

Infectious Disease Update for Dental Hygienists

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November, 2009

Disclaimers/Conflict of Interest

Employee of The Permanente Medical Group
No pharmaceutical/device industry funding
No conflicts of interest

The opinions expressed in this lecture are mine,
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Endocarditis Prevention Guidelines

- Previous guidelines were based on animal models and theoretical considerations.
- AHA committee reviewed old data as well as new studies.
- Most cases of endocarditis are not due to dental procedures.
- Risk of endocarditis from dental procedure is very low.
- Efficacy of prophylaxis unknown (may be zero).
- Number needed to treat is very high (>100,000).

Annual Risk of Endocarditis Per 100,000 in Olmsted County

• Overall	5
• Mitral valve prolapse, no MR	5
• Mitral valve prolapse with MR	50
• Rheumatic heart disease	410
• Prior endocarditis	740
• Valve replacement	350
• Valve replacement for NVE	630
• Valve replacement for PVE	2200

Oral Flora and the Pathogenesis of Endocarditis

- Mouth is the presumed source of bacteremias that lead to many cases of viridans streptococcal endocarditis.
- Dental procedures cause bacteremia.
- But most bacteremia is not from dental work; one estimate is that exposure from toothbrushing for a year causes 154,000 X more bacteremia than a tooth extraction.

Roberts GJ. *Pediatr Cardiol* 1999; 20: 317.

Endocarditis Prevention Guidelines

- Prophylaxis indicated for:
 - Artificial heart valves
 - Prior endocarditis
 - Certain congenital heart conditions
 - Valvulopathy after cardiac transplant
- Given for any procedure involving gingiva or the periapical part of the teeth, or perforation of oral mucosa, **IF** one of the conditions above is present.

Wilson W et al. *JADA* 2007; 138: 739
<http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.106.183095v1>

Prophylaxis no longer recommended for:

- Aortic stenosis
- Bicuspid aortic valve
- Ventricular or atrial septal defect
- Mitral valve prolapse with or without regurgitation
- Rheumatic heart disease
- Hypertrophic cardiomyopathy
- Any other cardiac condition not mentioned on the preceding slide

Endocarditis Prevention What's Unchanged?

- Regimens (all 1 hour before procedure):
 - Amoxicillin 2 g po
 - Cephalexin 2 g
 - Clindamycin 600 mg
 - Azithromycin or clarithromycin 500 mg
- No new recommendations for prosthetic joints
- Advises against antimicrobial mouth rinses for endocarditis prevention

Endorsements

- American Dental Association
- American Academy of Pediatrics
- Infectious Diseases Society of America
- International Society of Chemotherapy for Infection and Cancer
- Pediatric Infectious Disease Society

Endocarditis Prevention: The Future?

- British Society for Antimicrobial Chemotherapy issued guidelines similar to AHA. Some cardiologists objected.
- British NICE (National Institute for Health and Clinical Excellence) reviewed all evidence for prophylaxis.
- Concluded that it should not be used.
- We have more lawyers than they do.

Gould FK et al. *J Antimicrob Chemother* 2006; 57: 1035
<http://guidance.nice.org.uk/CG64/Guidance/pdf/English>

Guidelines for the prevention of prosthetic joint infection in patients with (potential) bacteremia

OR

When is a guideline not a
guideline?

Background

- Prior AAOS/ADA guideline stated "no scientific evidence supports the position that antibiotic prophylaxis to prevent hematogenous infections is required prior to dental treatment in patients with total joint prostheses."
- Antibiotics were recommended in specific high-risk conditions, on the assumption that they are more likely to be beneficial when risk is greater.
- Specific dental procedures were listed according to whether or not they were risky enough to warrant prophylaxis.

J Am Dent Assoc 2003; 134; 895-898.

High-Risk Conditions

- First two years after joint replacement
- Inflammatory arthropathies
- Immunocompromise from drugs or radiation
- Comorbidities including, but not limited to, prior PJI, malnourishment, hemophilia, HIV infection, IDDM, malignancy

A new guideline arose...

- New guideline issued by AAOS in 2009
- Old AAOS guideline was not published and is no longer available on the web site.
- ADA is apparently no longer a partner in the process.
- There are no new data to support changes in the recommendations.

