The standardized infection ratio (SIR) is a summary statistic that can be used to track HAI prevention progress over time; lower SIRs are better. The infection data are reported to CDC's National Healthcare Safety Network (NHSN). HAI data for nearly all U.S. hospitals are published on the Hospital Compare website. **This report is based on 2014 data, published in 2016.**

CLABSIs ↓60% LOWER COMPARED TO NAT'L BASELINE*

CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS

When a tube is placed in a large vein and not put in correctly or kept clean, it can become a way for germs to enter the body and cause deadly infections in the blood.

- ☐ **Ohio hospitals reported no significant change in CLABSIs between 2013 and 2014.**
- **6%** **Among the 91 hospitals in Ohio with enough data to calculate an SIR, 6% had an SIR significantly higher (worse) than 0.50, the value of the national SIR.**

CAUTIs ↓13% LOWER COMPARED TO NAT'L BASELINE*

CATHETER-ASSOCIATED URINARY TRACT INFECTIONS

When a urinary catheter is not put in correctly, not kept clean, or left in a patient for too long, germs can travel through the catheter and infect the bladder and kidneys.

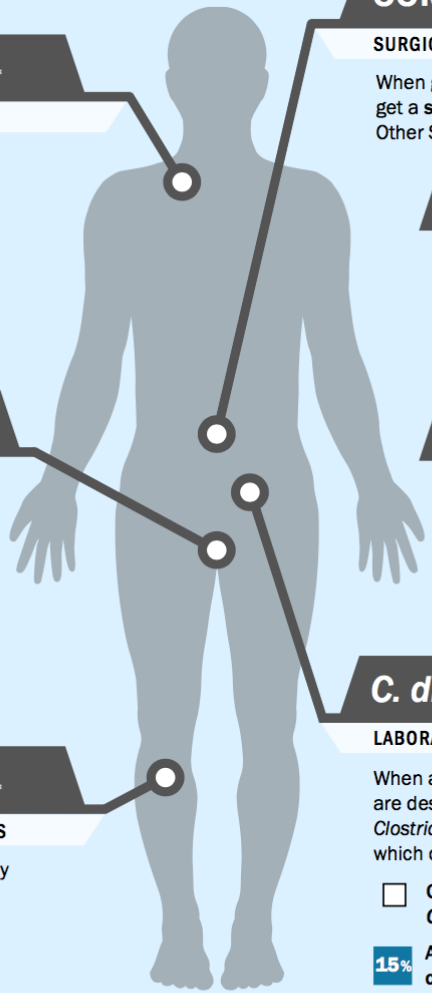
- ☐ **Ohio hospitals reported no significant change in CAUTIs between 2013 and 2014.**
- **10%** **Among the 110 hospitals in Ohio with enough data to calculate an SIR, 10% had an SIR significantly higher (worse) than 1.00, the value of the national SIR.**

MRSA Bacteremia ↓10% LOWER COMPARED TO NAT'L BASELINE*

LABORATORY IDENTIFIED HOSPITAL-ONSET BLOODSTREAM INFECTIONS

Methicillin-resistant *Staphylococcus aureus* (MRSA) is bacteria usually spread by contaminated hands. In a healthcare setting, such as a hospital, MRSA can cause serious bloodstream infections.

- ☐ **Ohio hospitals reported no significant change in MRSA bacteremia between 2013 and 2014.**
- **7%** **Among the 89 hospitals in Ohio with enough data to calculate an SIR, 7% had an SIR significantly higher (worse) than 0.87, the value of the national SIR.**



SSIs

SURGICAL SITE INFECTIONS

When germs get into an area where surgery is or was performed, patients can get a **surgical site infection**. Sometimes these infections involve only the skin. Other SSIs can involve tissues under the skin, organs, or implanted material.

SSI: Abdominal Hysterectomy ↓38% LOWER COMPARED TO NAT'L BASELINE*

- ☐ **Ohio hospitals reported no significant change in SSIs related to abdominal hysterectomy surgery between 2013 and 2014.**
- **11%** **Among the 36 hospitals in Ohio with enough data to calculate an SIR, 11% had an SIR significantly higher (worse) than 0.83, the value of the national SIR.**

SSI: Colon Surgery ↓19% LOWER COMPARED TO NAT'L BASELINE*

- ☐ **Ohio hospitals reported no significant change in SSIs related to colon surgery between 2013 and 2014.**
- **3%** **Among the 92 hospitals in Ohio with enough data to calculate an SIR, 3% had an SIR significantly higher (worse) than 0.98, the value of the national SIR.**

C. difficile Infections ↓8% LOWER COMPARED TO NAT'L BASELINE*

LABORATORY IDENTIFIED HOSPITAL-ONSET *C. DIFFICILE* INFECTIONS

When a person takes antibiotics, good bacteria that protect against infection are destroyed for several months. During this time, patients can get sick from *Clostridium difficile* (*C. difficile*), bacteria that cause potentially deadly diarrhea, which can be spread in healthcare settings.

- ☐ **Ohio hospitals reported no significant change in *C. difficile* infections between 2013 and 2014.**
- **15%** **Among the 131 hospitals in Ohio with enough data to calculate an SIR, 15% had an SIR significantly higher (worse) than 0.92, the value of the national SIR.**

*Statistically significant

CDC

Personal protective equipment

Work practice controls

Engineering controls

Housekeeping controls

PERSONAL PROTECTIVE EQUIPMENT

- gloves
- gowns
- masks
- goggles
- face shields
- shoe covers
- hair covers
- CPR resuscitator masks

Gowns

- Gowns are single use only.
- Dispose of in appropriate container.
- To remove, grasp around top and pull off turning inside out as it is removed so your clothing doesn’t become contaminated.

Gloves

- Are single-use only.
- Must fit properly and cover wrist.
- Change gloves and wash hands if going from a dirty to a clean activity.
- Remove by grasping at wrist and turn inside out.
- Discard in regular trash, or in biohazard trash (red bag) if appropriate.
- Wash hands after gloves are removed.

WORK PRACTICE CONTROLS

Handle sharps with care

Practice good hygiene

- -avoid splashing potentially infectious fluids
- -keep food/beverages away from patient areas
- -wash hands frequently
- -change white coat or scrubs if soiled

ENGINEERING CONTROLS

…are designed to eliminate hazards at the source.

Sharps Safety

- Use sharps containers.
- Do not overfill containers.
- Do not recap needles.
- Use forceps to remove needle from syringe.
- Do not bend, break, cut or manipulate sharps.
- Never handle broken glass--use forceps, or a dust pan and broom…

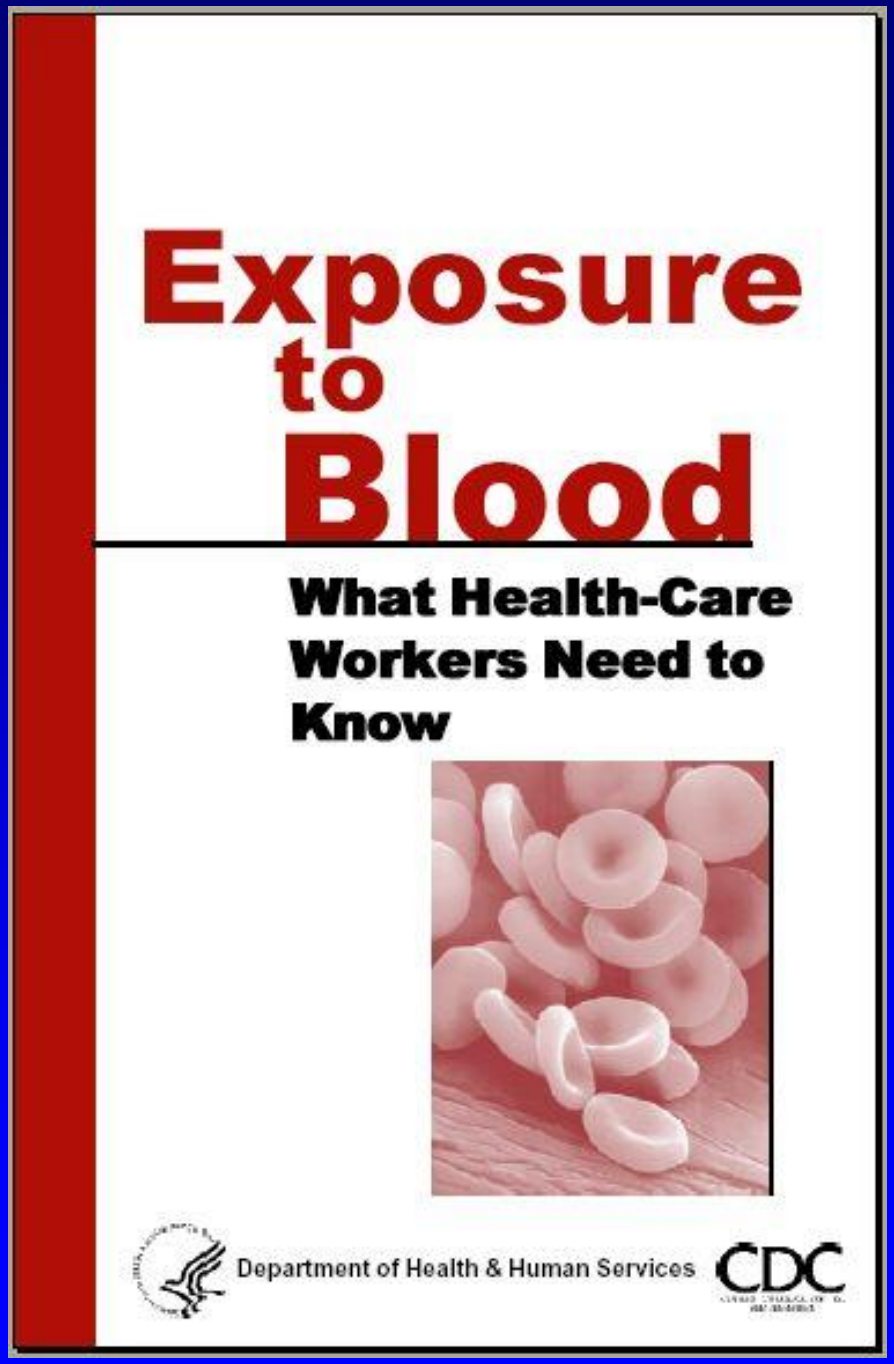
HOUSEKEEPING CONTROLS

- Do not push trash down in to container with your hands or feet.
- Do not over fill trash containers.
- Hold trash away from your body when transporting.
- Discard all infectious waste in biohazard containers.
- Decontaminate work surfaces with an appropriate disinfectant.

