Future of Infection Prevention: Predictions, Warnings and Challenges

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HEALTHCARE-ASSOCIATED INFECTIONS: IMPACT 1.7 million infections per year 98,987 deaths due to HAI 98,987 deaths due to HAI 9,987 deaths due to HAI 9,9

COST ESTIMATES	FOR HEALTH	ICARE-
ASSOCIATED IN	FECTIONS (H	iAls)
HAI	Cost per HAI <u>+</u>	Range
	SE	
Ventilator-associated pneumonia	25,072 <u>+</u> 4,132	8,682-31,316
Healthcare-associated	23,242 <u>+</u> 5,184	6,908-37,260
bloodstream infections		
Surgical site infections	10,443 <u>+</u> 3,249	2,527-29,367
Catheter-associated urinary tract	758 <u>+</u> 41	728-810
infections		
Costs based on literature rev	Anderson DJ, et al. ICHE iew 1985-2005; adjusted	2007;28:767-773 to US 1995 dollars

Future of Infection Prevention in the 21st Century: Predictions, Warnings and Challenges

Changing population of hospital patients

- Increased severity of illness
- Increased numbers of immunocompromised patients
- Increased numbers of older patients
- Shorter duration of hospitalization
- More and larger intensive care units

Growing frequency of antimicrobial-resistant and emerging pathogens

Lack of compliance with hand hygiene and other infection preventive measures (e.g., endoscope)













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EMERGING RESISTANT PATHOGENS: HEALTH CARE FACILITIES

Staphylococcus aureus: Oxacillin (occ. vancomycin, linezolid) Enterococcus: Penicillin, aminoglycosides, vancomycin, linezolid, dalfopristin-quinupristin

Enterobacteriaceae: ESBL producers, carbapenems Pseudomonas aeruginosa, Acinetobacter sp: Multidrug Mycobacterium tuberculosis: MDR (INH, rifampin), XDR (multiple)



EMERGING INFECTIOUS DISEASES RELEVANT TO THE HOSPITAL

1977 (US) – Legionnaire's disease
1978 (US) – Staphylococcal toxic shock syndrome
1996 (England → US) – Variant Creutzfeld-Jakob disease (vCJD)
2001 (US) - Anthrax (attack via letters)*
2002 (US) – Vancomycin-resistant *S. aureus**2002 (Canada → US) – Hypervirulent *C. difficile**2003 (China → worldwide) - SARS*
2003 (US) – Monkeypox*
2004 (Asia) – Avian influenza (H5N1)*
2006 (Worldwide) – XDR-TB* * HCWs at risk for infection
2009 Novel H1N1 influenza

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RATIONALE FOR HAND HYGIENE

Many infectious agents are acquired via hand contact with contaminated surfaces

- Contact transmission: healthcare (MRSA, VRE), day care (MRSA), home (MRSA, "cold viruses", herpes simplex)
- Fecal-oral transmission: day care (*Shigella, E. coli* O157:H7), home (*Salmonella, E. coli* O157:H7, *Cryptosporidium*)

Hand hygiene effective in reducing or eliminating transient flora Hand hygiene demonstrated to be effective in preventing illness (especially fecal-oral diarrheal illnesses) in healthcare facilities, child care centers/homes, and households

~40% of healthcare-associated infections due to cross-transmission

ASSOCIATION BETWEEN HAND HYGIENE COMPLIANCE AND HAI RATES

Author, year	Setting	Results
Casewell, 1977	Adult ICU	Reduction HAI due to Klebsiella
Maki, 1982	Adult ICU	Reduction HAI rates
Massanari, 1984	Adult ICU	Reduction HAI rates
Kohen, 1990	Adult ICU	Trend to improvement
Doebbeling, 1992	Adult ICU	Different rates of HAI between 2 agents
Webster, 1994	NICU	Elimination of MRSA*
Zafar, 1995	Newborn	Elimination of MRSA*
Larson, 2000	MICU/NICU	85% reduction VRE
Pittet, 2000	Hospitalwide	Reduction HAI & MRSA cross-transmission
HAI, healthcare-ass instituted	ociated infection	s *Other infection control measures also Boyce JM, Pitter D. MMWR 2002;51(RR-16)

WHAT IS OUR TRACK RECORD ON HANDWASHING IN HEALTHCARE FACILITIES?