<http://www.aaos.org/about/papers/advistmt/1033.asp>

Objections to the new guideline

- Addition of a new indication: "All patients with prosthetic joints"
- Recommendation for prophylaxis in patients with "comorbidities" – vague.
- No specific indication of the level of evidence supporting the recommendations (expert opinion). There is a disclaimer at the top that does not make this explicitly clear.

Objections to the new guideline

- No indication which procedures entail a risk of bacteremia sufficient to warrant prophylaxis, or which do not.
- Extensive section on preoperative prophylaxis for nonorthopedic surgery. Appears to be based on the notion that such prophylaxis is intended to prevent bacteremia (it's not). The list is incomplete and is unlikely to be updated as standards in nonorthopedic procedures change.

Responses to Date

- AAOS says it is soliciting comments.
- Letters from individual physicians
- Letter from Kaiser Permanente infectious disease and orthopedics specialists.
- Letter from Infectious Disease Society of America
- Criticism in the dental literature

AAOS Response

- "AAOS Information Statements are educational tools based on the opinions of the authors. They are not a product of a systematic review. Readers are encouraged to consider the information presented and reach their own conclusions."
- In other words, "information statement" means "groundless opinions."

Why give prophylaxis?

- Prosthetic joint infections are highly morbid complications.
- Dental work is associated with bacteremia.
- Prosthetic joint infections occur after dental work.
- Treatment with antibiotics might prevent such bacteremia from seeding the joints.
- Antibiotics are recommended for prevention of bacteremic seeding of other prostheses (heart valves).
- Antibiotic prophylaxis is cheap, safe, and cost-effective.

Does it hold up?

- *Dental work is associated with bacteremia.*
- True, but...
- Most bacteremia is not associated with dental work.
- Toothbrushing causes bacteremia in 23% of subjects (vs 60% for extraction).
- Oral flora rarely infect joints (0.06 cases per 1000 joint-years)

Lockhart PB et al. *Circulation* 2008; 117: 3118.

Does it hold up?

- *Prosthetic joint infections occur after dental work.*
- Yes, but so do meteor showers.
- *Post hoc, ergo propter hoc?*
- No association has been demonstrated.
- Even for endocarditis, in which many infections are due to oral flora, there is no temporal association with dental work.

Durack D. *Ann Intern Med* 1998; 129: 829.

Does it hold up?

- *Treatment with antibiotics might prevent such bacteremia from seeding the joints.*
- Not supported by experimental data.
- No human trials showing it is effective.

Does it hold up?

- *Antibiotics are recommended for prevention of bacteremic seeding of other prostheses (heart valves).*
- Unlike PJI, endocarditis is commonly due to oral flora.
- Even for endocarditis, evidence of benefit is slender.
- Declining use for endocarditis prophylaxis.

Does it hold up?

- *Antibiotic prophylaxis is cheap, safe, and cost-effective.*
- Low cost per patient but large in aggregate.
- If antibiotics actually work, cost-effectiveness is still poor (perhaps \$500,000/QALY).
- If antibiotics don't work, they will do more harm than good.
- Potential risks include allergy, drug resistance, and *C. difficile* colitis.

So How Safe Are Antibiotics?

- Pretty safe, but...
- About 142,500 visits to US emergency departments annually for adverse reactions to antibiotics
- 19% of all ED visits for adverse drug events
- 37% were due to penicillins, 12% cephalosporins
- Overall ED visit for about 1/1000 prescriptions
- Clindamycin had a 2X higher rate of ED visits
- These visits are the “tip of the iceberg” – many reactions not referred to ED.
- Cumulative effect on antibiotic resistance and efficacy is not trivial

Shehab N et al. *Clin Inf Dis* 2008; 47: 735.

Bottom line for joint prophylaxis

- No good evidence that there is any benefit whatsoever.
- If there is any benefit, it must be very, very, very small. May be harmful.
- No evidence that it is cost-effective.
- AAOS information statement is irrational.
- New trials to provide guidance are unlikely.

Napenas J et al. *JCDA* 2009; 75: 447.
Wahl MJ. *Clin Inf Dis* 1995; 20: 1420.

So what do we (not) do?