Hepatitis B

Hepatitis C

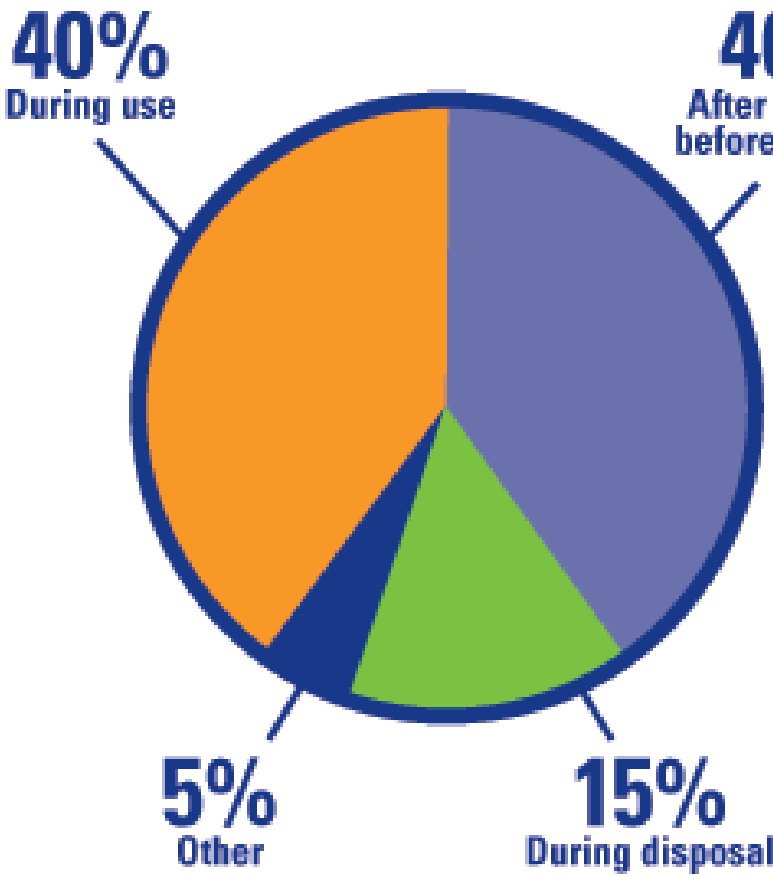
Human Immunodeficiency Virus



I was infected courtesy of a lapse in concentration.

OSHA
Occupational Safety and Health Administration

WHEN NEEDLESTICK INJURIES OCCUR



Risk of Infection following exposure:

HBV (30%)

Percutaneous	1-43%
Mucocutaneous	1-6%

HCV (3%)

Percutaneous	0.3-1.8%
Mucocutaneous	unknown (very small)

HIV (0.3%)

Percutaneous	0.3%
Mucocutaneous	< 0.1%

Document the Injury…

- Report immediately for evaluation and testing to:
  - Employee Health or
  - Emergency Department
- EARLY PEP most effective!

PEP Recommended:

HBV

- If source HBsAg+ and HCP HBsAb <10 mIU/mL
- use of HBIG and/or HBV vaccine

HCV

- followup HCV testing
- No current recommendations for prophylaxis with immune globulin or antiviral agents

HIV

- 4weeks antiretroviral drug protocol
- consider possible HIV resistance of source

PEP FOLLOWUP

HCP to report:

- Any PEP medication side effects
- Signs or symptoms of possible acute HIV infection within 12 weeks of exposure

Recommended laboratory testing:

- Anti-HIV at baseline, 6 weeks, 3 months, and 6 months (for all HIV-exposed HCP)
- CBC, renal & hepatic panels at baseline and 2 weeks to monitor for toxicity

TRANSMISSION BASED PRECAUTIONS


This Personal Protective Equipment thing is starting to get out of hand....

DROPLET PRECAUTIONS

(In addition to Standard Precautions)

VISITORS: For your safety, we strongly recommend that you wear an isolation mask in the room. If you need assistance, please check with a patient care provider before entering the room.

Clean hands before and after patient care.

- **Staff & Visitors:** Mask when entering room.
- **Patient:** Mask when out of room.

- **Use dedicated or disposable equipment when possible.**
- **Gown & Glove if contact with secretions likely. Eye protection as appropriate.**

KETTERING HEALTH NETWORK

Revised 01/27/2012

Droplet Transmission

Droplets are generated by talking, coughing, and sneezing.

Microorganisms in droplets (10um) are propelled a short distance through the air and deposited on conjunctiva, nose, and mouth mucosa.

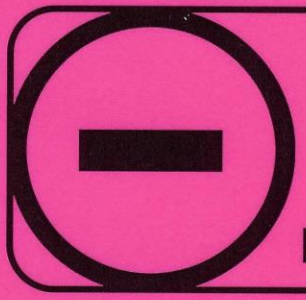
AIRBORNE PRECAUTIONS

(In addition to Standard Precautions)

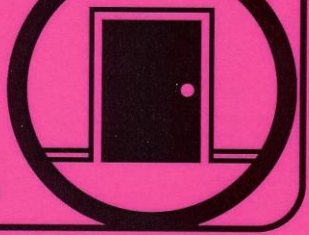
VISITORS: For safety reasons, we strongly recommend you wear an isolation mask in the room. If you need assistance, please check with a patient care provider before entering the room.

Clean hands before and after patient care.

- **Non-immune Staff:** PAPR/N-95 respirator to enter room.
- **Visitors:** Isolation mask to enter room.
- **Patient:** Mask when out of room.



Negative Pressure Room with Door Closed.



KETTERING HEALTH NETWORK

Revised 01/01/2012

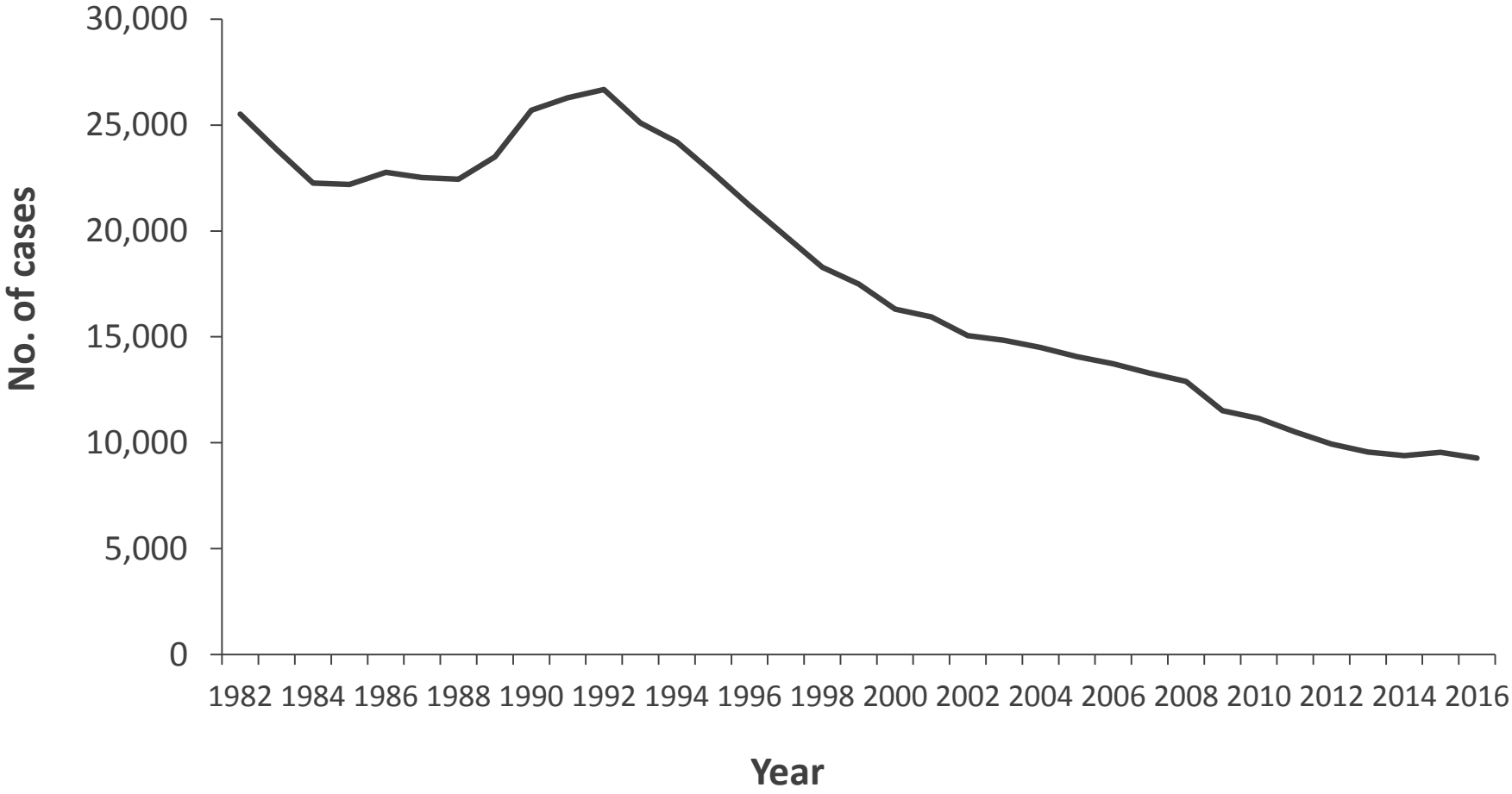
Airborne Transmission

- Microbes eg, AFB in small droplet nuclei (<5um) or dust particles.
- Dispersed widely by air currents and remain suspended for prolonged periods of time.
- Requires special PPE respiratory protection.
- Requires special air handling and ventilation:
  negative pressure room or portable HEPA filter

