Introduction to Airborne Infection Prevention and Control (IPC) – More than Just TB!

Paul A. Jensen, PhD, PE, CIH

23 June 2020

www.StopTB.org/wg/ett
Infection prevention and control of epidemic- and pandemic-prone acute respiratory infections in health care

WHO 2014
Guidelines on Core Components of Infection Prevention and Control Programmes at the National and Acute Health Care Facility Level

WHO 2016
Guidelines on Core Components of Infection Prevention and Control Programmes at the National and Acute Health Care Facility Level

MINIMUM REQUIREMENTS for infection prevention and control programmes

The starting point for implementing the World Health Organization core components of infection prevention and control programmes at the national and health care facility level
Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-Care Settings, 2005
Coronavirus disease (COVID-19) Pandemic

Public Advice
Country & technical guidance
Donate
Your questions

www.who.int
Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings

Update May 18, 2020
“It may seem a strange principle to enunciate as the very first requirement of a hospital is that it should do the sick no harm.”
What is Infection Prevention and Control (IPC)?
Prevention of Transmission

**Patient to:**
- Worker
- Patient
- Visitor
- Family

**Visitor to:**
- Worker
- Patient
- Visitor
- Family

**Worker to:**
- Worker
- Patient
- Visitor
- Family

**Family to:**
- Worker
- Patient
- Visitor
- Family
What is airborne IPC?

- Part of general infection prevention and control!
First, let's talk about the general IPC!

- Standard Precautions (formerly known as Universal Precautions)
- IPC precautions are based on the transmission method
  - Contact
  - Large droplet
  - Airborne (small droplets)
How do we reduce risk?
How do we reduce risk?
## Excess Occupational Risk

<table>
<thead>
<tr>
<th>Work Location</th>
<th>TB Incidence Rate Ratio Relative to General Population TB Incidence Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outpatient Facilities</td>
<td>4.2 – 11.6</td>
</tr>
<tr>
<td>General Medical Wards</td>
<td>3.9 – 36.6</td>
</tr>
<tr>
<td>Inpatient Facilities</td>
<td>14.6 – 99.0</td>
</tr>
<tr>
<td>Emergency Departments</td>
<td>26.6 – 31.9</td>
</tr>
<tr>
<td>Laboratories</td>
<td>42.5 – 135.3</td>
</tr>
</tbody>
</table>


Hierarchy of IPC

- **Administrative Controls** – Reduce risk of exposure, infection, and disease through policies and practices
- **Environmental Controls** – Reduce concentration of infectious bioaerosols in areas where contamination of air is likely
- **Personal Protective Equipment** – Protect personnel who must work in environments with contaminated air, surfaces, patients, specimens, etc.
Hierarchy of IPC

- Administrative and Managerial Controls
- Environmental Controls
- Personal Protective Equipment

- Worker
- Patient
- Facility
Hierarchy of IPC

- Administrative and Managerial Controls
- Environmental Controls
- Personal Protective Equipment

- Worker
- Patient
- Facility
Hierarchy of IPC

Administrative and Managerial Controls
Environmental Controls
Personal Protective Equipment

Worker
Patient
Facility

IPC Plan
Written IPC Plan

- Fundamental Principles of IPC
- Facility IPC Assessment
- Education and Training
- Surveillance and Reporting
- Standard Precautions
- Transmission-based Precautions
- Performance Improvement
- Emergency Management Planning
- Annual Evaluation
Hierarchy of IPC

Administrative and Managerial Controls
Environmental Controls
Personal Protective Equipment

Worker
Patient
Facility
Hierarchy of IPC

- Administrative and Managerial Controls
- Environmental Controls
- Personal Protective Equipment
- Worker
- Patient
- Facility
- Cough Etiquette
Source Control
Cough Etiquette and Respiratory Hygiene


Important Notice to All Patients

Cover Your Cough and Sneeze

Cover your nose and mouth when you cough or sneeze.

Wash your hands

Wash your hands with soap and warm water as often as possible.

Rinse your hands with soap, warm water and alcohol.