- DON'T use antibiotics for procedures with low risk of bacteremia (see *JADA* 2003; 134: 895).
- DON'T use antibiotics for pins, plates, screws, cosmetic implants, etc.
- DON'T use antibiotics if the patient is at increased risk of adverse reaction (e.g., they had antibiotic-associated colitis before).
- DON'T give antibiotics to everyone with a prosthetic joint

So what do we do?

- MOST IMPORTANT: Educate patients on the importance of good dental health, and on prompt treatment of all bacterial infections.
- Consider using the pre-2009 guideline.
- It is not evidence-based, but it is a reasonable compromise between the bad data and the hopes and fears of doctors and patients.
- Prepare an informational handout for the patients.
- Maintain dialogue with the physicians.

Bloodborne Pathogens

- Many diseases can be transmitted by human blood.
- The “big three”: Human Immunodeficiency Virus (HIV), hepatitis B (HBV), hepatitis C (HCV)
- Rare: syphilis, West Nile virus, malaria, many others
- Prevention
- Follow-up after exposure

The Rule of 3s

Approximate risk of transmission - percutaneous injury from seropositive individual:

- Hepatitis B - 30%
- Hepatitis C - 3%
- HIV - 0.3%

This is modified by:

- HBIG and hepatitis B vaccination
- Treatment of acute HCV with interferon
- Prophylaxis with HAART

HIV

- Risk of transmission is approximately 0.3% from a needlestick.
- Risk increased for: hollow needle, needle that was in a blood vessel, patient with high level of viremia (virus in blood)
- Risk decreased for: solid needle, patient on effective treatment, injury through a glove.
- No vaccine is available for prevention

HIV – Management after Injury

- Assess: Was the source patient infected? If so, what treatment was he/she on?
- If HIV status unknown but risk factors present (man who has sex with men, commercial sex worker, current/past injected drug user, history of other sexually transmitted disease, consider asking the source patient to have a rapid HIV test.
- Nature of the injury: percutaneous much riskier than mucus membrane, intact skin very low risk. Nonbloody saliva very low risk.

HIV – Management after Injury

- Post-exposure prophylaxis involves 2-3 drugs for 4 weeks.
- Important to start early (less than 72 hr, but sooner is better).
- No immune globulin is available.
- The drugs are expensive and poorly tolerated – should be used only if benefit is likely to exceed risk.
- Key points: prompt evaluation, assess the source.

HBV – Prevention

- All health-care workers at risk for bloodborne pathogen exposure should be vaccinated against hepatitis B (series of three doses).
- Vaccine is recombinant viral surface antigen – very safe, zero risk of transmitting disease
- After completing series, test for hepatitis B surface antibody.
- If positive, protection is effective for many decades – no boosters or retesting needed.
- If negative, individual is still at risk.

HBV – Prevention, continued

- Nonresponders should be tested for prior HBV infection (hepatitis B core antibody and surface antigen tests).
- If no evidence of prior infection, try vaccinating again.
- If still no response, treat as nonimmune if an exposure occurs.

TABLE 3. Recommended postexposure prophylaxis for exposure to hepatitis B virus

Vaccination and antibody response status of exposed workers*	Treatment		
	Source HBsAg [†] positive	Source HBsAg [†] negative	Source unknown or not available for testing
Unvaccinated	HBIG [‡] x 1 and initiate HB vaccine series [§]	Initiate HB vaccine series	Initiate HB vaccine series
Previously vaccinated			
Known responder**	No treatment	No treatment	No treatment
Known nonresponder [¶]	HBIG x 1 and initiate revaccination or HBIG x 2 [¶]	No treatment	If known high risk source, treat as if source were HBsAg positive
Antibody response unknown	Test exposed person for anti-HBs [¶] 1. If adequate,** no treatment is necessary 2. If inadequate, [¶] administer HBIG x 1 and vaccine booster	No treatment	Test exposed person for anti-HBs 1. If adequate, [¶] no treatment is necessary 2. If inadequate, [¶] administer vaccine booster and recheck titer in 1-2 months

* Persons who require postexposure prophylaxis and do not

Ref: MMWR June 29, 2001

Hepatitis C

- No vaccine or immune globulin available
- No post-exposure prophylaxis recommended
- Treatment of early infection appears to be much more effective than treatment of chronic infection, so there may be a role for early detection.
- Acute infection is often asymptomatic.
- Optimal follow-up interval to look for early infection is not clear. CDC suggests serology at 4-6 months, and consider viral RNA testing at 4-6 weeks as an option.
- Optimal treatment plan for early infection is not clear (as some infections will resolve spontaneously, and the treatment is toxic). Consult an expert.