Tuberculosis in the United States

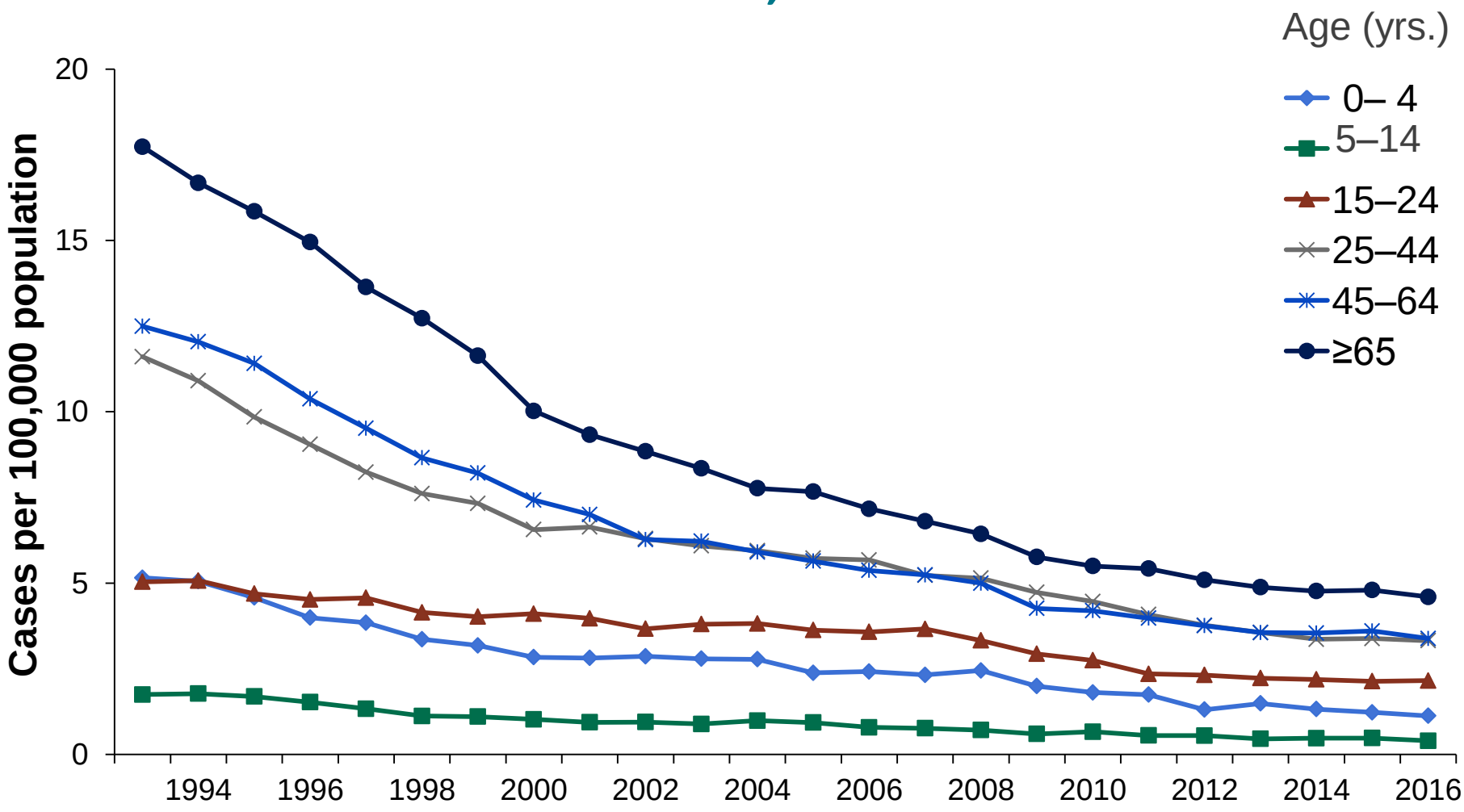
National Tuberculosis Surveillance System
Highlights from 2016

Reported Tuberculosis (TB) Cases United States, 1982–2016*



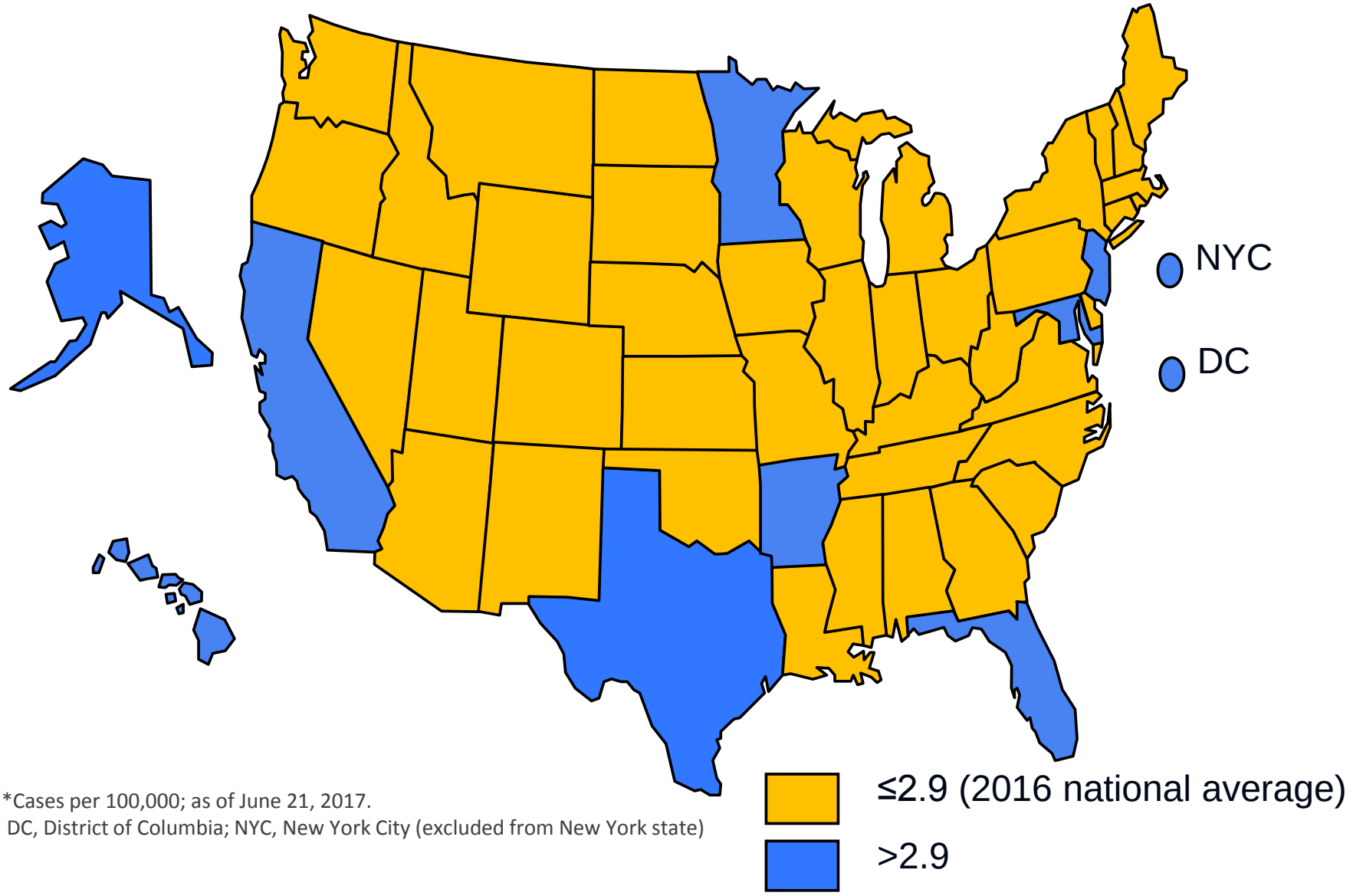
*As of June 21, 2017.

TB Case Rates* by Age Group, United States, 1993–2016



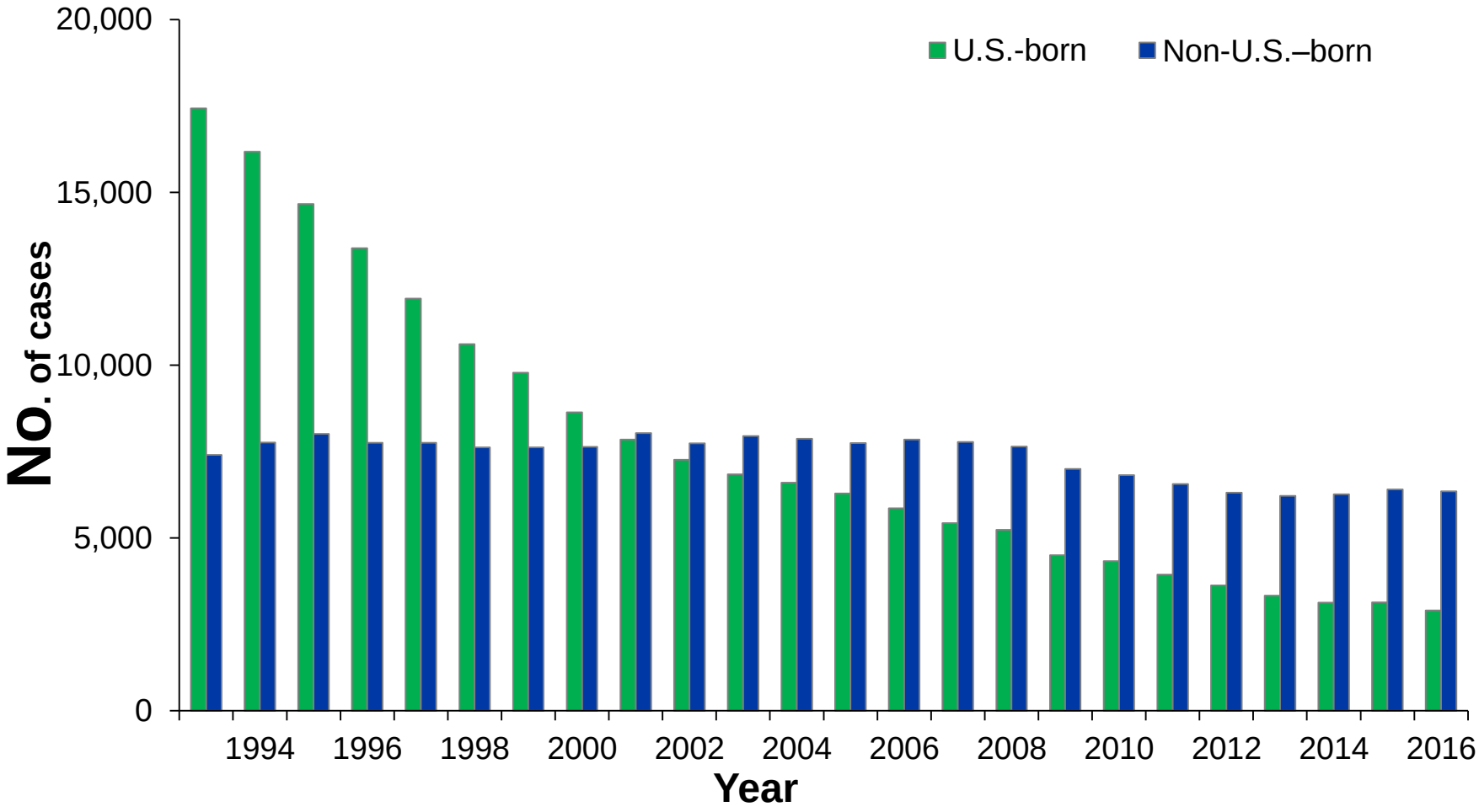
*Cases per 100,000 population; as of June 21, 2017.