A review of 34 published studies of handwashing adherence among healthcare workers found that adherence rates varied from 5% to 81%



The average adherence rate was only 40%

Hand Hygiene Adherence an Institutional Priority

Multidisciplinary Program

- Administrative support (IOC, Executive Staff, Dept Heads) Monitor HCWs adherence to policy and provide staff with information about performance
- Provide HCWs with accessible hand hygiene (HH) products
- to include alcohol based hand rubs Education regarding types of activities that result in hand contamination and indications for hand hygiene
- Reminders in the workplace (e.g., posters)
- Considering ways to include HH in management standards (loss of hospital privileges, tickets for non-compliance, coffee coupons)





GI ENDOSCOPES Widely used diagnostic and therapeutic procedure Endoscope contamination during use (10⁹ in/10⁵ out) Semicritical items require high-level disinfection minimally Inappropriate cleaning and disinfection has lead to cross-transmission In the inanimate environment, although the incidence

remains very low (35 cases of transmission from 1993-2002), endoscopes represent a risk of disease transmission

Endoscope Reprocessing: Current Status of Cleaning and Disinfection

Guidelines

- Society of Gastroenterology Nurses and Associates
- European Society of Gastrointestinal Endoscopy
- British Society of Gastroenterology Endoscopy
- Gastroenterological Society of Australia
- Gastroenterological Nurses Society of Australia
- American Society for Gastrointestinal Endoscopy
- Association for Professional in Infection Control and Epidemiology
- Multi-society Guideline for Reprocessing Flexible GI Endoscopes, 2011
- Centers for Disease Control and Prevention, 2008

TRANSMISSION OF INFECTION

Gastrointestinal endoscopy

- >300 infections transmitted
- 70% agents Salmonella sp. and P. aeruginosa
- Clinical spectrum ranged from colonization to death (-4%)
 Number of reported infections is small, suggesting a very
- Iow incidence Endemic transmission may go unrecognized
- Bronchoscopy
- 90 infections transmitted
- 90 mections transmitted
- M. tuberculosis, atypical Mycobacteria, P. aeruginosa
 Spach DH et al Ann Intern Med 1993: 118:117-128 and Weber DJ et al Gastroint Dis
- 2002;87

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Limited infection prevention resources Implementation of guidelines/standards, bundles and new technology demonstrated to reduce HAIs Public reporting of HAIs CMS non-reimbursement for HAIs

State and federal laws legislating care issues

Influenza immunization for staff

MRSA screening of patients and staff

Greater emphasis on infection prevention by The Joint Commission

INCREASING DEMANDS ON IPs WITH ACCOUNTABILITY

Public expectation of 0 rate of healthcare-associated infections? Buy in by legislatures and CMS IP accountability and attention rich but resource poor

IP ACTIVITIES

1975 to 1990

- Surveillance
- Outbreak investigations
- Exposure evaluations
- Education
- JCAHO
- Policy development and review
- Sterilizer monitoring
- Dialysis water

1991 to 2003 (new)

- Targeted surveillance
- OSHA TB
- OSHA Bloodborne
- Molecular epidemiology
- MRSA, VRE
- BT preparedness
- Construction rounds

IP ACTIVITIES

2004 to 2008 (new)

IHI bundles

- CMS core measures
- NSQUIP (VAs, others)
- NDNQI (ANA)
- Other CQI initiatives
- MRSA active surveillance
- Unannounced TJC visits
- Avian influenza preparedness
- Endoscope sampling

Future (2009-)

- Public health reporting
- Mandated influenza vaccine
- Mandated MRSA surveillance
- Cost analyses
- Comprehensive surveillance

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SOURCE OF INFECTION PREVENTION STRATEGIES

Centers for Disease Control and Prevention The Joint Commission CMS

Institute for Healthcare Improvement (IHI) Professional Organizations: APIC, SHEA, AAMI, AORN, SGNA, AIA, SGNA, ASGE

INFECTION PREVENTION STRATEGIES

Centers for Disease Control and Prevention

- Prevention of Intravascular Device-Related Infections, 2010
- Prevention of Catheter-Associated UTI, 2009
- Guideline for D/S in Healthcare Facilities, 2008
- Guideline for Isolation Precautions, 2007
 Management of MDR Organisms, 2006
- Management of MDR Organisms,
 Preventing HA Pneumonia, 2003
- Environmental Infection Control in HCF, 2003
- Environmental mection control in ACF, 200.
 Hand Hygiene in Healthcare Settings, 2002
- Prevention of Surgical Site Infections, 1999
- Prevention of Surgical Site Infections, 1999
 Management of Occupational Exposure to HBV, HCV, HIV, 2002
- Infection Control in Healthcare Personnel, 1998

INFECTION PREVENTION STRATEGIES

Society of Healthcare Epidemiology of America (SHEA) Management of HCWs Infected with HBV, HCV, HIV, March 2010

- Disinfection and Sterilization of Prion-Contaminated Medical Instruments, February 2010
- Compendium of Strategies to Prevent HAIs, October 2008
 Surgical Site Infection
 - Surgical Site Infection
 CLA-Bloodstream Infection
 - Catheter-Associated UTI
 - Ventilator-Associated Pneumonia
 - ◆ Clostridium difficile
 - ◆ Methicillin-resistant S. aureus

