

# Infection Prevention and Control at Workplace

### Dr Siti Munira Yasin MBBS, MPH, DrPH

Senior Lecturer and Public Health Medicine Specialist (Occupational Health), Faculty of Medicine, UiTM Sungai Buloh

&

Director,

Center for Occupational Safety, Health and Wellbeing (COSHaW) UiTM Selangor Branches, UiTM Puncak Alam

### Introduction

1981 ople with have it. Get the facts. Get tested. Get involved. Find out more about HIV, including where to get tested, at gettested.cdc.gov CDC against



# **2016**



### What is an Infectious Disease?

Infectious diseases are the invasion of a host by a microorganism (Also known as transmissible or communicable disease)



Bacteria



Prions



Parasites





Fungi



Protozoa



### **Causal of Diseases**



#### COMMON TERMS FOR INFECTIOUS DISEASES

#### TIME



- e.g: Chicken pox
  - an infectious disease caused by the varicella-zoster virus
  - the latent period for chicken pox is shorter than the incubation period, so a child with chicken pox becomes infectious to others before developing symptoms



- Other examples?
  - HIV (AIDS)
    - latent period relatively short
    - infectious period occurs (many years) before the onset of symptoms



# Public Health Interventions for Controlling Infectious Diseases



- Controlling or eliminating agent at source of transmission
- 2. Protecting portals of entry
- 3. Increasing host's defenses



### Microorganisms

• Not all micro-organisms cause disease

- Many are beneficial:
  - Keep skin healthy eg. Staphylococcus epidermidis
  - Keep digestive tract healthy eg. Bacteroides species

### **Examples of Infectious Diseases**

Measles
 (rubeola virus)



 Pertussis
 (Bordetella parapertussis
 bacteria)



 Creutzfeldt-Jakob Disease (CJD)(prion)



Candida /
 Oral Thrush
 (protozoa)



Tinea
 (Dermatophyte fungus)



Lice
 (parasite)



### Common Occupational Infections in Healthcare Settings

- Hepatitis A, B and C, and Human Immunodeficiency Virus (HIV which can develop into AIDS).
- Other infections from patients in medical care and from people in institutions or schools - for example enteric infections, ringworm, scabies, etc.
- Brucellosis, leptospirosis and Q fever and other animal infections (zoonoses) caught from faecal matter, urine and materials found in animal handling facilities, or handling of animals and birds.
- Legionella infections, in a fine mist spray in the air, in and around the cooling units of air-conditioning plant, and in potting mixtures.
- Cytomegalovirus and rubella-causing antenatal infections, in schools and childcare settings.
- Tuberculosis
- Avian flu as yet this is not easily transferred from birds to humans, however there is a fear of a world-wide pandemic if this were to occur.

### **Bloodborne Pathogens**

- Human Immunodeficiency Virus (HIV)
  - HIV is the virus that leads to AIDS
  - HIV affects the body's immune system
  - HIV does not survive well outside the body
  - Estimated >1.1 million people living with HIV
  - Infected for life



Single, red-colored H9-T cell infected by numerous mustard-colored HIV particles which are attached to the cell's surface membrane. Source: NIAID.

### **Bloodborne Pathogens**

- Other bloodborne diseases
  - Caused by viruses or bacteria
  - Circulate in blood at some phase; capable of being transmitted



Zika Virus (left) and Ebola Virus (right) can be spread to workers through contaminated blood or infectious body fluids.



Source: CDC / C.Goldsmith

Source: CDC / F. Murphy

### **Bloodborne Pathogens**

- Examples
  - Hepatitis D (HDV)
  - Syphilis
  - Malaria
  - Babesiosis
  - Brucellosis
  - Leptospirosis
  - Arboviral Infections

- Relapsing fever
- Creutzfeldt-Jakob
   Disease
- Human T-Lymphotropic
   Virus Type I
- Viral Hemorrahagic Fever

### **Microorganisms and Disease**

Different micro-organisms can produce the same disease.