TB Case Rates,* United States, 2016



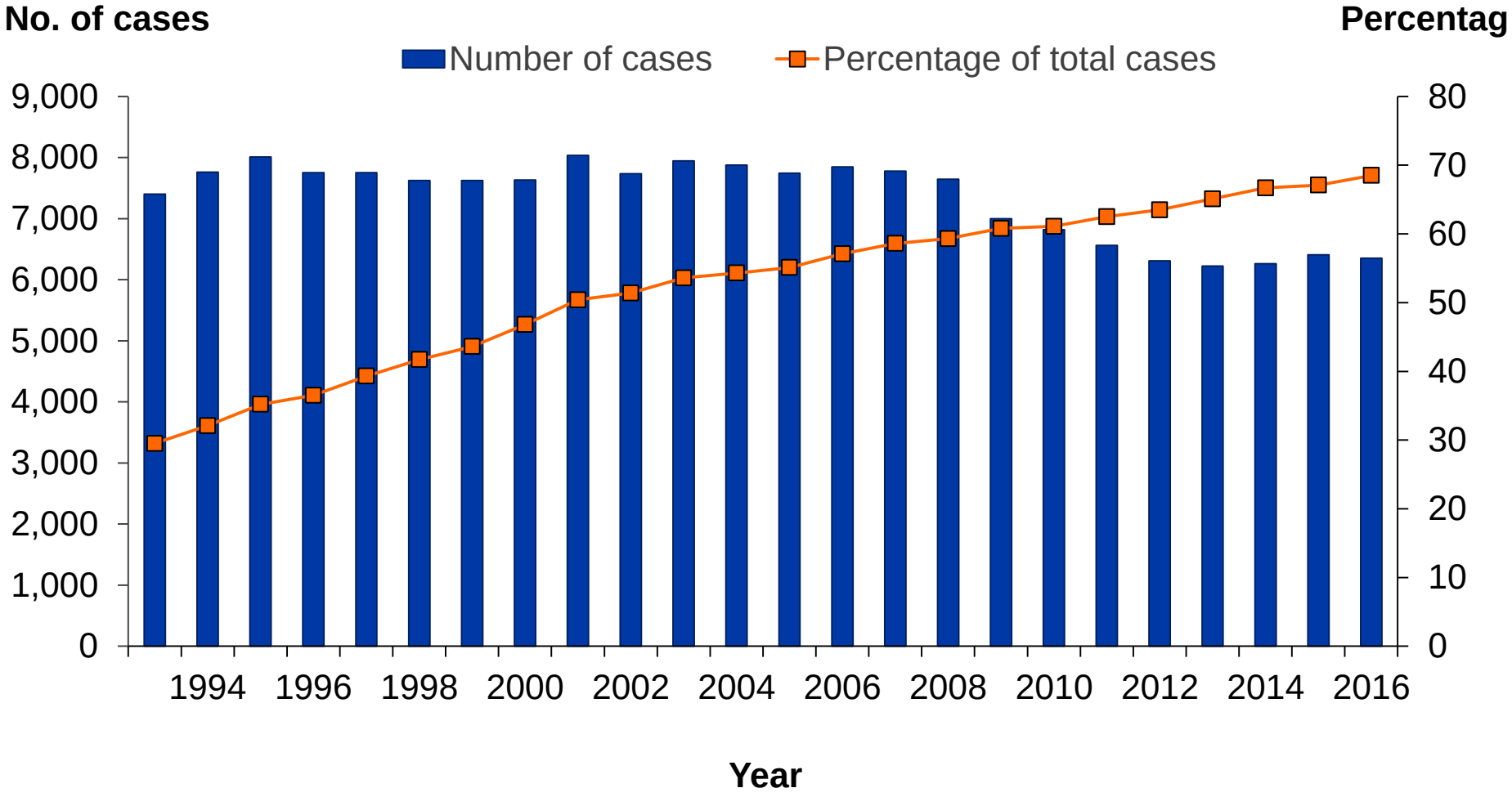
*Cases per 100,000; as of June 21, 2017.
DC, District of Columbia; NYC, New York City (excluded from New York state)

Number of TB Cases Among U.S.-Born versus Non-U.S.–Born Persons, United States, 1993–2016*



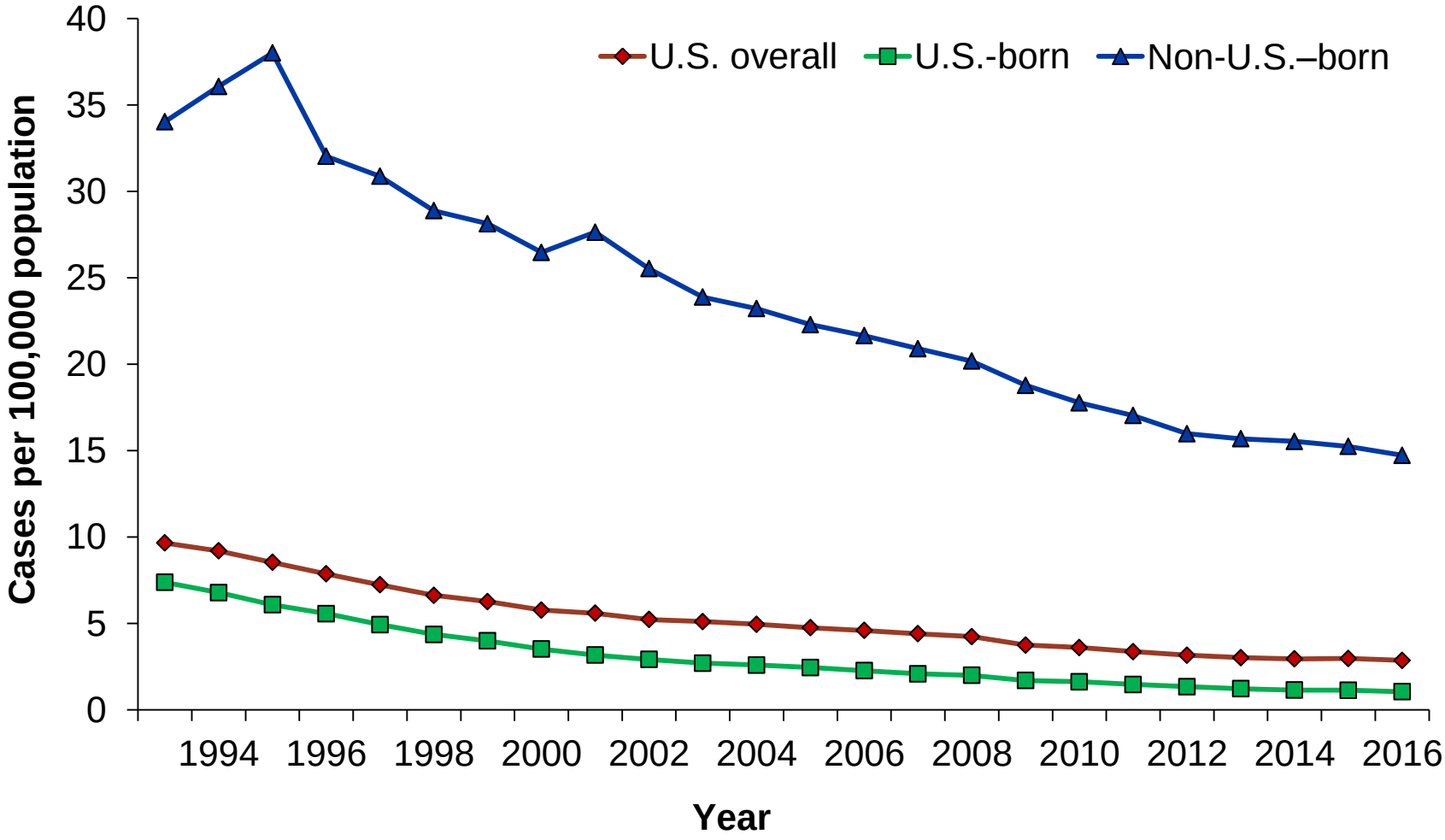
*As of June 21, 2017.

Trends in TB Cases Among Non-U.S.–Born Persons, United States, 1993–2016*



*As of June 21, 2017.

TB Case Rates Among U.S.-Born versus Non-U.S.–Born Persons, United States, 1993–2016*



*As of June 21, 2017.

STOP

CONTACT PRECAUTIONS

(In addition to Standard Precautions)

STOP

VISITORS: For safety reasons, we strongly recommend that you wear gown & gloves in the room. If you need assistance, please check with a patient care provider before entering the room.

Clean hands before and after patient care.

Gown and gloves when entering beyond view only zone in room.

- **Use dedicated or disposable equipment when possible.**
- **Clean and disinfect shared equipment.**

KETTERING HEALTH NETWORK

Revised 01/01/2012

Contact Transmission

Direct:

Between body surfaces resulting in transfer of microorganisms

Indirect:

Between a susceptible host and a contaminated intermediate object

Colonized or Infected: What is the Difference?

- People who carry bacteria without evidence of infection (fever, increased white blood cell count) are colonized
- If an infection develops, it is usually from bacteria that colonize patients
- Bacteria that colonize patients can be transmitted from one patient to another by the hands of healthcare workers

* Bacteria can be transmitted even if the patient is not infected

Why is *Staph aureus* so important?