Epidemic and Pandemic Alert and Response

World Health Organization

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Hierarchy of IPC

Administrative and Managerial Controls
Environmental Controls
Personal Protective Equipment

Worker
Patient
Facility
Hierarchy of IPC

- Administrative and Managerial Controls
- Environmental Controls
- Personal Protective Equipment
- Worker
- Patient
- Facility
- Signage
Комната забора мокроты

Режим работы
7.00 – 7.15 – ЛТО-3
7.15 – 7.30 – ЛТО-1
7.30 – 7.45 – ЛХО
7.45 – 8.00 – ЛТО-2

Внимание!
Зона высокого риска заражения!
Пользуйтесь респиратором!
Cough More Than 20 Days

Please Reg. Room No. 1
Mambo unayopaswa kujua kuhusu COVID-19 ili kujilinda mwenyewe na wengine

Fahamu kuhlusa COVID-19
- Virusi vya Corona (COVID-19) ni ungonjwa unaoabashibwana na virusi ambavyo vinaweza kuerea kutoka kwa mtu mimoja hawi kwa mvungu.
- Virusi ambavyo hubabishwa COVID-19 ni virusi vipyi ambavyo vinaweza kuerea kutoka kwa mtu mimoja hawi kwa mvungu.

Zingatia Kuka mbaali na wengine
- Fanja ununuzi wa mboga na dawa, kuona daktari, na kuafya shughuli za kibinjika mtandao inapoweze kana.
- iliwa ni lazimu ujikishi huko wehe bibinafi, ka angalau futi 6 mbaali na wengine na ne vii viwenye vilaa ambavyo ni lazimu vishika.
- Poloja bidhaa za kuja nga na vyakula vya kuja, na upunguzo utamangano wako na wengine mu kadi iwezekana.

Fahumu jinsi COVID-19 husambazwa
- Unaweza kuambukizwa kutoka kwa vitone vidojo vya hewa ya kupumuza pale ambapo mtu aliye ambukizwa amekoa, kupiga chafla, au kuonega.
- Pia unaweza kuja kwa lushi kwa saku nuu kifaa ambacho kina virusi hivi; na kisha kushika mdomo wako, mapua au macho.

Zuia kusambaa kwa COVID-19
- Itesha mbaali na kwa ngina.
- Kaa nyumbani iliwa uzito ufanya iliwa unaendea huduma ya matibabu.
- Epuka kutumia usafiri za umma, kushiriki unasafiri, au teknisi.
- Szitewe na wato wengine na nyama wato wambani kwako.
- Hakuna matibabu mahusiano ya COVID-19, lakini unaweza kutafuta uoguzi wa kimatibabu zilizo kusaidia kupumuza dalili zako.
- Iliwa uhamisho msada wa kimatibabu, piga simu kabila.

Jilinde mwenyewe na wengine kutokana na COVID-19
- Kaa nyumbani ikawa ikiwa izaidi, iliwa unaweza avezekanayosha na uweke utamangamo wa karibu na watu wengine.
- Vaa itimbaa cha usoni ambacho kina fimikika mapaa na mdomo wako katika maeneo ya umma.
- Safisha na mbaali vywache saku ni zinaogozusa mara mbara mara.
- Osha mikono yako mbara kwa mbara kwa sabuni sa maji kwa angalau sekuende 20, au lume sanitsia yako mikono yenyi ambazo ambavyo ina angalau aslinia 60 ya alcohol.

Fahamu hatari zako za kuwa mgonjwa vibaya zaidi
- Kila mtu yako katika hatari za kupata COVID-19.
- Watu wazima wataktoroma na watu wao umwi wowote ambao wamele hali yenyi za kimatibabu zinaogozuma huenda wakawala katika hatari kuwa zaidi ya kuzidwe mu ngwagoni hu vibaya zaidi.

Reduce your risk of coronavirus infection

Clean hands with soap and water or alcohol-based hand rub

Cover nose and mouth when coughing with tissue or flexed elbow

Avoid close contact with anyone with cold or flu-like symptoms

Thoroughly cook meat and eggs

Avoid contact with wild or live farm animals

Ministry of Health & Wellness

Adapted from the World Health Organization

Protect Yourself From Coronavirus
#StayCoronavirusFree #KeepHealthy

cdc.gov/coronavirus

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TB AND COVID-19

#ItsTimeToEndTB  #FightCOVID19
GUIDELINES for THE PREVENTION of TUBERCULOSIS IN HEALTH CARE FACILITIES IN RESOURCE-LIMITED SETTINGS

WHO 1999

Tuberculosis Infection-Control in the Era of Expanding HIV Care and Treatment

WHO 2007
# Five Steps for Patient Management to Prevent Transmission of TB in HIV Care Settings