For example: meningitis (inflammation of the membranes that surround the brain and spinal cord) can be caused by viruses, bacteria, fungi, parasites, including:

- *Haemophilus influenzae* (bacteria)
- Neisseria meningitidis (bacteria)
- Escherichia coli (bacteria)
- Cryptococcus neoformans (yeast)
- *Morbillivirus* (virus)
- NSAIDS (drug therapy) ...more

### **Microorganisms and Disease**

# Multi-resistant organisms are significant in today's health care system.











### Common multi-resistant organisms include: MRSA and VRE

# What are the health effects of exposure to infectious diseases?

- The health effects of infectious disease can be very serious. Some are life threatening, some are not. Some are treatable, some are not. Some can lead to permanent damage, while others can be treated successfully. Many infectious diseases share symptoms such as fever, diarrhoea, muscular pains, and rashes. Certain infectious diseases can cause serious damage to (for example):
- The liver (eg hepatitis, Q fever)
- The lungs (eg tuberculosis, legionnaires disease)
- The eyes
- The kidneys (eg leptospirosis)
- The foetus (eg rubella, cytomegalovirus CMV)

#### Examples of occupationally acquired diseases, their sources and workers at risk.

From Hazards at Work - TUC Guide to Health and Safety

Source	Infection	Occupations at Risk	
		Directly	Incidentally
Isolation/study of pathogens	Various	Lab and health services workers	
Human tissue and body fluids	Hepatitis, tuberculosis, enteric infections, HIV infection, Children's diseases such as rubella, cytomegalovirus (CMV), chicken pox, mumps	Health care workers, accident and emergency service workers, children's services workers, mortuary workers, sex industry workers	teachers, institution staff, cleaners of all types, security staff, first aiders, people involved in accidents
Animals, animal products	Anthrax, avian flu, brucellosis, Q Fever, leptospirosis, chlamydial infections (psittacosis), salmonellosis, rabies, orf, toxoplasmosis, bat lyssavirus	Animal/bird handlers, wildlife officers, vets, abattoir workers, processors of animal products	Agricultural workers
Ticks	Lyme disease	Game keepers, shepherds	Timber workers
Soil	Salmonellosis, shigellosis, hepatitis A, leptospirosis Tetanus and other clostridial infections		Sewerage and water workers Agricultural and construction workers, gardeners
Contaminated aerosols	Legionnaires disease	Air conditioning maintenance workers	Officer workers, other maintenance workers





Direct Contact



Indirect Contact

### Droplet

# **Routes of Transmission**



Water, Food & Soil Borne



**Bodily Fluids** 

Airborne





Vectors



You're Invited.

**Contamination sources:** 

- Blood
- Other potentially infectious materials (OPIM)



- Human body fluids
- Any unfixed tissue or organ from human
- Cultures, culture mediums, or other solutions
- Experimental animal blood, tissues, or organs infected with HIV or HBV

Spread of bloodborne pathogens occurs through:

- Direct contact
- Indirect contact
- Respiratory transmission
- Vector-borne transmission



Source: NIOSH

### How exposure occurs:

- Needlesticks
- Cuts from other contaminated sharps
- Contact of mucous membrane or broken skin with contaminated blood or OPIM



Source: OSHA DTE

### Occupational exposures:

- Occupations at risk
  - First responders
  - Housekeeping personnel in some industries
  - Nurses and other healthcare personnel



Source: OSHA

- CDC estimates 5.6 million workers in healthcare and related occupations are at risk
- All occupational exposure to blood places workers at risk



The figure on left shows percent of occupational groups of healthcare workers exposed to blood or body fluids, with nurses (44%), physicians (28%), and technicians (15%) accounting for most of the incidents. The figure on the right shows healthcare work locations where exposures occurred, with inpatient facilities, such as the medical or surgical ward (20%) and intensive care unit (13%), and operating rooms (25%) accounting for the majority of exposure sites. Source: CDC (2008)

### **How Are We Protected?**

- Intact healthy skin and mucous membranes with beneficial bacteria and natural anti-microbial substances
- Anti-microbial substances in bodily fluids
- Airways (cilia)
- Digestive system (acids and alkalis)
- Immune system



### **GUIDELINES ON OCCUPATIONAL EXPOSURES**

TO HUMAN IMMUNODEFICIENCY VIRUS (HIV), HEPATITIS B VIRUS (HBV) AND HEPATITIS C VIRUS, AND RECOMMENDATIONS FOR POST EXPOSURE PROPHYLAXIS (PEP)

### What is the policy?

e.g. Guidelines on Occupational Exposures to HIV, Hepatitis B & Hepatitis C, and recommendations for post exposure prophylaxis (2007). Ministry of Health, Malaysia



UPATIONAL HEALTH UNIT STRY OF HEALTH MALAYSIA

Practical Guidelines for Infection Control in Health Care Facilities

#### e.g.

Practical Guidelines for Infection Control in Health Care Facilities. (2004). WHO WPRO, Manila.