2nd most common cause of HAIs reported to NHSN

CNS (15%), *Staph aureus* (14%)

Most common cause of SSIs (30%) and VAPs (24%)

MRSA first identified in the 1960s in hospitalized patients

MRSA has become a predominant cause of *S. aureus* infections in both healthcare and community settings

- Primarily due to transmission of relatively few ancestral clones rather than the de novo development of methicillin- resistance among susceptible strains

Recent estimates:

- 49-65% of *S. aureus* HAIs reported to NHSN are caused by MRSA
- 86% of all invasive MRSA infections are healthcare-associated

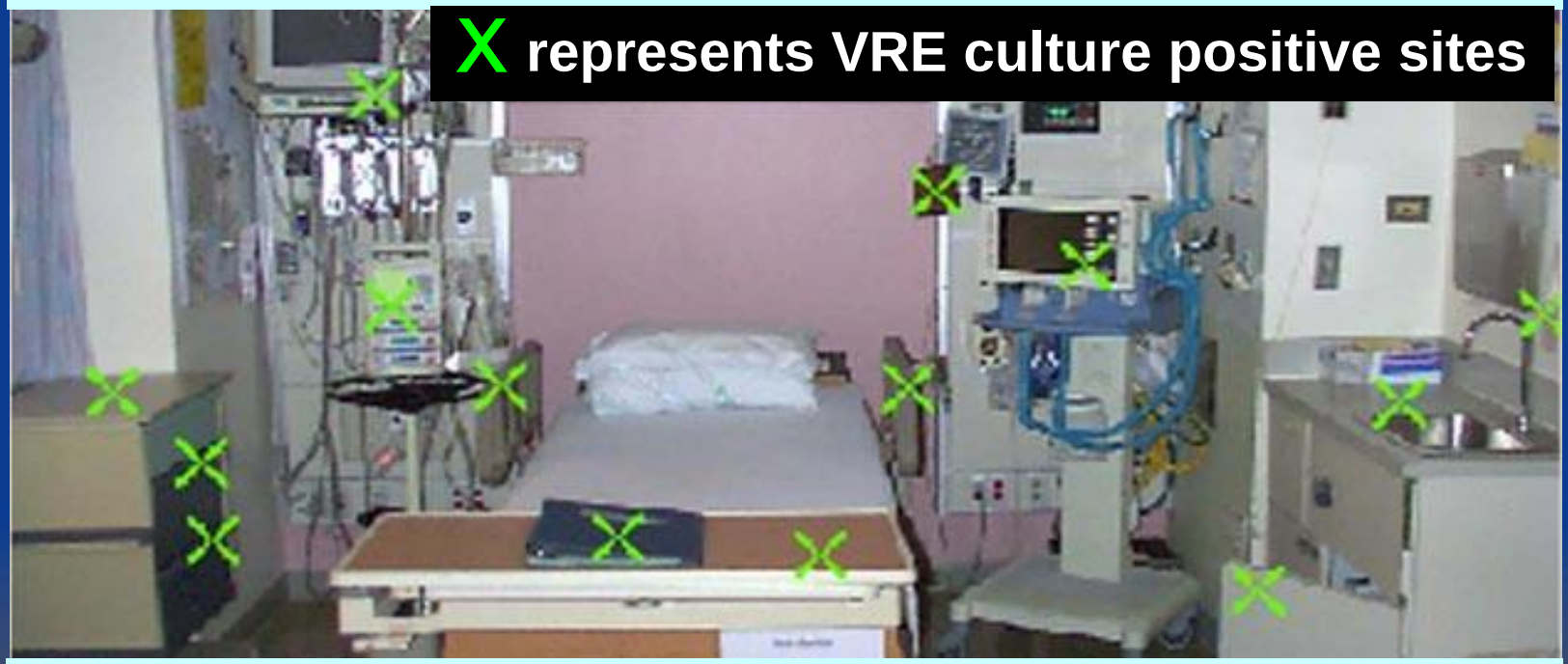
Hidron et al. Infect Control Hosp Epidemiol 2008;29:996-1011 Klevens et al. JAMA 2007;298:1763-71

Why is the Emergence of MRSA so important?

- MRSA treatment options limited
  - increased morbidity & mortality
- Antibiotic misuse can spread resistance
  - prevalent MRSA >> more vancomycin use >> more vancomycin resistance (VRE and VRSA) >> more linezolid/daptomycin use > > more resistance
- Preventing MRSA infections reduces all *S. aureus* infections
- MRSA is a marker for ability to contain transmission of important pathogens
- Programs that prevent MRSA transmission will likely reduce patient-to- patient transmission of other epidemiologically important healthcare pathogens

Hidron et al. Infect Control Hosp Epidemiol 2008;29:996-1011 Klevens et al. JAMA 2007;298:1763-71

The Inanimate Environment Can Facilitate Transmission



~ Contaminated surfaces increase cross-transmission ~

Abstract: The Risk of Hand and Glove Contamination after Contact with a VRE (+) Patient Environment. Hayden M, ICAAC, 2001, Chicago, IL.

Recovery of VRE from Hands and Environmental Surfaces

- Up to 41% of healthcare worker's hands sampled (after patient care and before hand hygiene) were positive for VRE[1]
- VRE were recovered from a number of environmental surfaces in patient rooms
- VRE survived on a countertop for up to 7 days[2]

[1] Hayden MK, *Clin Infect Diseases* 2000;31:1058-1065.

[2] Noskin G, *Infect Control and Hosp Epidemi* 1995;16:577-581.

STOP

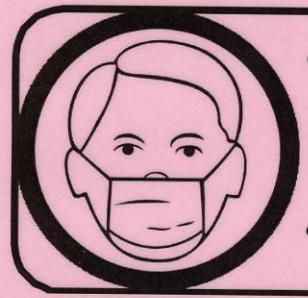
NEUTROPENIC PRECAUTIONS

(In addition to Standard Precautions)

STOP

VISITORS: For the patient's safety, we strongly recommend that you wear an isolation mask if you have cold-like symptoms. If you need assistance, please check with a patient care provider before entering the room.

Clean hands before and after patient care.



- **Staff & Visitors:** Mask, when entering room, if you have cold-like symptoms.
- **Patient:** Mask when out of room.

No fresh or dried plants/flowers.

KETTERING HEALTH NETWORK

Revised: 01/27/2012

STOP

CONTACT PRECAUTIONS WITH HANDWASHING

STOP

(In addition to Standard Precautions)

VISITORS: For your safety, we strongly recommend that you wear gown and gloves in the room. If you need assistance, please check with a patient care provider before entering the room.

Clean hands before patient care

AND

wash hands with soap and water after patient care.

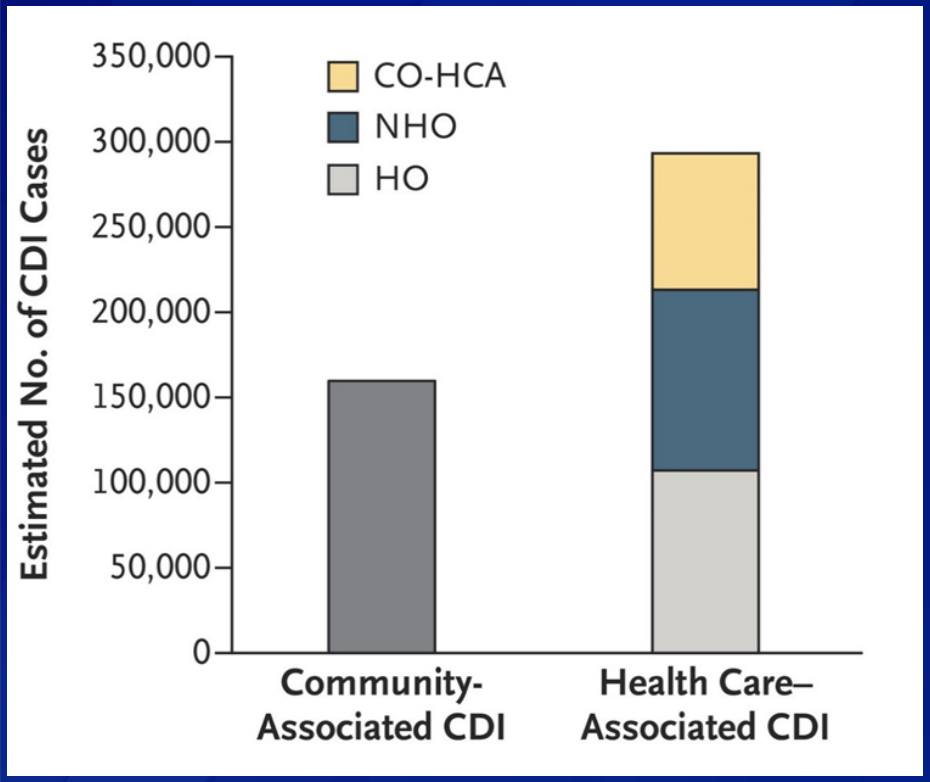
Gown and gloves when entering beyond view only zone in room.

- **Use dedicated or disposable equipment when possible.**
- **Clean and disinfect shared equipment with approved bleach product.**

KETTERING HEALTH NETWORK

Revised: 01/01/2012

Estimated Annual U.S. Burden



Estimated U.S. Burden of CDI, According to the Location of Stool Collection and Inpatient Health Care Exposure, 2011.

