Infection Control - an Overview

2nd Annual Scientific Conference and General Meeting of the Society for Quality in Healthcare in Nigeria
July 6th 2010

Professor Folasade T Ogunsola
Consultant Clinical Microbiologist/Infection Control Chair
Lagos University Teaching Hospital
1847: Vienna General Hospital, Austria

- Doctors go from autopsy suite direct to the obstetrics ward
- His theory: puerperal fever, caused by "cadaverous particles" transmitted from the autopsy suite to the obstetrics ward via the hands of students and physicians.
- Infections due to *Streptococcus*
Hand Hygiene: Not a New Concept

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

Semmelweis’ Hand Hygiene Intervention

~ Hand antisepsis reduces the frequency of patient infections ~

Infection Control as a Quality Standard

- Created in 1998 as the international arm of The Joint Commission (United States)
- Mission: To improve the safety and quality of patient care around the world.
- Six Goals
  1. Identify Patients Correctly
  2. Improve Effective Communication
  3. Improve the Safety of High-Alert Medications
  4. Ensure Correct-Site, Correct-Procedure, Correct-Patient Surgery
  5. Reduce the Risk of Health Care–Associated Infections
  6. Reduce the Risk of Patient Harm Resulting from Falls
Healthcare Associated Infections (HAI) or nosocomial infections are those infections that were neither present nor incubating at the time the patient was admitted to the healthcare facility.

WHY DO THEY OCCUR?
Modern Healthcare has increased the risks

Prevalence varies from hospital to hospital
- 5-15% in modern hospitals – WHO Guideline on Handhygiene 2009
- Risk of healthcare-associated infections (HAI) in developing countries is estimated to be as high as 25%
- 2-20 times higher than in developed countries
Health Care-Assiated Infections

- Significant global public health problem:
  - High morbidity and mortality
  - High socioeconomic costs
  - Amplification of outbreaks
    - Measles, Diarrhoea, ARD, TB, Lassa, VHF
  - Occupational hazards
    - Hepatitis, HIV, TB, Viral Haemorrhagic fevers
Health Care-Associated Infections

- Most common types
  - Surgical Site Infections
  - Blood stream Infections
  - Urinary tract Infections
  - Lower respiratory tract Infections

- Others
  - Gastrointestinal
  - Reproductive system Infections (puerperal sepsis)
What is Infection Control

- Strategies built around core principles that are designed to protect clients, health care providers and the community from Healthcare associated Infections

- involves issues of quality, risk management, clinical governance and health and safety.

- Infection prevention and control maximize patient outcomes and are part of the government's responsibility to provide effective, efficient and quality health services.
In order to control or prevent infection it is essential to understand that transmission of a pathogen resulting in colonisation or infection requires the following 5 vital links:
Infection Control Strategies

AIM: BREAK LINKS

- Agent
- Source
- Mode of transmission
- Portal of entry into the host
- Susceptible host
The organisms come from many possible sources, such as:

- **The patients’**
  - Own flora – the mouth, gastrointestinal tract, vagina or the skin; - Endemic
  - Community acquired Infection

- **HCW –**
  - The resident microbial flora
  - Transient bacteria carried on the hands of health care workers from one patient to another;

- **Environment**
  - Formites, Surfaces,
  - Contaminated instruments, dressings, needles, Infusions, contaminated disinfectants etc.
Epidemic-prone diseases
Less common
Devastating
- Faecal-oral diseases (e.g. cholera, rotavirus)
- Respiratory diseases (e.g. RSV, adenovirus, pneumonic plague, tuberculosis)
- Vaccine-preventable diseases (e.g. measles)
- Viral haemorrhagic fevers (e.g. CCHF, Ebola, Lassa, Marburg, novel arenavirus)
HIERARCHY OF INFECTION CONTROL MEASURES

- **Engineering controls**
  - built into the design (private bathrooms, private rooms, HVAC systems)
  - IPC professionals should be involved in the design and planning of new facilities.
  - Infection Control Risk assessment should be done to evaluate and mitigate potential risks for microorganism transmission