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Screen</td>
<td>Early recognition of patients with suspected or confirmed TB disease is the first step in the protocol. It can be achieved by assigning a staff member to screen patients for prolonged duration of cough immediately after they arrive at the facility. Patients with cough of more than two weeks duration, or who report being under investigation or treatment for TB*, should not be allowed to wait in the line with other patients to enter, register, or get a card. Instead, they should be managed as outlined below.</td>
</tr>
<tr>
<td>2</td>
<td>Educate</td>
<td>Instructing the above mentioned persons identified through screening in cough hygiene. This includes instructing them to cover their noses and mouths when coughing or sneezing, and when possible providing face masks or tissues to assist them in covering their mouths.</td>
</tr>
<tr>
<td>3</td>
<td>Separate</td>
<td>Patients who are identified as TB suspects or cases by the screening questions must be separated from other patients and requested to wait in a separate well-ventilated waiting area, and provided with a surgical mask or tissues to cover their mouths and noses while waiting.</td>
</tr>
<tr>
<td>4</td>
<td>Provide HIV Services</td>
<td>Triaging symptomatic patients to the front of the line for the services they are seeking (e.g. voluntary HIV counseling and testing, medication refills), to quickly provide care and reduce the amount of time that others are exposed to them is recommended. In an integrated service delivery setting, if possible, the patient should receive the HIV services they are accessing before the TB investigation.</td>
</tr>
<tr>
<td>5</td>
<td>Investigate for TB or Refer</td>
<td>TB diagnostic tests should be done on site or, if not available onsite, the facility should have an established link with a TB diagnostic center to which symptomatic patients can be referred. Also, each facility should have a linkage with a TB treatment center to which those who are diagnosed with TB can be referred.</td>
</tr>
</tbody>
</table>

*WHO 2007*
FAST
A Tuberculosis Infection Control Strategy

FIRST EDITION: MARCH 2013
This handbook is made possible by the support of the American people through the United States Agency for International Development (USAID). The contents of this handbook are the sole responsibility of TB CARE II and do not necessarily reflect the views of USAID or the United States Government.

TB CARE 2011
• Find cases Actively
• Separate
• Treat effectively
Test, Trace and Treat:

Partnership to Accelerate COVID-19 Testing (PACT) in Africa

TEST
to diagnose cases

TRACE
to identify cases and their contacts

TREAT
to provide supportive care in symptomatic cases

Africa CDC 2020
Hierarchy of IPC

Administrative and Managerial Controls
Environmental Controls
Personal Protective Equipment

Worker
Patient
Facility

Education
Medidas de Control Ambiental:
Irradiación Germicida Ultravioleta (UVGI)
Школьнику о туберкулезе

Как передаётся туберкулёз?

Туберкулёз - это болезнь, за которую передаются через воздух и через язык. Человек может заразиться туберкулёзом, если привыкать, что тёплые волчья или другие животные, а также человек, который болен туберкулёзом, посуду и предметы, которые он касался. В случае передачи туберкулёза через воздух, человек может передать его другому человеку, если он соприкасается с ним, а также через язык. В случае передачи через язык, человек может передать его другому человеку, если он соприкасается с ним, а также через язык. В случае передачи через язык, человек может передать его другому человеку, если он соприкасается с ним, а также через язык.

Что нужно сделать, чтобы не заняться туберкулёзом?

Придерживайтесь чистоты, чаще варите, чаще ешьте мясо. Часто варите рис, варите, чаще ешьте мясо, чаще ешьте рыбу и чаще ешьте, чтобы поддерживать здоровье и слизистые. К тому же, если вы часто едите мясо, вам больше не придется передавать туберкулёз. Если вы часто едите, то вы не будете передавать туберкулёз. Если вы часто едите, то вы не будете передавать туберкулёз. Если вы часто едите, то вы не будете передавать туберкулёз. Если вы часто едите, то вы не будете передавать туберкулёз. Если вы часто едите, то вы не будете передавать туберкулёз.

Школьники, помните, туберкулёз излечим!

Беда чужой не бывает!

Туберкулез - болезнь социальных сумерек.

Детское отделение РПТД.
Precaução Respiratória por Aerosol

A disseminação aérea ocorre por via respiratória, através de aerosol disperso pelo ar.