- **453,000 CDI cases[1]**
  - **293,000 healthcare-associated**
    - **107,000 hospital-onset**
    - **104,000 nursing home-onset**
    - **81,000 community-onset, healthcare-facility associated**
  - **160,000 community-associated**
    - **82% associated with outpatient healthcare exposure**

Overall, 94% of CDI cases related to healthcare

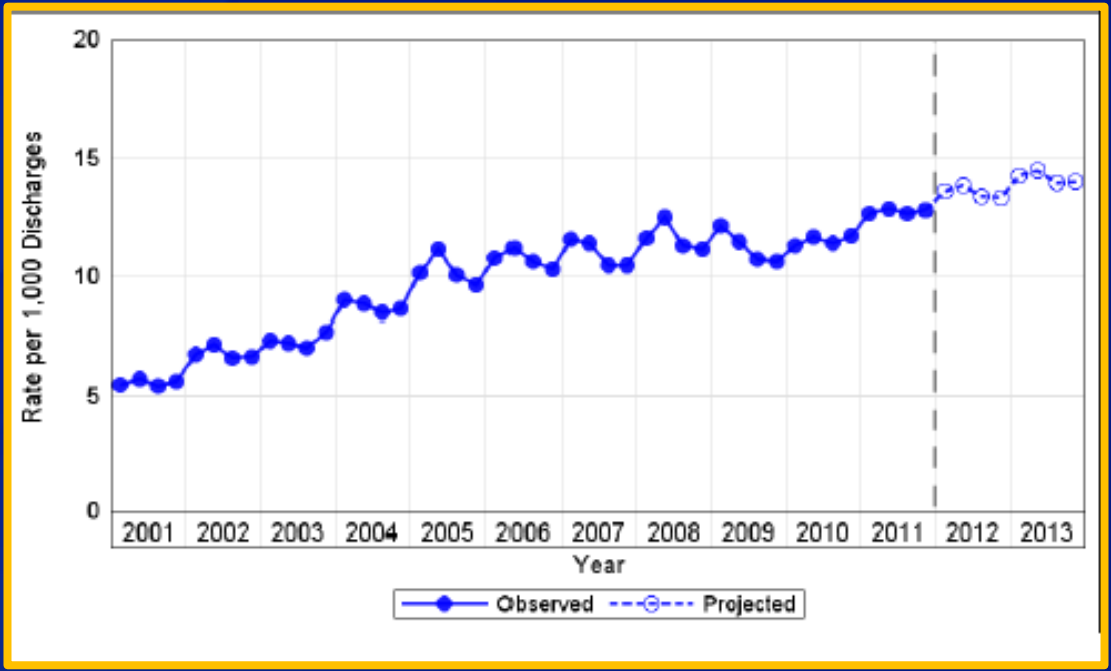
- **29,000 deaths**
- **$4.8 billion in excess healthcare costs[2]**

CO-HCA: Community onset healthcare-associated
NHO: Nursing home onset
HO: Hospital onset

1. Lessa et al. N Engl J Med 2015; 372(9):825-834.
2. Dubberke et al. Clin Infect Dis 2012; 55:S88-92.

Healthcare Burden

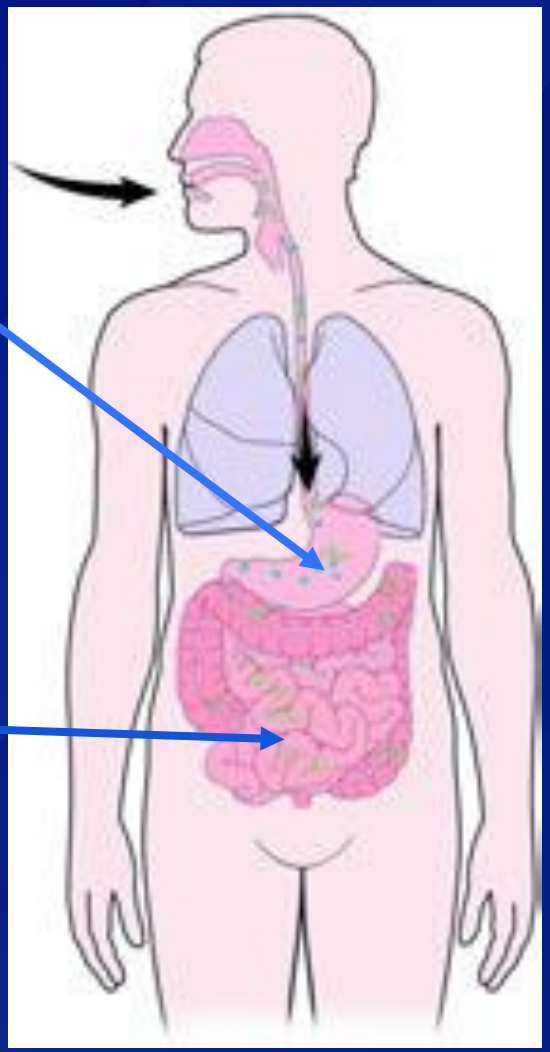
- ***C. difficile* most commonly reported pathogen in 2011 multistate prevalence survey of healthcare-associated infections (HAI)[1]**
  - 12.1% of 452 HAIs caused by CDI
  - Rates of CDI per 1,000 discharges have risen through 2013[2]



1. Magill et al. N Engl J Med 2014; 370:1198-1208.
2. Steiner et al. HCUP Projections Report 2014-01.

Pathogenesis of CDI

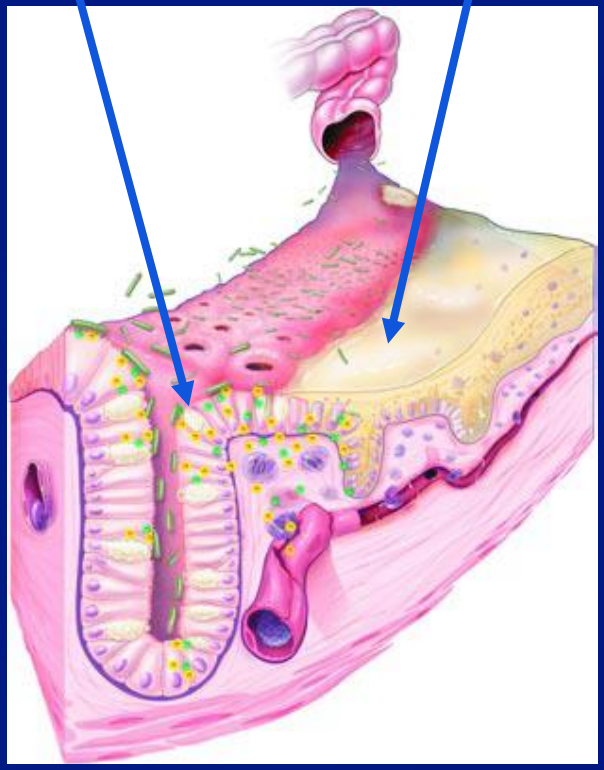
1. CDI spores survive in the environment for long periods of time. Following ingestion, they traverse the acidic environment of the stomach.



2. Spores germinate within the intestine.

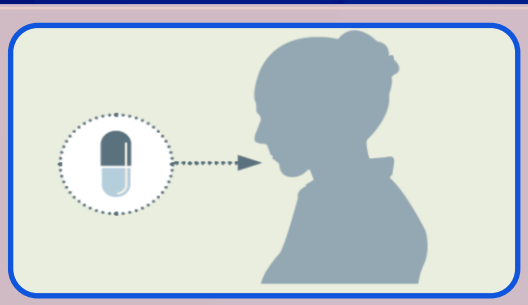
3. Altered lower intestine flora (due to antimicrobial use) allows proliferation of *C. difficile* in colon.

4. Toxin A & B Production leads to colon damage +/- pseudomembrane.



Sunenshine & McDonald Cleve Clin J Med 2006; 73(2):187-197.

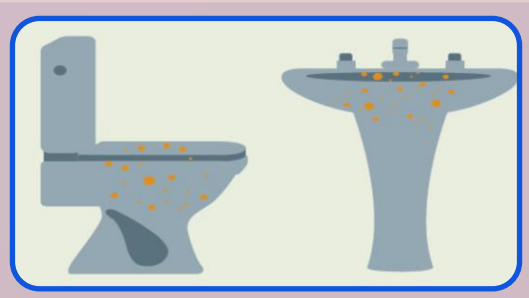
Epidemiology: Modifiable Risk Factors



Exposure to antibiotics

High Risk:

- Fluoroquinolones [1]
- 3rd and 4th generation cephalosporins, clindamycin, carbapenems[2]



Exposure to *C. difficile* spores

- Spores can remain viable for months[3]
- Contamination is increased in rooms of patients with active CDI [4,5]
- Hands of patients and personnel are easily contaminated[5]

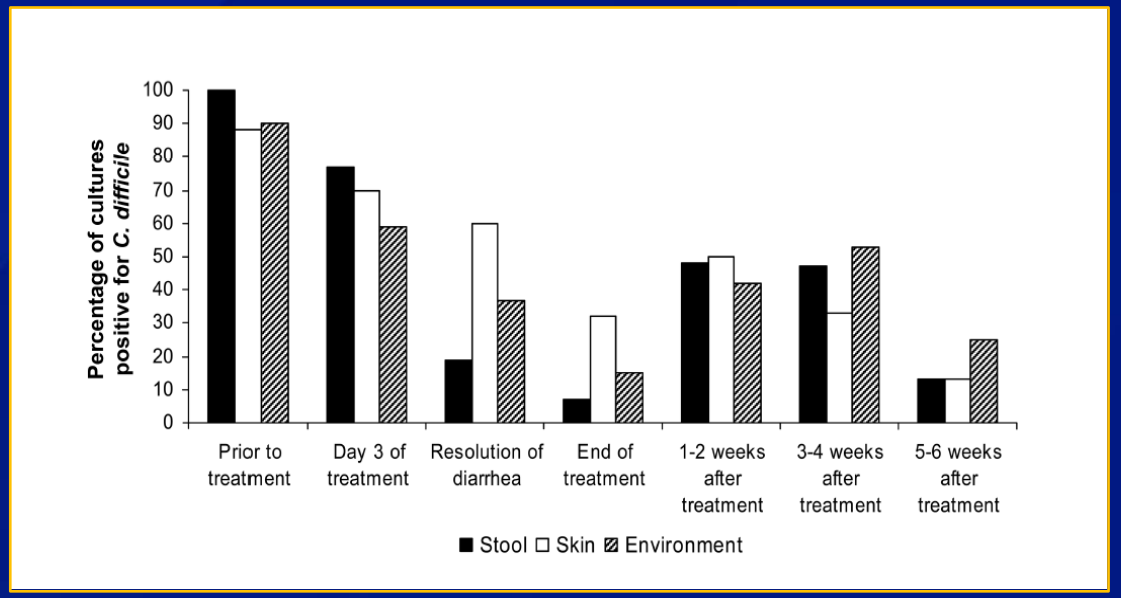
Gastric acid suppression

- Data, though inconsistent, implicate proton pump inhibitor (PPI) use[1,4,6,7]
- More study is needed to link restriction of PPI use with decreased CDI incidence[8]

1. Pepin et al. Clin Infect Dis 2005; 41(9):1254–1260.
2. Hensgens et al. J Antimicrob Chemother 2012; 67(3):742-748.
3. Weber & Rutala. Infect Control Hosp Epidemiol 2011; 32: 207-209.
4. Dubberke et al. Am J Infect Control 2007; 35:315-318.
5. Shaugnessy et al. Infect Control Hosp Epidemiol 2011; 32;201-206.
6. Linney et al. Can J Hosp Pharm 2010; 63(1):31–37.
7. Buendgens et al. J Crit Care 2014; 696:e11-15.
8. Dubberke et al. Infect Control Hosp Epidemiol 2014; 35(6):628-645.