- **Administrative controls**
  - Policies and Protocols that guide procedure
  - Organisation of the programmes
  - Administrative oversight

- **Personal protective equipment (PPE)**
  - Least desirable
  - Does not eliminate hazards
  - Dependent on appropriate use
  - Requires educated, knowledgeable staff.
Routine Practice

- **Hand hygiene**
- **Risk assessment** related to client symptoms, care and service delivery, eg screening for infectious diseases, fever respiratory symptoms, rash, diarrhea, excretions and secretions
- **Risk reduction strategies** through use of personal protective equipment (PPE), cleaning of environment, laundry, disinfection and sterilization of equipment or single use equipment, waste management, safe sharps handling, client placement and healthy workplace practices
- **Education** of health care providers, clients and families/visitors
Risk assessment

SCREENING QUESTIONNAIRE FOR FEBRILE RESPIRATORY ILLNESS (FRI)

EXAMPLE OF CLIENT/RESIDENT SCREENING QUESTIONNAIRE

Date: ____________________ Time: ____________________
Name: ____________________

- [ ] Y [ ] N New or worsening cough
- [ ] Y [ ] N Shortness of breath (worse than usual)
- [ ] Y [ ] N Fever within the past 24 hours

CLINICIAN SHOULD CONSIDER DONNING PERSONAL PROTECTION EQUIPMENT IF FEVER, PLUS ONE OR TWO ABOVE CLIENT SYMPTOMS, ARE PRESENT.

Client has reported the following symptoms:
- [ ] Y [ ] N Muscle aches
- [ ] Y [ ] N Severe fatigue, feeling unwell
- [ ] Y [ ] N Severe headache, (worse than usual)
- [ ] Y [ ] N New rash associated with fever
- [ ] Y [ ] N Recent travel to: ____________________
- [ ] Y [ ] N Contact with sick person with Hx of recent travel

Notes:

Completed by:

Download at:
http://www.peelregion.ca/health/professionals/index.htm
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- Screen for infectious disease
- Cough, cold, diarrhoea
- At point of entry
- On admission
Risk reduction strategies

- Minimizes exposure to body fluids and mucous membranes.
- Hand hygiene,
- Use of personal protective equipment (PPE)
- Client Placement
- Cleaning and disinfection of equipment
Risk Reduction Strategies

- Standard Precautions –
  - Apply to all clients and patients attending healthcare facilities, and

- Transmission based Precautions - Garner and HICPAC 1996
  - Contact
  - Droplet
  - Airborne
  (Common vehicle and vector borne)
Standard Precautions

- Places a physical, mechanical or chemical barrier between microorganisms and an individual
- Use for all patient contact
- Minimum standard
Standard Precautions *in Practice*

- Hand hygiene
- Personal protective equipment (PPE)
- Disinfection of contaminated equipment and environmental surfaces
- Injection safety
- Proper disposal of infectious waste/sharps
- Respiratory hygiene/cough etiquette
Hand Hygiene

- Cornerstone of infection control
- Single most effective method to prevent the spread of many communicable diseases
- Includes
  - Hand washing: use of plain soap & water to mechanically remove bacteria and viruses and debris
  - Hand antisepsis: use of antimicrobial soap & water, or waterless hand gel to kill bacteria and viruses on hands
How to handwash?

WASH HANDS ONLY WHEN VISIBLY SOILED! OTHERWISE, PREFER HANDRUB!

Duration of the entire procedure: 40-60 sec.

