INFECTION PREVENTION AND CONTROL PRINCIPLES

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Infection Prevention and Control For Healthcare Auxillaries
- An Update and Skill Enhancement
Faculty of Dentistry UiTM 2 September 2016
Are Hospitals Dangerous???

• Hospitals were originally set up for the sick and dying among the poor
• The wealthy had the physicians to attend to them at their homes to provide care
• Hospitals were widely perceived as dangerous places

Pittet et al http://www.hopisafe.ch
"It may seem a strange principle to enunciate as the very first requirement in a hospital that it should do the sick NO HARM"

- Florence Nightingale
<table>
<thead>
<tr>
<th>Time Period</th>
<th>Key Events</th>
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</thead>
<tbody>
<tr>
<td>Pre 1800</td>
<td>Early efforts at wound prophylaxis</td>
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<tr>
<td>1800-1940</td>
<td>Nightingale, Semmelweis, Lister, Pasteur</td>
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<tr>
<td>1940-1960</td>
<td>Antibiotic era begins, <em>Staph. aureus</em> nursery outbreaks, hygiene focus</td>
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<tr>
<td>1960-1970’s</td>
<td>Documenting need for infection control programmes, surveillance begins</td>
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<tr>
<td>1980’s</td>
<td>Focus on patient care practices, intensive care units, resistant organisms, HIV</td>
</tr>
<tr>
<td>1990’s</td>
<td>Hospital Epidemiology = Infection control, quality improvement and economics</td>
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</table>
Infection requires **THREE** main elements:
In healthcare settings, the **MAIN** modes for transmission of infectious agents:

- Contact (including bloodborne)
- Droplet and
- Airborne.
Other sources of transmission include:

- **Endogenous** flora of patients (e.g. bacteria residing in the respiratory or gastrointestinal tract)

- **Exogenous** - Environmental sources such as air, water, medications or medical equipment and devices that have become contaminated.
Droplet Transmission

• Droplet transmission can occur when an infected person coughs, sneezes or talks,
• Droplets are infectious particles $\geq$ 5 microns
• Droplet distribution is limited by the force of expulsion and is of shorter distance - usually at least 1 metre. However, droplets can also be transmitted indirectly to mucosal surfaces (e.g. via hands).
• Examples: influenza virus and meningococcus.
Airborne Transmission

• Aerosols containing infectious agents can be dispersed over long distances by air currents (e.g. ventilation or air conditioning systems) and inhaled by susceptible individuals.

• Examples: include measles virus, chickenpox (varicella) virus and *M. tuberculosis*. 
Factors Influencing HCAIs

- Co-morbidities
- Virulence of agent
- Wounds or devices
- Age
- Immune status
Prevention of HAIs

• Healthcare-associated infections (HAIs) can occur in any healthcare setting.

• Basic principles of infection prevention and control apply regardless of the setting.

• Risk management is integral in the prevention and control of HAIs
Prevention of HAIs

• **Standard** and **transmission-based precautions** provides high-level protection to patients and healthcare workers

• Infection prevention and control is integral to clinical care - It is not an additional set of practices.
Why Is Infection Control Important in Dentistry?

- Both patients and dental health care personnel (DHCP) can be exposed to pathogens
- Contact with blood, oral and respiratory secretions, and contaminated equipment occurs
- Proper procedures can prevent transmission of infections among patients and DHCP
Chapter: Dental Practice
Policies and Procedures on Infection Control, MOH (2010)

Content:

1. Standard Precaution
2. Personal Protective Equipment
3. Patient Protection
4. Cleaning, Disinfection and Sterilization of Dental Equipment and Instruments
5. Cleaning and Disinfection of Treatment room
6. Dental Radiology Asepsis
7. Dental Laboratory Materials and Equipment
Standard Precaution

• Standard Precautions are designed to reduce the risk of transmission of micro-organisms from both recognized and unrecognized sources of infection

• **Standard Precautions applies to ALL patients REGARDLESS of their diagnosis.**

Applicable to:

• blood (including dried blood)
• secretions and excretions (*excluding* sweat)
  -regardless of whether they contain visible blood
• non-intact skin
• mucous membranes
Standard Precaution