Management of Needlestick Injuries

Assess the source – but respect confidentiality

- If male, sex with men
- Sex with IDU or commercial sex worker
- IDU, current or past
- Transfusions
- Medical care in less-developed country
- Country of origin
- Occupational exposure
- History of hepatitis B vaccination
- Any known serologic tests

Management of Needlestick Injuries - 2

Test the source if appropriate

- Hepatitis B surface antigen (HBsAg)
- HIV serology – use the rapid test
- Hepatitis C antibody

Management of Needlestick Injuries - 3

Assess the injury

- Percutaneous, mucous membrane, skin
- Type of fluid
- Type of needle/other sharp

Management of Needlestick Injuries - 4

Baseline testing for stuck person

- Assess for risk factors
- Vaccination history
- Serologic response to HBV vaccine?
- HIV serology
- Hepatitis B SAg and SAb
- Hepatitis C antibody
- ALT

Management of Needlestick Injuries - 5

Treatment options

- Hepatitis B vaccine
- Hepatitis B immune globulin
- HIV post-exposure prophylaxis

Follow-up

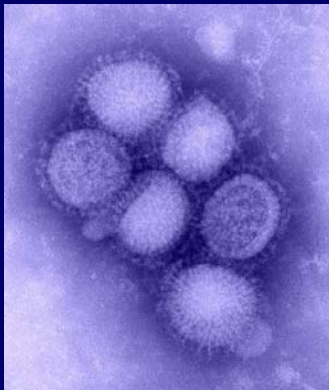
- Serologic testing
- Consider HCV Rx if infection occurs

The Risks of Bloodborne Diseases Can Be Minimized by Using

- Standards / Universal Precautions:
- FOR ALL PATIENTS — EVERY TIME
 - You can not tell for sure which patients carry bloodborne diseases such as Hepatitis B, Hepatitis C, or HIV.
 - Standard/Universal precautions resolves this uncertainty by treating all blood and body fluids as if they were infectious.

Pandemic H1N1 Influenza

- Seasonal influenza kills about 40,000 Americans per year, mostly the elderly, very young, or ill.
- Viruses in circulation change each year
- Periodic major changes result in a pandemic, which we have experienced in 2009



Influenza Virus

- RNA Virus with high mutation rate
- 3 distinct Types (A, B, and C)
- Certain subtypes of Influenza A and Influenza B circulate among humans and cause annual outbreaks

Pandemics

- Spanish Flu, H1N1, 1918
 - Killed ~ 50 million worldwide and 700,000 in the US . Most of the deaths were caused by secondary bacterial pneumonia.
- Asian Flu, H2N2, 1957
 - Killed ~1.5 million worldwide/70,000 U.S
- Hong Kong Flu, H3N2, 1968
 - Killed ~ 1 million worldwide/34,000 U.S

Transmission of Influenza A H1N1



- Spread from person to person primarily through large-particle respiratory DROPLET transmission
- Requires close contact (< 6 feet)
- Contact with contaminated surfaces
- Bodily fluids should be considered potentially infectious

Prevention

- Wash hands frequently with alcohol-based hand cleaner or soap and water.
- Surgical masks are sufficient since spread by droplets.
- OSHA and CDPH require N95 respirators or higher, but this is not supported by data, and is opposed by many non-governmental experts.
- Cover your mouth and nose with a tissue when coughing or sneezing.
- Avoid close contact (i.e. being within about 6 feet) with persons with influenza-like illness.

Prevention

- Powered air-purifying respirator (PAPR) or N95 should be used for intubations, CPR, open suctioning and bronchoscopies.



H1N1 Treatment Guidelines

- Treatment is recommended for:
 - All hospitalized patients with confirmed, probable or suspected novel influenza (H1N1).
 - Pregnant women
 - HCW who have suspected swine influenza.
 - Others at high risk of complications.