World Health Organization Regional Office for Western Pacific, Manila Regional Office for South-East Asia, New Dehi

### Control measures to manage HCWs exposed to or infected with disease

- 1. Assessment of the incident:
  - The method of transmission Type of exposure
     Use of PPE
     Compliance with precautions
- 2. Assessment of the source of exposure:
  - Communicability Diagnosis of infection
- 3. Assessment of the HCW exposed to or infected with disease:
  - Determining immune status of HCW Diagnosis of infection

# Management of HCWs exposed to or infected with disease

- Post-exposure prophylaxis
- Treatment of infected HCW
- Counseling
- Work restriction/reassignment/return to work
- Tracing close contacts
- Assessing worker for fitness to work

### When Exposure Occurs

### Exposure incident:

 Specific eye, mouth, or other mucous membrane, non-intact skin, parenteral contact with blood or OPIM that results from the performance of an employee's duties.



Source: CDC

### When Exposure Occurs

- Immediate actions
  - Wash exposed area with soap and water
  - Flush splashes to nose, mouth, or skin with water
  - Irrigate eyes with water and saline



Source: OSHA

# **Blood & Bodily Fluid Exposure**

### ACTIONS

- Withdraw immediately from the case / procedure
- Attend to appropriate first aid:
- Needlestick/other sharp bleed, wash with soap and water
- Mucous membrane flush with normal saline or water
- Non-intact skin wash affected area with soap & water or antiseptic if no soap & water available
- Intact skin wash area well with soap & water
- Report the incident to the superior
- IDCo undertakes a risk assessment
  - Negligible risk probable follow-up with GP

 Low or high risk – will advise staff member to attend an ED to be admitted and assessed +/- bloods & post exposure treatment

### When Exposure Occurs

- Report exposure immediately
- Direct employee to healthcare professional for treatment

### When Exposure Occurs

- Confidential medical evaluation and follow-up
  - Route(s) of exposure and circumstances
  - Source individual
  - Collect/test blood for HBV and HIV serological status
  - Post exposure prophylaxis (when medically indicated)
  - Counseling
  - Evaluation

Employer's responsibilities:

- Perform hazard assessment
- Identify and provide appropriate PPE to employee at no cost
- Train employees on use and care
- Maintain/replace PPE
- Review, update, evaluate PPE program

Engineering and work practice controls:

- Safer medical devices
- Sharps disposal containers
- Hand hygiene







Source: OSHA DTE

Source: NIOSH

Source: NIOSH

### **Immunization Recommendations for Healthcare Workers**

BOX. Summary of main changes\* from 1997 Advisory Committee on Immunization Practices/Hospital (now Healthcare) Infection Control Practices Advisory Committee recommendations for immunization of health-care personnel (HCP)

#### Hepatitis **B**

• HCP and trainees in certain populations at high risk for chronic hepatitis B (e.g., those born in countries with high and intermediate endemicity) should be tested for HBsAg and anti-HBc/anti-HBs to determine infection status.

#### Influenza

- Emphasis that all HCP, not just those with direct patient care duties, should receive an annual influenza vaccination
- Comprehensive programs to increase vaccine coverage among HCP are needed; influenza vaccination rates among HCP within facilities should be measured and reported regularly.

#### Measles, mumps, and rubella (MMR)

- History of disease is no longer considered adequate presumptive evidence of measles or mumps immunity for HCP; laboratory confirmation of disease was added as acceptable presumptive evidence of immunity. History of disease has never been considered adequate evidence of immunity for rubella.
- The footnotes have been changed regarding the recommendations for personnel born before 1957 in routine and outbreak contexts. Specifically, guidance is provided for 2 doses of MMR for measles and mumps protection and 1 dose of MMR for rubella protection.

#### Pertussis

- HCP, regardless of age, should receive a single dose of Tdap as soon as feasible if they have not previously received Tdap.
- The minimal interval was removed, and Tdap can now be administered regardless of interval since the last tetanus or diphtheria-containing vaccine.
- Hospitals and ambulatory-care facilities should provide Tdap for HCP and use approaches that maximize vaccination rates.

#### Varicella

Criteria for evidence of immunity to varicella were established. For HCP they include

- written documentation with 2 doses of vaccine,
- · laboratory evidence of immunity or laboratory confirmation of disease,
- diagnosis of history of varicella disease by health-care provider, or diagnosis of history of herpes zoster by health-care provider.