Institute for Healthcare Improvement VAP AND CA-BSI BUNDLES

VAP Bundle

Elevation of the head of the bed to between 30 and 45 degrees Daily "sedation vacation" and daily assessment of readiness to extubate Peptic ulcer disease (PUD) prophylaxis Deep venous thrombosis (DVT) prophylaxis (unless contraindicated)

CA-BSI

Hand hygiene Maximal barrier precautions Chlorhexidine skin antisepsis Optimal catheter site selection, with subclavian vein as the preferred site for non-tunneled catheters Daily review of line necessity, with prompt removal of unnecessary lines

INFECTION CONTROL INTERVENTIONS

2000: Addition of 2% chlorhexadine/70% isopropyl alcohol (ChoraPrep®) to the central line dressing kit. 2001: Mandatory training for nurses on IV line site care and maintenance. 2003: Full body drape added to central line kit. MD could choose kit containing a catheter impregnated with antiseptic or antibiotic. 2005: 2nd generation impregnated catheter included in all central line kits (except for Neonatal ICU). 2006: Pilot in MICU of IHI bundle to prevent CLA-BSI. 2007: Implementation of the IHI bundle in all ICUs. 2008: Implementation of Infection Control Liaison Program 2009: Implementation of Biopatch.









PROTECTIVE DISK WITH CHG

Bacteria can recolonize the skin and CHG suppresses regrowth

CHG patch provides contact around the insertion site and 7 day continuous release of CHG provides ongoing antimicrobial protection

Randomized, controlled trials show CHG patch reduces risk of infection (JAMA 2009;301:1231 and Ann Hematol 2009:88:267)

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lealthcare Facility HAI Reporting to CMS via NHSN – Current ar Proposed Requirements (8/1/2011)			
HAI Event	Facility Type	Start Date	
CLABSI	Acute Care Hospitals Adult, Pediatric, and Neonatal ICUs	January 2011	
CAUTI	Acute Care Hospitals Adult and Pediatric ICUs	January 2012	
SSI	Acute Care Hospitals Colon and abdominal hysterectomy procedures	January 2012	
I.V. antimicrobial start (proposed)	Dialysis Facilities	January 2012	
Positive blood culture (proposed)	Dialysis Facilities	January 2012	
Signs of vascular access infection (proposed)	Dialysis Facilities	January 2012	
CAUTI	Inpatient Rehabilitation Facilities	October 2012	
CLABSI (proposed)	Long Term Care Hospitals	October 2012	
CAUTI (proposed)	Long Term Care Hospitals	October 2012	
MRSA Bacteremia	Acute Care Hospitals Facility-wide	January 2013	
C. difficile LabID Event	Acute Care Hospitals Facility-wide	January 2013	
HCW Influenza Vaccination	Acute Care Hospitals, OP Surgery, ASCs	January 2013	
SSI (proposed)	Outpatient Surgery/ASCs	January 2014	

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CMS (government) non-reimbursement for HAIs State and federal laws legislating care issues

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CMS – HAI DIAGNOSES FOR WHICH REIMBURSEMENT NOT ALLOWED, FY 2009

Catheter-associated UTI

Vascular catheter-associated infection Surgical Site Infection

Coronary artery bypass graft (CABG) - Mediastinitis

- Bariatric surgery : Laparoscopic gastric bypass, asstrantizational and a strain asstraintia asstraintia asstraintia asstraintia.
- gastroenterostomy, laparoscopic gastric restrictive surgery Orthopedic procedures: Spine, neck, shoulder, elbow

Modified 2/19/2009 – 10 conditions listed – Effective 1 October 2008 http://www.cms.hhs.gov/HospitalAcqCond/06_Hospital-Acquired_Conditions.asp

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CONCLUSIONS

Healthcare-associated infections are associated with significant patient morbidity and mortality Compliance with infection prevention recommendations needed to prevent HAIs Many challenges will impact the incidence of HAIs

CONCLUSIONS

Current challenges

- Increased emphasis on preventing HAIs;
- Increased demands on IP time
- Lack of compliance with hand hygiene and guidelines/policies
- Institution of IHI bundles and other CQI activities
- Public reporting, mandated vaccines, mandated practices
- Multidrug pathogens: VRSA, MDR-GNRs, XDR-TB
 Emerging pathogens: *C. difficile*, norovirus
- Public desire for 0 rate of healthcare-associated infections
- CMS non-reimbursement for HAIs

CONCLUSIONS

Future

- Gene therapy-genes introduced into human cells
- Xenotransplanation-organs from nonhuman species to human recipients emerged due to shortage of human organs
- Emerging pathogens?
- Influenza pandemic?
- Bioterrorism?

DISCUSSION TOPICS

Impact of healthcare-associated infections Challenges in infection control

Thank you

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