<http://www.cdc.gov/h1n1flu/recommendations.htm>

Vaccination for H1N1

- CDC recommends vaccination for:
 - Pregnant women
 - Household contacts of infants under 6 months
 - Healthcare and emergency-services workers
 - Young people between 6 months and 24 years of age;
 - Adults ages 25-64 with underlying chronic medical problems

Vaccination for H1N1

- Inactivated intramuscular vaccine
- Live attenuated intranasal vaccine (FluMist)
- Both are safe and effective
- Essentially same as seasonal flu vaccines except for the antigens

H1N1 Vaccine safety

- Concerns regarding Guillain-Barre syndrome based on 1976 fiasco (less than 1 case per 100,000 vaccinees), but no reason to believe it will be a problem, and no cases to date.
- Amount of thimerosal in the vaccine is not harmful. State has issued a waiver allowing use of thimerosal-containing vaccine in children and pregnant women.
- The vaccines CANNOT cause the flu.
- The vaccines do NOT cause autism.

Typical Pustule



Note: There is no spider in this picture.

Meet the Staphylococci

Coagulase-negative

- Multiple species, e.g. *epidermidis*, *warneri*
- Normal flora of skin
- Relatively low virulence
- Common contaminants in many cultures
- Important in infections of devices, such as artificial joints, valves, venous catheters, etc.
- *S. saprophyticus* in UTI

Coagulase-positive

- *Staphylococcus aureus*
- Highly virulent

Epidemiology of *S. aureus*

- Nasal carriage in 20-40 % of adults at any one time.
- Over time
 - 30% prolonged carriage
 - 50% intermittent carriage
 - 20% no colonization
- Therefore, spontaneous loss of colonization is common.

SB1058

Medical Facility Infection Control and Prevention Act or Nile's Law

- Effective January 1, 2009
- Active surveillance for colonization by MRSA
- Patient education
- Quarterly reporting of *C. difficile*, bacteremias due to VRE and MRSA, central line infections, and surgical site infections
- Starting in 2011, this will be posted on the web
- Regular cleaning of hospital environment and equipment
- Surveillance for nosocomial acquisition (2011)

Community-acquired associated MRSA

The Good Old Days:

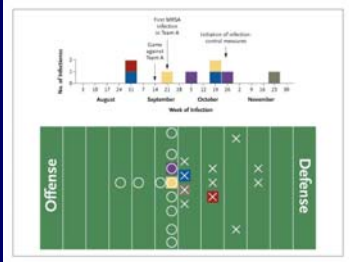
- MRSA was only a nosocomial infection.
- MRSA was often susceptible to quinolones.
- MRSA was always susceptible to vancomycin.

The Current Evil Times:

- MRSA is common in the community.
- New clones with increased virulence are causing necrotizing pneumonia and skin infections.
- MRSA is usually resistant to quinolones.
- MRSA can be resistant to vancomycin.
- *In vitro* testing may fail to identify resistance to vancomycin or clindamycin.
- Time to panic?

A Clone of Methicillin-Resistant *Staphylococcus aureus* among Professional Football Players

Epidemic-Curve Graph (Top) and Field Position Diagram (Bottom) of Cases of MRSA Infection among St Louis Rams Professional Football Players in 2003

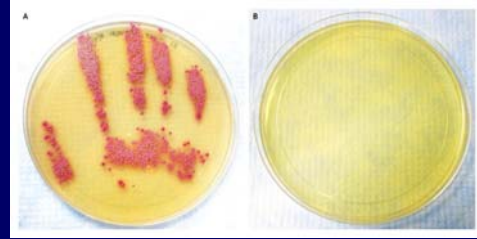


Kazakova, S. V. et al. N Engl J Med 2005;352:468-475



Rapid Testing for MRSA

A health-care worker performed an abdominal exam on a patient with asymptomatic MRSA colonization. Hands were cultured before and after hand hygiene with alcohol gel.

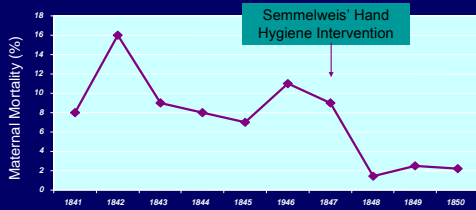


Donskey C and Eckstein B. N Engl J Med 2009;360:e3



Effect of Hand Hygiene

Maternal Mortality due to Postpartum Infection



Hand antiseptics reduces the frequency of patient infections

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

Resources for Patients

Living with MRSA

<http://www.tpchd.org/page.php?id=131>