- Hand hygiene
- Use of personal protective equipment
- Safe use and disposal of **sharps**
- Environmental cleaning
- Reprocessing of reusable medical equipment and instruments
- **Respiratory hygiene and cough etiquette** (2007)
- Aseptic non-touch technique
- Waste management
- Appropriate handling of linen
Hand Hygiene
Hand Hygiene Definitions

- **Handwashing**
  - Washing hands with *plain soap and water*

- **Antiseptic handwash**
  - Washing hands with water and soap or other detergents containing an *antiseptic agent*

- **Alcohol-based handrub**
  - Rubbing hands with an *alcohol-containing preparation*

- **Surgical antisepsis**
  - Handwashing with an antiseptic soap *before operations* by surgical personnel
Hands Need to be Cleaned

When??

- **Visibly dirty**
- After touching **contaminated objects** with **bare hands**
- **Before** and **after** patient treatment (before glove placement and after glove removal)
Efficacy of Hand Hygiene Preparations in Reduction of Bacteria

Source: http://www.cdc.gov/handhygiene/materials.htm
The Rationale for Hand Hygiene

- Many infectious agents are acquired via hand contact with contaminated surfaces
- Hand hygiene is effective in reducing/eliminating transient flora
- Hand hygiene demonstrated to be effective in preventing illness in HC facilities

40% of HCAIs due to cross-transmission
## Multi-resistant Pathogens: The HOT Spot

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Resistance</th>
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<tbody>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>Methicillin-resistant</td>
</tr>
<tr>
<td>Gram negative bacteria</td>
<td>ESBL</td>
</tr>
<tr>
<td>Gram negative bacteria</td>
<td>Carbapenemases- KPC, NDM-1</td>
</tr>
<tr>
<td><em>Enterococcus</em></td>
<td>Vancomycin-resistant enterococci (VRE)</td>
</tr>
</tbody>
</table>

These are mainly transmitted via contact-transmission.
Ignaz Semmelweis (1815-1865)

- 1840’s: General Hospital of Vienna
- Divided into two clinics, alternating admissions every 24 hours:
  - First Clinic: Doctors and medical students
  - Second Clinic: Midwives

http://www.cdc.gov/handhygiene/materials.htm
The Intervention:
Hand scrub with chlorinated lime solution

Hand hygiene basin at the Lying-In Women’s Hospital in Vienna, 1847.

http://www.cdc.gov/handhygiene/materials.htm
Hand Hygiene: Not a New Concept

Maternal Mortality due to Postpartum Infection
General Hospital, Vienna, Austria, 1841-1850

~ Hand antisepsis reduces the frequency of patient infections ~

What is our Track Record on Hand Hygiene in Healthcare Facilities?

Globally,

- A review of 34 published studies on handwashing adherence among HCWs found that adherence varied from **5% to 81%**

- The **average** adherence rate was **40%**
Factors Influencing Compliance with Hand Hygiene Practices

**Observed Risk**
- Doctor
- Male
- Intensive Care Unit
- Working during weekdays
- **Wearing gloves**

**Self Reported**
- Cause irritation and dryness
- **Location of sinks/shortage of sinks**
- Busy
- Understaffing/Overcrowding
- Wearing gloves
- **Forget**
- No role model
- No written protocol
- No risk of acquiring infection
- Lack of campaign
Key Recommendations for HAND HYGIENE
in Dental Settings

1. Perform hand hygiene—
   a. When hands are visibly soiled.
   b. After barehanded touching of instruments, equipment, materials, and other objects likely to be contaminated by blood, saliva, or respiratory secretions.
   c. Before and after treating each patient.
   d. Before putting on gloves and again immediately after removing gloves.

2. Use soap and water when hands are visibly soiled (e.g., blood, body fluids); otherwise, an alcohol-based hand rub may be used.
The Use of Gloves

Reason:
“Prevent gross contamination of the hands when touching blood, body fluids, secretions, excretions, mucous membranes, and non-intact skin.”