#### Meningococcal

- HCP with anatomic or functional asplenia or persistent complement component deficiencies should now receive a 2-dose series of meningococcal conjugate vaccine. HCP with HIV infection who are vaccinated should also receive a 2 dose series.
- Those HCP who remain in groups at high risk are recommended to be revaccinated every 5 years.

Abbreviations: HBsAg = Hepatitis B surface antigen; anti-HBc = hepatitis B core antibody; anti-HBs = hepatitis B surface antibody; Tdap = tetanus toxoid, reduced diptheria toxoid and acellular pertussis vaccine; HIV = human immunodeficiency virus.

<sup>\*</sup> Updated recommendations made since publication of the 1997 summary of recommendations (CDC Immunization of health-care workers: recommendations of the Advisory Committee on Immunization Practices [ACIP] and the Hospital Infection Control Practices Advisory Committee [HICPAC]. MMWR 1997;46[No. RR-18]).

Hepatitis B vaccination:

- Offered to all potentially exposed employees
- Provided at no cost to employees (within 10 days to employees with occupational exposure)
- Declination form



Source: OSHA DTE

No vaccinations for:

- Hepatitis C
- HIV

### Housekeeping:

- Written schedule for cleaning and decontamination
- Picking up broken glass
  - Not picked up by hands
  - Mechanical means only



Source: OSHA DTE

Clean-up and decontamination:

- Wear protective gloves
- Use appropriate disinfectant
- Clean and disinfect contaminated equipment and work surfaces
- Thoroughly wash up immediately after exposure



Source: OSHA DTE

• Properly dispose of contaminated PPE, towels, rags, etc.

### **Aseptic Technique**

Protects the patient during invasive procedures.

- IV cannulation
- Chest decompression
- IM injections
- intubation, surgical airways
- wound dressings, indwelling catheters, PEG tubes

Know your landmarks, don't re-touch the area once clean

### **Cleaning Schedule for Fleet & Equipment**

### As required:

- Bodily fluid spills
- Visibly soiled areas
- After infectious patients
- Cleaning Schedule for Fleet & Equipment

### **Every Case:**

- Change Linen
- Check and clean visible soiling on stretcher and patient care area
- Dispose all single use items
- Process re-usable equipment

### Daily:

- Cleaning of all ambulance surfaces
- NB. This is currently being reviewed and is subject to change

### **Linen Handling**

- Used linen is an infection risk.
- Carefully remove used linen, folding the linen in on itself to prevent uniform contamination.
- Avoid shaking the linen.
- Dispose directly into an appropriate bag.
- Wet linen should be doublebagged.



### **Equipment Reprocessing**

### **SINGLE USE ONLY** must be discarded

	DEFINITION	EXAMPLES	CLEANING REQUIRED
Critical Items	introduced directly into the bloodstream or other normally sterile area of the body	STERILE AT TIME OF USE needles, surgical instruments	Single use or sterilisation
Semi-critical Items	items that may come into contact with mucous membranes but do not ordinarily penetrate body surfaces; contact with non- intact skin	laryngoscope blades, Magill forceps	Single use or clean thoroughly as soon as possible after using Steam sterilisation preferred, but a high level disinfecting procedure that destroys microorganisms, most fungal spores, tubercle bacilli & small non-lipid viruses may be used after meticulous physical cleaning to remove any visible contamination
Non-critical Items	Do not ordinarily touch the patient or touch only intact skin	splints, spine-boards, BP cuffs, stethoscopes, thermometers **if items comes into contact with non-intact skin, it becomes a semi- critical item for cleaning purposes**	Clean (scrub rather than soak) with soap & water, followed by an appropriate disinfectant

### **Environmental Cleaning**

Equipment cleaning is not sterilisation, it is removal of organic debris and many pathogens using detergent and water.

Cleaning sponges and cloths must be changed often.

Mops and buckets should be cleaned & stored dry.





- Regulated waste disposal:
  - Dispose of regulated waste in closable, leak-proof red or biohazard labeled bags or containers
  - Dispose of contaminated sharps in closable, punctureresistant, leak-proof, red or



Source: OSHA DTE

### Waste disposal

- According to colour coding and labelling
- Clinical waste, radioactive waste, general waste, cytotoxic waste.





### **Safe Handling of Sharps**

It is important that paramedics are aware of the inherent risk of injury associated with the use of sharps such as needles, scalpels and lancets.