1. Wet hands with water
2. Apply enough soap to cover all hand surfaces.
3. Rub hands palm to palm
4. Right palm over left dorsum with interlaced fingers and vice versa.
5. Palm to palm with fingers interlaced
6. Backs of fingers to opposing palms with fingers interlocked
7. Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa.
8. Rinse hands with water
9. Dry thoroughly with a single use towel
10. Use towel to turn off faucet
11. ...and your hands are safe.
Hand Hygiene

- Use alcohol-based hand rub at 60-90% concentration ethyl or isopropyl or
- Hand washing with plain liquid soap and running water.
- The use of alcohol-based hand rub is the preferred method of decontamination of hands that are not visibly soiled and should be available at the point of care.
- Use hand hygiene after touching blood, body fluids, excretions and contaminated items in the client/resident’s environment.

Your 5 moments for Hand Hygiene:
1. Before Patient Contact
2. Before An Aseptic Task
3. After Body Fluid Exposure Risk
4. After Patient Contact
5. After Contact with Patient Surroundings
Personal Protective Equipment

- Types of personal protective equipment (PPE)
  - Gloves: sterile, non-sterile, utility
  - Gowns and aprons
  - Masks
  - Goggles
**Gloves**

- Use *when touching* blood, body fluids, secretions, excretions, contaminated items, mucous membranes, or nonintact skin

- Avoid touching the environmental surfaces and yourself with contaminated gloves
**Gowns**

- Use *during procedures and activities* when contact of clothing or exposed skin with blood/body fluids is anticipated
- Fasten securely at back and neck
- Change between patients
Masks, goggles, face shields

- Use during activities likely to generate splashes or sprays of blood, body fluids, secretions, or excretions
- Masks should fully cover nose and mouth
- Goggles should fit snugly over and around eyes
- Face shields should cover forehead, extend below chin and wrap around side of face
Environmental Cleaning and Disinfection

- Patient environments should be cleaned daily, and upon discharge or transfer
- Step One, **Cleaning**: mechanically removes dirt and soilage
  - Use of soap or mild detergent and water
- Step Two, **Disinfection**: destroys harmful infectious agents
  - Chemical process of killing bacteria or viruses
  - Use of disinfectants containing ingredients of chlorine, ammonia, phenols, etc.
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\(^2\)

The Inanimate Environment Can Facilitate Transmission

~ Contaminated surfaces increase cross-transmission ~

Environmental measures

- Clean and disinfect frequently-touched surfaces where persons receive care
- Use hospital-grade disinfectant or bleach diluted with water
  \[(\text{bleach to water ratio} = 1:100)\]
  *Use a higher concentration for spills (1:10)
- If using manufactured/diluted product
  - Check concentration if using bleach
  - Reconstitute bleach mixtures daily
  - Follow manufacturer instructions
  - In Nigeria 3.5% Dilute 1:3 to get 1:100
Clean AND Disinfect

**Blood and body fluid spills**

- Wear gloves (gown if necessary) to clean up spills
- If spill involves broken glass, do not remove glass by hand; use tongs or other device
- Wipe spills w/paper towel and dispose in leak-proof bag
- Clean and disinfect surface with appropriate disinfectant or bleach
Safe Handling of Hospital Laundry and Linens

- Contaminated linens or textiles can be a source of infectious agents and should be handled with care
  - New admissions require clean linen
  - Do not shake used laundry
  - Place used laundry in a leak-proof bag or receptacle that can be tied closed
  - Used linens should be stored in a utility room with other “dirty” items until they can be laundered
- Clean linens should be transported and stored away from dirt and dust
Linen and Laundry

- Wear gloves when handling soiled linens; gown if contact with skin or clothing likely
- Leak-proof bags
- Laundering removes microbes by 3 factors:
  - Mechanical
  - Chemical
  - Thermal
Bloodborne infectious agents potentially transmitted by occupational exposure include:

- HIV
- Hepatitis B
- Hepatitis C
- Viral hemorrhagic fevers
- Yellow fever
- Dengue fever
- Syphilis
Safe Practices to Prevent Exposure to Bloodborne Infectious Agents - Sharps

- Exposure to bloodborne pathogens in healthcare facilities are primarily from percutaneous injuries like cuts or needlesticks
  - Improper disposal
  - Accidental collisions
  - Recapping needles