Fundamentals:
“Wearing gloves does not replace the need for hand washing because:

1. Gloves have small unapparent defects
2. Hands can become contaminated during removal of gloves”

“Failure to change gloves between patient contacts is an infection control hazard”.

Centre for Disease Control
Respiratory Hygiene
Respiratory Hygiene / Cough Etiquette

• The strategies target primarily patients, HCWs and individuals accompanying patients who might have undiagnosed transmissible respiratory infections with signs of illness including cough, congestion, runny nose, or increased production of respiratory secretions.

• HCWs should be educated on preventing the spread of respiratory pathogens when in contact with symptomatic persons.
Stop the spread of germs that make you and others sick!

Cover your Cough

Cover your mouth and nose with a tissue when you cough or sneeze or cough or sneeze into your upper sleeve, not your hands.

Put your used tissue in the waste basket.

You may be asked to put on a surgical mask to protect others.

Clean your Hands after coughing or sneezing.

Wash hands with soap and warm water for 20 seconds or clean with alcohol-based hand cleaner.

Cover Up Coughing and Sneezing

- Turn your head away from others
- Use a tissue to cover your nose and mouth
- Drop your tissue into a waste bin
- No tissues? Use your sleeve
- Clean your hands after discarding tissue using soap and water or alcohol gel for at least 15 seconds

These steps will help prevent the spread of colds, flu and other respiratory infections.
Transmission of *Mycobacterium tuberculosis*

- Spread by droplet nuclei
- Immune system usually prevents spread
- Bacteria can remain alive in the lungs for many years (latent TB infection)
Risk of TB Transmission in Dentistry

- Risk in dental settings is LOW

- Tuberculin skin test conversions among DHCP are rare
Preventing Transmission of TB in Dental Settings

- Assess patients for history of TB
- Defer elective dental treatment
- If patient must be treated:
  - DHCP should wear face mask
  - Separate patient from others/mask/tissue
  - Refer to facility with proper TB infection control precautions
Bloodborne Pathogens
Transmission of Bloodborne Pathogens

- Bloodborne viruses: hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV)
- Are transmissible in health care settings
- Are often carried by persons unaware of their infection
Sharps Safety

• Most percutaneous injuries (e.g., needlestick, cut with a sharp object) among HCWs involve needles and other sharp instruments.

• Implementation of the OSHA Bloodborne Pathogens Standard has helped to protect HCWs from blood exposure and sharps injuries.

• However, sharps injuries continue to occur and pose the risk of bloodborne pathogen transmission to HCWs and patients.
Potential Routes of Transmission of Bloodborne Pathogens
Average Risk of Bloodborne Virus Transmission after Needlestick

<table>
<thead>
<tr>
<th>Source</th>
<th>Risk</th>
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<tbody>
<tr>
<td><strong>HBV</strong></td>
<td></td>
</tr>
<tr>
<td>HBsAg⁺ and HBeAg⁺</td>
<td>22.0%-31.0% clinical hepatitis; 37%-62% serological evidence of HBV infection</td>
</tr>
<tr>
<td>HBsAg⁺ and HBeAg⁻</td>
<td>1.0%-6.0% clinical hepatitis; 23%-37% serological evidence of HBV infection</td>
</tr>
<tr>
<td><strong>HCV</strong></td>
<td>1.8% (0%-7% range)</td>
</tr>
<tr>
<td><strong>HIV</strong></td>
<td>0.3% (0.2%-0.5% range)</td>
</tr>
</tbody>
</table>
Concentration of HBV in Body Fluids

- **High**: Blood, Serum, Wound exudates
- **Moderate**: Semen, Vaginal Fluid, Saliva
- **Low/Not Detectable**: Urine, Feces, Sweat, Tears, Breast Milk
Risk Factors for HIV Transmission after Percutaneous Exposure to HIV-Infected Blood

**CDC Case-Control Study**

- Deep injury
- Visible blood on device
- Needle placed in artery or vein
- Terminal illness in source patient

Exposure Prevention Strategies
Exposure Prevention Strategies

- Engineering controls
- Work practice controls
- Administrative controls
Engineering Controls