Contact Precautions (CP)

- Contamination of the environment is highest prior to treatment[1]
- **Presumptive CP**, while CDI test results are pending, may be used as a special approach whenever indicated by risk assessement[2]



- Patients who have been treated may have asymptomatic shedding[3]
- **Prolonging the duration of CP** until discharge is a special approach based on evidence of continued shedding of spores after diarrhea resolves (especially up to 4 weeks after treatment ends)[2]

1. Bobulsky et al. Clin Infect Dis 2008; 46(3):447-450
2. Dubberke et al. Infect Control Hosp Epidemiol 2014;
3. Sethi et al. Infect Control Hosp Epidemiol 2010: 31(1):21-27

Antimicrobial Stewardship

Exposure to any antimicrobial is the single most important risk factor for *C. difficile* infection (CDI).

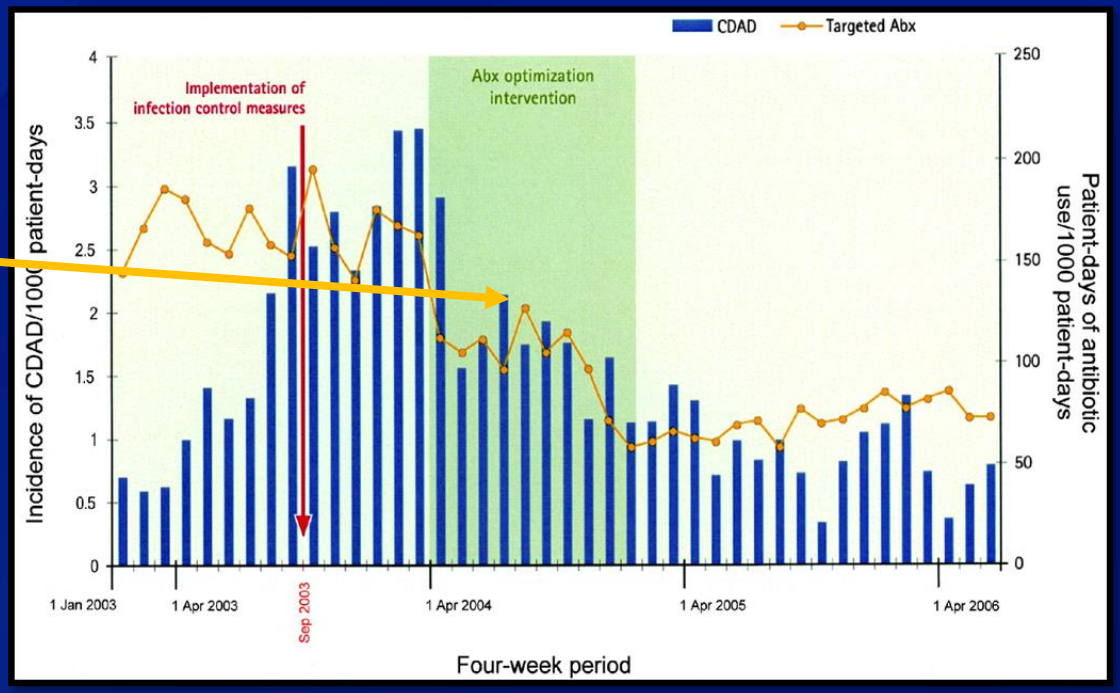
- **Antibiotic exposure has lasting impact on the microbiome.**
  - Risk of CDI is elevated (7-10 fold) during and in the 3 months following antimicrobial therapy[1,2]
  - 85-90% of CDI occurs within 30 days of antimicrobial exposure[1]
- **Target high risk antibiotics for CDI prevention**
  - Fluoroquinolones[3]
  - 3rd/4th generation cephalosporins, carbapenems[2]

1. Chang et al. Infect Control Hosp Epidemiol 2007; 28(8):926–931.
2. Hensgens et al. J Antimicrob Chemother 2012; 67(3):742-748.
3. Hsu et al. Am J Gastroenterol 2010; 105(11):2327–2339.

Stewardship Approach: Feedback

Non-restrictive feedback resulted in statistically significant reductions in incident CDI.

Reductions in CDI attained through antimicrobial stewardship surpassed those attained through infection control measures.



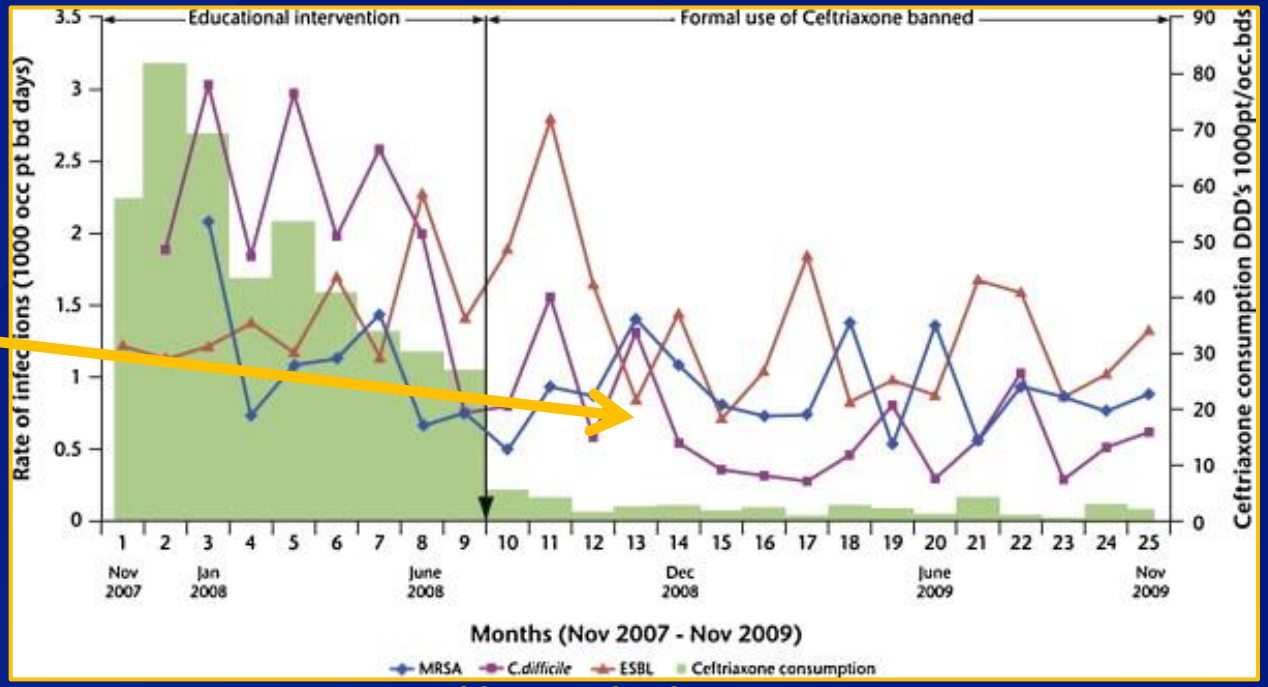
Tertiary Hospital in Quebec, 2003-2006

Valiquette et al. Clin Infect Dis 2007; 45:S112-121.

Stewardship Approach: Restriction

Restricting the use of ceftriaxone was associated with reduced rates of CDI.

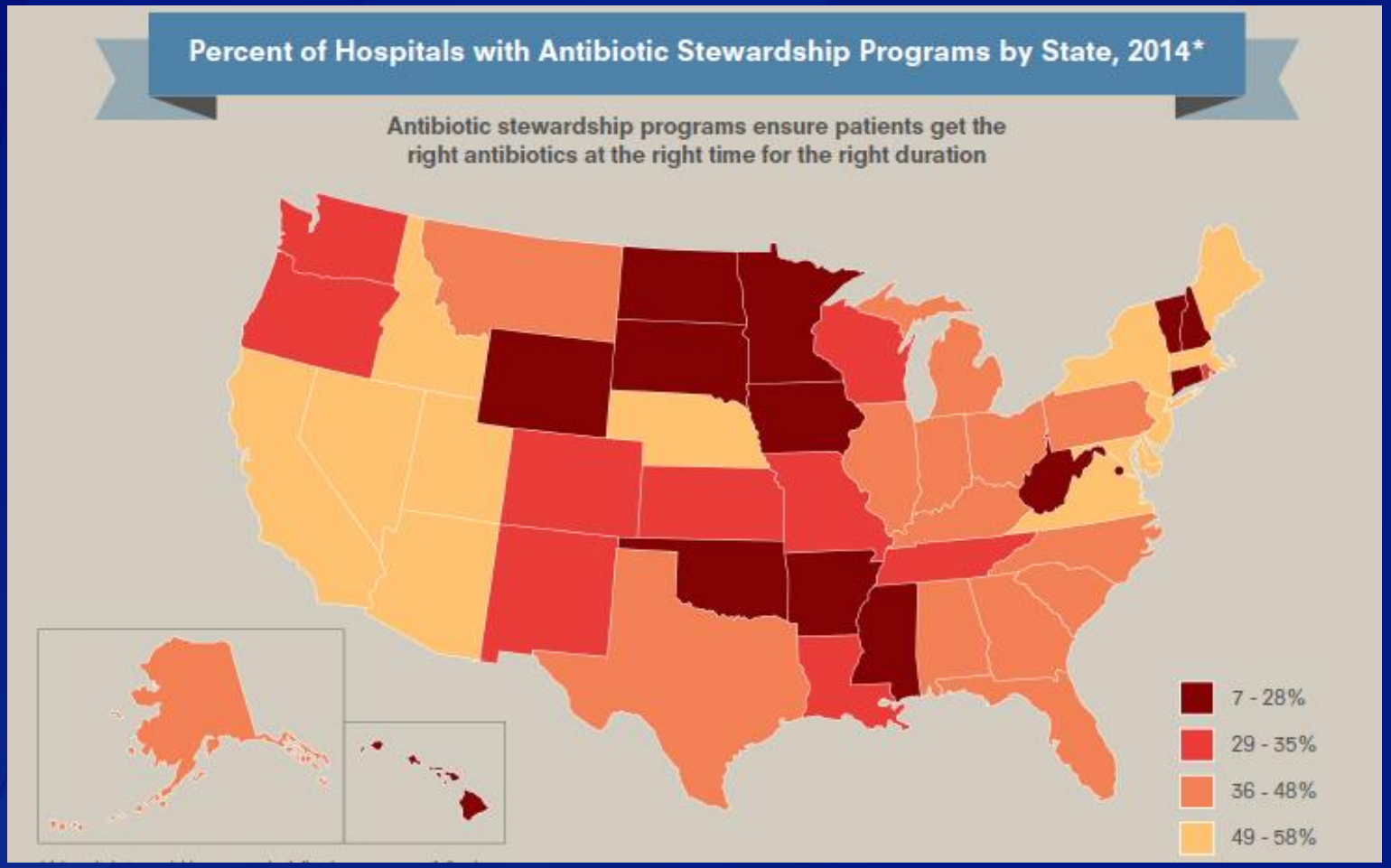
Formal restriction implemented



District general hospital; Glasgow, UK, 2007-2009

Fig. 1 Hospital-acquired methicillin-resistant *Staphylococcus aureus* (MRSA), *Clostridium difficile* and extended-spectrum β-lactamase (ESBL)-producing coliform rates following a restrictive antibiotic policy in a district general hospital over 2 years. pt/occ.bds, patient-occupied bed-days; DDDs, defined daily doses.