- Safe practices include:
  - Safe handling of sharps
  - Easy access to sharps containers
  - Puncture proof sharps containers
  - Disabling of and bleach disinfection of needles
  - Staying focused on tasks
Prevention of Needlestick Injuries
Components of Respiratory Hygiene and Cough Etiquette

Healthcare personnel need to instruct persons with signs and symptoms of respiratory infection to:

- Cover nose and mouth when coughing or sneezing
- Contain respiratory secretions with disposable tissue and dispose in the waste containers
- Perform hand hygiene after contact with respiratory secretions, contaminated objects
- Encourage coughing persons to be seated away from others in common waiting areas (ideally, at least 3 feet from others), or ask them to wait outside
Components of Respiratory Hygiene and Cough Etiquette

. Healthcare facilities should consider
  ▪ No-touch waste containers and tissues, if available
  ▪ Easy access to hand washing stations or basins with fresh water and soap
  ▪ Surgical masks for those with respiratory symptoms and can tolerate masks

. Staff should use precautions
  ▪ Wear a surgical mask when examining a patient with respiratory symptoms (especially if they have fever) until infection ruled out
RESPIRATORY ETIQUETTE POSTER

Cover your cough or sneeze

When you cough or sneeze... Cover your mouth and nose with a tissue or your upper sleeve. **Do not use your hand!**

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

Put your used tissue or mask in the waste basket after use.

Cough Corner

You may be asked to sit in a 'cough corner' to stop the spread of germs.

Stop the spread of germs that make you and others sick

Tell staff if you have a:
- Cough
- Sneeze
- Fever
- Cold
- Flu

Clean your hands with alcohol-based hand cleaner:
- when you arrive and before you leave
- after coughing or sneezing

Region of Peel
Working for you
Public Health
Education

- Educate health care providers regarding infection prevention and control strategies.
- Educate clients/residents/families about hygiene and infection prevention strategies.
- Communicate between all sectors of health care to ensure...
Key contact precautions

✓ Use clean, unsterilized gloves and disposable or re-usable gown whenever you have direct contact with a patient.

✓ Remove safely the gloves and gown immediately following any contact with a patient. Perform hand hygiene immediately after removing any item of PPE.

✓ Dedicate specific equipment for use with a single patient and ALWAYS clean and disinfect shared equipment between patient uses.

✓ Avoid touching your face, eyes or mouth with either gloved or un-gloved hands as these may be contaminated.

✓ Place patients in a single occupancy room whenever possible or alternatively with other patients with the same diagnosis.
Droplet precautions guidelines

✓ Wear a medical mask when within a 1 metre range of the patient.

✓ Put the patient in a single room or in a room that contains only other patients with the same diagnosis, or with similar risk factors, and ensure that every patient is separated by at least one metre.

✓ Ensure that the transportation of a patient to areas outside of the designated room is kept to a minimum.

✓ Perform hand hygiene immediately after removing any item of PPE.
Airborne precautions guidelines

- Keep patient in well-ventilated area, separated from other patients

- Place patient in airborne precaution room, with \( \geq 12 \) air changes per hour (ACH) and controlled airflow away from corridor and directly to outside, if possible

  NOTE: Airflow can be checked with a piece of tissue paper

- Use particulate respirator when entering high-risk areas, ensuring seal is checked before every use

- Limit movement of patient

- Educate patient about respiratory etiquette and cough hygiene and

- Ensure patients wear medical mask if outside of room

- Perform hand hygiene immediately after removing any item of PPE
Infection Control Program

- Infection Prevention and Control Unit – Can be alone or part of Quality in healthcare unit
- Policy at National, State, Local Government
- Institutional Program
  - Policy
  - Standard Operating procedures
  - IPC committee – sets policy, reviews activities of team, determines training needs
  - IPC team - day to day function
### Core infection prevention and control interventions for health-care facilities at a glance