• Isolate or remove the hazard
• Examples:
  — Sharps container
  — Medical devices with injury protection features (e.g., self-sheathing needles)
Work Practice Controls

• Change the manner of performing tasks
• Examples include:
  - Using instruments instead of fingers to retract or palpate tissue
  - One-handed needle recapping
Post-Exposure Management

- Exposure reporting
- Wound management
- Assessment of infection risk- e.g:
  - Type and severity of exposure
  - Bloodborne status of source person
  - Susceptibility of exposed person
IMPROVING ADHERENCE TO INFECTION CONTROL APPROACHES
How to Improve Adherence to Infection Control Approaches?

Adherence To Infection Control

- Individual Factors
- Environmental Factors
- Institutional Factors

Strategy for Improvement:
MULTIMODAL AND MULTIDISCIPLINARY INTERVENTION
A Multimodal, Multidisciplinary Approach

System change

Education

Monitoring performance

Reminders

Safety culture
Multimodal Intervention: Critical Elements for Success

1. System Change

Handwashing ...
an action of the past
(except when hands are visibly soiled)

System change

Alcohol-based hand rub is standard of care
Multimodal Intervention: Critical Elements for Success

2. Education of Healthcare workers
3. Monitoring and Feedback of Performance

AUDIT CHECKLIST

- Audit Satisfactory
- Nonconformances Found
- Observations Made
Multimodal Intervention: Critical Elements for Success

4. Reminders in the Workplace

Wash Your Hands!

1. WET HANDS WITH WARM WATER
   - Remove jewelry and wet hands and washes with warm water.

2. USE SOAP TO KILL GERM
   - Use 1 or 2 squirts of liquid or foam soap.

3. RUB HANDS TOGETHER & LATHER
   - Scrub in between and around fingers.

4. SCRUB BETWEEN FINGERS & UNDER FINGERNAILS
   - Scrub back of each hand with palm of other hand.

5. Rinse thoroughly under running water.

WHEN?
- Before eating or touching your food.
- After using the bathroom.
- After blowing your nose or coughing.
- After touching animals.
- After playing outside.
- Before & after visiting a sick relative or friend.

Handwashing with soap and water:

1. Remove jewelry and wet hands and washes with warm water.
2. Use 1 or 2 squirts of liquid or foam soap.
3. Lather soap and scrub hands well, palm to palm.
4. Scrub in between and around fingers.
5. Scrub back of each hand with palm of other hand.
6. Scrub fingertips of each hand in opposite palm.
7. Scrub each thumb in opposite hand.
8. Scrub each wrist in opposite hand.
9. Rinse thoroughly under running water.
11. Turn off water using same paper towel.
Multimodal Intervention: Critical Elements for Success

5. Executive support and strong unit leadership
   • Infection control liaison staff involvement

Strong Administrative Support

SAVES LIVES: Clean Your Hands
5 May 2009-2020

Through an annual day focused on hand hygiene improvement in healthcare, this initiative promotes continual, sustainable best practices in hand hygiene at the point of care in all healthcare settings around the world.
Multimodal Intervention: Critical Elements for Success

6. Leadership and **Cultural change**
COMPLIANCE TO INFECTION CONTROL MEASURES SHOULD BE PART OF A CULTURE OF PATIENT CARE

A safe culture can only begin to be engineered into our HC system when we adopt a “JUST and NON- BLAMING CULTURE”
Evolving to NEW Challenges in Infection Control and Patient Safety

- Team and **multidisciplinary** team work
- Successful interventions
- Adaptability of actions
- Sustainability of actions / interventions
- **Leadership** commitment / Governance
Infection Control and Quality Healthcare in the New Millenium

Multidisciplinary Team Approach

1847
1863
1958
1970
1980
1990
2000

Pittet D, Am J Infect Control 2005, 33:258
1. Recognize
2. Explain
3. Act

Multiple-task activities
Multimodal approaches
Multiple partners team
Multidisciplinary strategies
Infection Control is EVERYONE’S responsibility. Let us ALL work together in the spirit of WORK and learn to make our healthcare system a SAFER one.