Dancer et al. Intl J Antimicrob Agents 2013; 41(2):137-142.



Currently 39% (1,642/4,184) of U.S. hospitals have an antibiotic stewardship program with all 7 core elements.

The national goal is 100% of hospitals by 2020.

http://www.cdc.gov/getsmart/healthcare/evidence.html

CONTACT

DROPLET

STOP

CONTACT/DROPLET PRECAUTIONS

(In addition to Standard Precautions)

STOP

VISITORS: For your safety, we strongly recommend that you wear an isolation mask, gown and gloves in the room. If you need assistance, please check with a patient care provider before entering the room.

Clean Hands Before and After Patient Care.

- **Staff & Visitors:** Gown, gloves & mask to enter room.
- **Patient:** Mask when out of room.

- **Use dedicated or disposable equipment when possible.**
- **Clean and disinfect shared equipment.**
- **Eye protection as appropriate.**

KETTERING HEALTH NETWORK

Revised: 09-27-12

CONTACT

AIRBORNE

STOP

CONTACT/AIRBORNE PRECAUTIONS

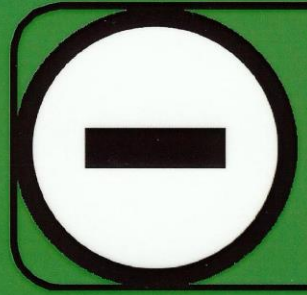
(In addition to Standard Precautions)

STOP

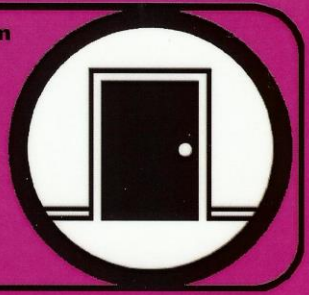
VISITORS: For your safety, we strongly recommend that you wear an isolation mask, gown and gloves in the room. If you need assistance, please check with a patient care provider before entering the room.

Clean Hands Before and After Patient Care

- **Staff:** Gown, gloves & PAPR or N-95 Respirator to enter room.
- **Visitors:** Gown, gloves and isolation mask to enter room.
- **Patient:** Mask when out of room.



- **Negative Pressure Room with door closed.**
- **Use dedicated or disposable equipment when possible.**
- **Clean and disinfect shared equipment with approved disinfectant.**



KETTERING HEALTH NETWORK

Revised: 09-27-12

CONTACT

NEUTROPENIC

STOP

CONTACT/NEUTROPENIC PRECAUTIONS

(In addition to Standard Precautions)

STOP

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Clean Hands Before and After Patient Care.

- **Staff & Visitors:** Gown & gloves when entering room. Add mask if you have cold-like symptoms.
- **Patient:** Mask when out of room.

- **No fresh or dried plants/flowers.**
- **Use dedicated or disposable equipment when possible.**
- **Clean and disinfect shared equipment.**

KETTERING HEALTH NETWORK

Revised: 09-27-12

DROPLET NEUTROPENIC

STOP

DROPLET/NEUTROPENIC PRECAUTIONS

STOP

(In addition to Standard Precautions)

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Clean Hands Before and After Patient Care.

- **Staff & Visitors:** Mask to enter room.
- **Patient:** Mask when out of room.

- **Use dedicated or disposable equipment when possible.**
- **Gown and gloves if contact with secretions likely.**
- **Eye protection as appropriate.**

KETTERING HEALTH NETWORK

Revised: 09-27-12

CONTACT

CONTACT w/HANDWASHING

STOP

CONTACT/CONTACT w/HANDWASHING PRECAUTIONS

(In addition to Standard Precautions)

STOP

VISITORS: For your safety, we strongly recommend that you wear gown and gloves in the room. If you need assistance, please check with a patient care provider before entering the room.

Clean hands before patient care

AND

wash hands with soap and water after patient care.

Gown and gloves when entering beyond view only zone in room.

- **Use dedicated or disposable equipment when possible.**
- **Clean and disinfect shared equipment with bleach product.**

KETTERING HEALTH NETWORK

Revised: 09-27-12

CONTACT w/HANDWASHING NEUTROPENIC

STOP

CONTACT w/ HANDWASHING/ NEUTROPENIC PRECAUTIONS

STOP

(In addition to Standard Precautions)

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KETTERING HEALTH NETWORK

Revised: 09-27-12

CONTACT w/HANDWASHING AIRBORNE

CONTACT w/HANDWASHING/ AIRBORNE PRECAUTIONS

(In addition to Standard Precautions)

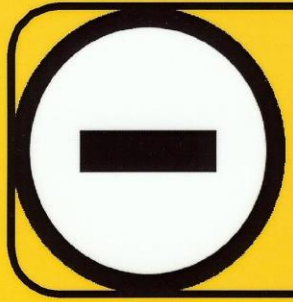
VISITORS: For your safety, we strongly recommend that you wear an isolation mask, gown & gloves in the room. If you need assistance, please check with a patient care provider before entering the room.

Clean hands before patient care

AND

wash hands with soap and water after patient care.

- **Staff:** Gown, gloves & PAPR or N-95 Respirator to enter room.
- **Visitors:** Gown, gloves & isolation mask to enter room.
- **Patient:** Mask when out of room.



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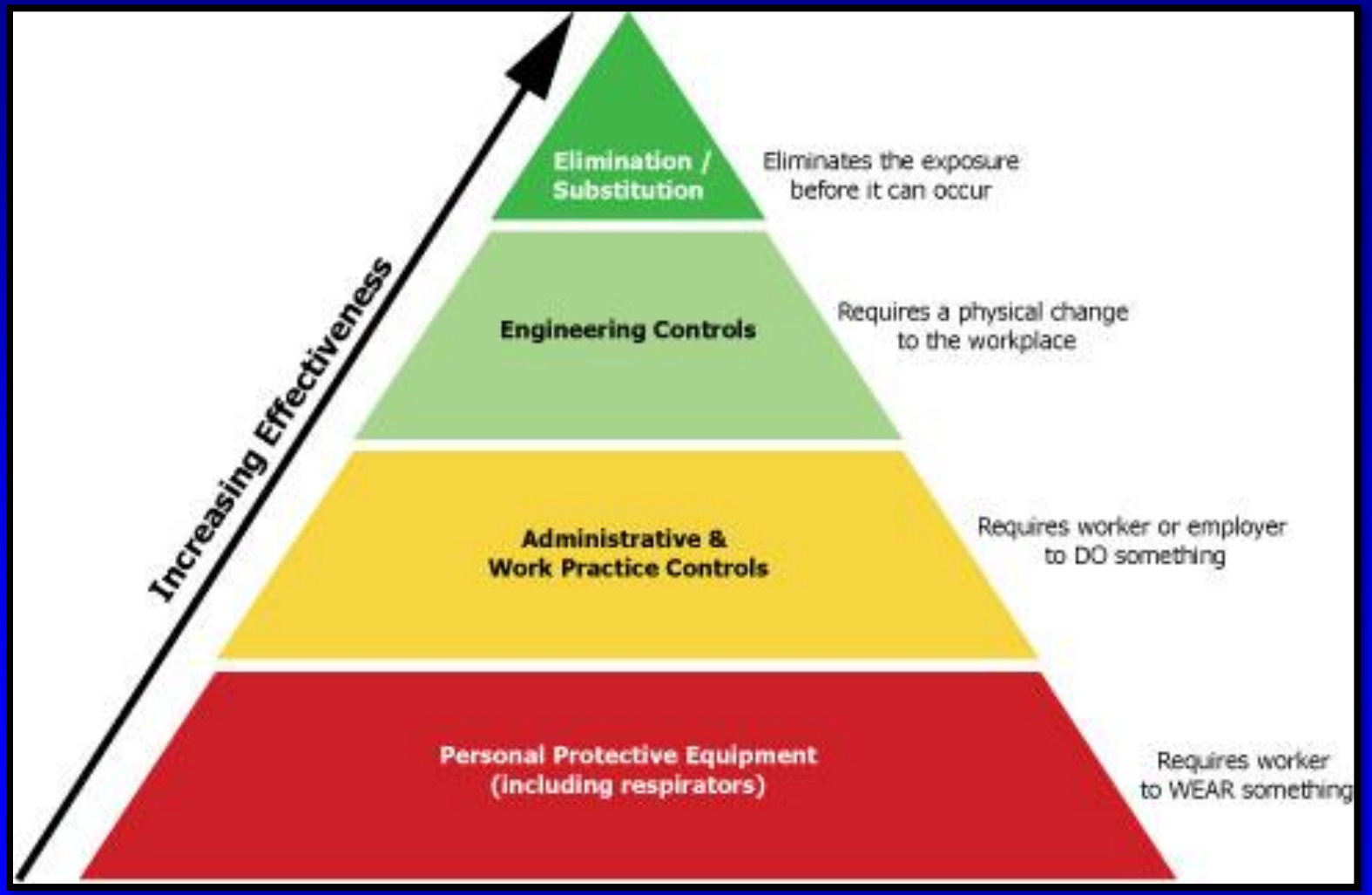
KETTERING HEALTH NETWORK

Revised 09-27-12

The hierarchy of hazard control…



Dial hospital operator 24/7 for Infection Prevention and Control