<table>
<thead>
<tr>
<th>Specific interventions</th>
<th>Target groups</th>
<th>Equipment and supply needs</th>
<th>Critical process indicators for monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hand hygiene</strong></td>
<td>All health-care workers, Visitors, Patients</td>
<td>Clean running water, Soap, Sinks or basins, Towels, Alcohol-based solutions</td>
<td>Proportion of staff observed performing hand hygiene before attending patients</td>
</tr>
<tr>
<td><strong>Personal protective equipment</strong></td>
<td>All health-care workers</td>
<td>Gloves, Gowns</td>
<td>Proportion of staff observed wearing gloves when exposure to blood or body fluids is anticipated</td>
</tr>
<tr>
<td><strong>Isolation precautions</strong></td>
<td>Nurses, Physicians, Nursing aids, Other</td>
<td>Gloves, Gowns, Masks, Eye protection</td>
<td>Average time between admission and isolation for tuberculosis patients</td>
</tr>
<tr>
<td><strong>Aseptic technique</strong></td>
<td>Nurses, Physicians, Laboratory technicians, Dental surgeons</td>
<td>Antiseptics, Sterile gloves, Sterile devices and instruments, Sterile barrier devices</td>
<td>Proportion of intravenous lines inserted using aseptic technique</td>
</tr>
<tr>
<td><strong>Cleaning and disinfection</strong></td>
<td>Nurses, Nursing aids, Housekeeping staff, Laboratory staff</td>
<td>Cleaning fluids, Cleaning equipment, Disinfectant</td>
<td>Proportion of rooms appropriately disinfected after patients' discharge</td>
</tr>
<tr>
<td><strong>Sterilization</strong></td>
<td>Sterilization staff, Nurses, Laboratory technicians, Dental surgeons</td>
<td>Autoclaves and steam sterilizers, Test strips, Chemicals</td>
<td>Proportion of sterilized devices whose sterility is documented with test strips</td>
</tr>
<tr>
<td><strong>Waste management</strong></td>
<td>Health-care workers, Waste handlers, Logistics</td>
<td>Sharps boxes and other collection containers, Storage space and containers for interim storage, Final disposal options, Personal protection equipment for waste handlers</td>
<td>Presence of health-care waste in the surroundings of the health-care facility</td>
</tr>
<tr>
<td><strong>Antibiotic use protocol</strong></td>
<td>Physicians</td>
<td>Essential list of antibiotics</td>
<td>Proportion of prescriptions including an antibiotic</td>
</tr>
<tr>
<td><strong>Immunization and exposure management</strong></td>
<td>All health-care workers</td>
<td>Hepatitis B vaccine, other appropriate vaccines</td>
<td>Three-dose hepatitis B vaccine coverage among nurses, physicians and laboratory technicians</td>
</tr>
</tbody>
</table>
Does it concern Me???
Case History – Lassa fever in Imo state

10th Jan

23 Jan

3rd Mar

9th Feb

25 Feb

15 Mar

Index case-SSD

- 17 infections
- 10 deaths + doctor

Shared syringes

Reused syringes

Rural hospital

500,000

Hospital A

Hospital C

UNTH Enugu

Index case-SSD

3/5 HCW

6/9 patients

Unsafe surgery

Boiled equipments

Poor environmental care

Shared equipment – suction tubes etc

Hospital B

What Nigeria needs to do

- Develop a national programme to support hospitals in reducing the risk of health-care-associated or nosocomial infections.
  - set relevant national objectives consistent with other national healthcare objectives;
  - develop and continually update guidelines for recommended healthcare surveillance, prevention, and practice;
  - develop a national system to monitor selected infections and assess the effectiveness of interventions;
  - harmonize initial and continuing training programmes for healthcare professionals;
  - facilitate access to materials and products essential for hygiene and safety;
  - Encourage health care establishments to monitor health-care associated infections and to provide feedback to the professionals concerned.
  - Designate an agency to oversee the programme.
Thank you for listening.