When handling sharps the following principles apply:

- the person using the sharp is responsible for its safe disposal
- dispose of the sharp immediately following its use and at the point of care
- dispose of all sharps in designated puncture resistant containers that conform to relevant local standards
- dispose of sharps disposal containers when they are ¾ full or reach the specified fill line, seal appropriately and place in the clinical waste bin
- never pass sharps by hand between health care workers
- never recap used needles
- never bend, break or otherwise manipulate by hand a needle from a syringe
- never discard excess syringe fluid into mobile sharps container (potential for eye exposure)

### **Clinical Waste Disposal**



### **Clinical Waste Bins**



### Sharps Containers







### Training:

- Who
  - All employees with occupational exposure to blood or other potentially infectious material (OPIM)



Source: OSHA DTE

- Employees who are trained in first aid and CPR
- No cost; during working hours
- When
  - Initial assignment
  - Annually; or with new/modified tasks

### **Education of HCWs**

- Prevention and management of exposure to and infection with disease
- Universal and additional precautions
- Action recommended following potential exposure
- The consequences of non-compliance

# Education on: Standard precautions...

Vital when working in health care!

- Immunisations
- Hand hygiene
- Standard and additional precautions
- PPE
- Cleaning and reprocessing of equipment
- Waste disposal (medical, sharps, linen)
- Good personal hygiene (uniform)

### WASH WIPE COVER



don't infect another...

### RESOURCES



# Additional Precautions: Transmission Based Precautions

- In some cases, standard precautions are not enough to prevent infection transmission and...
- TRANSMISSION BASED PRECAUTIONS are required





# Additional Precautions: Transmission Based Precautions

Address the different ways in which organisms are transmitted:

- Airborne TB, measles, chickenpox
- Droplet influenza, rubella, pertussis, meningococcal, norovirus
- Contact multi-resistant organisms, gastroenteritis, clostridium difficile, hepatitis A

Should be tailored to the particular infection and mode of transmission (includes the potential addition of masks, and gowns)



### **Personal Hygiene**

• A clean uniform is important

• Respiratory hygiene and cough etiquette

# Hand Hygiene

- Good hand hygiene is THE single most important step in preventing healthcare acquired infections.
- Health care workers only perform hand hygiene 40% of the times when it is required (CDC, 2009).
- We have around 460,000,000,000 bacteria on our hands right now...

Soap & Water for visibly soiled hands and when available





Alcohol-based hand rubs at all other times

### **WHO 5 Moments for Hand Hygiene**



Other related issues:

- Finger nails & jewellery
- Wearing of gloves
  does NOT negate the
  need to perform
  hand hygiene before
  and after use

PPE examples:

- Gloves
- Masks
- Aprons/Gowns
- Face shields
- Mouthpieces
- Safety glasses
- Removal and dispose PPE appropriately



Source: NIOSH

- PPE selection
  - Safe design and construction
  - Fit comfortably
- Required PPE training
  - When it is necessary
  - What kind is necessary
  - Proper donning, adjusting, wearing, doffing
  - Limitations
  - Proper care, maintenance, useful life, disposal



Source: CDC

### The training program shall contain at a minimum the following elements:

1. An accessible copy of the regulatory text of this standard and an explanation of its contents;

2. A general explanation of the epidemiology and symptoms of bloodborne diseases;

3. An explanation of the modes of transmission of bloodborne pathogens;

4. n explanation of the employer's exposure control plan and the means by which the employee can obtain a copy of the written plan;

5. An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials;

6. An explanation of the use and limitations of methods that will prevent or reduce exposure including appropriate engineering controls, work practices, and personal protective equipment;

7. Information on the types, proper use, location, removal, handling, decontamination and disposal of personal protective equipment;

8. An explanation of the basis for selection of personal protective equipment;

9. Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine and vaccination will be offered free of charge;

10. Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials;

11 An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available;

12. Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident;

Explanation of the signs and labels and/or color coding required by paragraph (g)(1); and

A. An opportunity for interactive questions and answers with the person conducting the training session.

### **Tuberculosis SOPs for campus**



### Acknowledgements

- Dr Nurhuda Ismail (Infectious Disease Epidemiologist), UiTM Sungai Buloh & Coordinator COSHaW
- Elective Year 2 students, 2018
- COSHaW (Center for OSH and Wellbeing UiTM Selangor)
- SOSHCo (Sub committee Occuaptional Safety and Health) UiTM Sungai Buloh
- Infectious Disease Committee (ID) Faculty of Medicine, UiTM Sungai Buloh.

### THANK YOU

smunira@salam.uitm.edu.my

sitimu.yasin@gmail.com