- **Quarto privativo** - manter a porta fechada e a janela aberta.
- **Máscara:** filtro especial (vestir antes de entrar no quarto).
- **Transporte:** o paciente deve usar máscara cirúrgica.

HUCFF/UFRJ
Coordenação de Controle de Infecção Hospitalar

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Cough Hygiene

Cover your mouth and nose when you cough. There are three ways of doing this:

Use your upper arm  
Use a tissue  
Use a surgical mask

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 with soap and water or clean with alcohol-based hand cleaner.

If you have any more questions – talk to people at your closest clinic.

Stop the spread of germs that make you and others sick!
Cough Hygiene

Cover your mouth and nose when you cough. There are three ways of doing this:

1. Use your upper arm
2. Use a tissue
3. Use a surgical mask

If you have any more questions – talk to people at your closest clinic.

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.

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Clean your Hands

after coughing or sneezing.

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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 with soap and water or clean with alcohol-based hand cleaner.
Hierarchy of IPC

Administrative and Managerial Controls
Environmental Controls
Personal Protective Equipment
Worker
Patient
Facility
Environmental Controls
What should be thought of first?

Risk !!!

Admin Controls !!!!
Environmental Controls
What should be thought of next?

Patient, HCW, & Specimen Flow !!!

Admin Controls !!!
Environmental Controls

Plan your work

Work your plan
Hierarchy of IPC

Administrative and Managerial Controls
Environmental Controls
Personal Protective Equipment

Worker
Patient
Facility

Positive Pressures
Is this room positive pressure or negative pressure?
Hierarchy of IPC

- Administrative and Managerial Controls
- Environmental Controls
- Personal Protective Equipment
- Worker
- Patient
- Facility
Hierarchy of IPC

Administrative and Managerial Controls
Environmental Controls
Personal Protective Equipment

Worker
Patient
Facility

Negative Pressure
Room Air Cleaners
Hierarchy of IPC

- Administrative and Managerial Controls
- Environmental Controls
- Personal Protective Equipment
- Worker
- Patient
- Facility
Hierarchy of IPC

- Administrative and Managerial Controls
- Environmental Controls
- Personal Protective Equipment

Worker
Patient
Facility
Doors
Hierarchy of IPC

Administrative and Managerial Controls
Environmental Controls
Personal Protective Equipment
Worker
Patient
Facility
Hierarchy of IPC

- Administrative and Managerial Controls
- Environmental Controls
- Personal Protective Equipment
- Respirator

Worker
Patient
Facility
Bronchoscopy
Use Personal Protective Equipment (PPE) When Caring for Patients with Confirmed or Suspected COVID-19

Before caring for patients with confirmed or suspected COVID-19, healthcare personnel (HCP) must:

- Receive comprehensive training on when and what PPE is necessary, how to don (put on) and doff (take off) PPE, limitations of PPE, and proper care, maintenance, and disposal of PPE.
- Demonstrate competency in performing appropriate infection control practices and procedures.

Remember:

- PPE must be donned correctly before entering the patient area (e.g., isolation room, unit if cohorting).
- PPE must remain in place and be worn correctly for the duration of work in potentially contaminated areas. PPE should not be adjusted (e.g., retying gown, adjusting respirator/facemask) during patient care.
- PPE must be removed slowly and deliberately in a sequence that prevents self-contamination. A step-by-step process should be developed and used during training and patient care.

Preferred PPE – Use N95 or Higher Respirator

- Face shield or goggles
- N95 or higher respiratory when equipment is not available, use the best available alternative, like a facemask
- Isolation gown
- One pair of clean, non-sterile gloves

Acceptable Alternative PPE – Use Facemask

- Face shield or goggles
- Isolation gown
- One pair of clean, non-sterile gloves
- Facemask
- N95 or higher respirator if available but facemasks are an acceptable alternative.
Donning (putting on the gear):
More than one donning method may be acceptable. Training and practice using your healthcare facility’s procedure is critical. Below is one example of donning.

1. Identify and gather the proper PPE to don. Ensure choice of gown size is correct (based on training).
2. Perform hand hygiene using hand sanitizer.
3. Put on isolation gown. Tie all of the ties on the gown. Assistance may be needed by another HCP.
4. Put on NIOSH-approved N95 filtering facepiece respirator or higher (use a facemask if a respirator is not available).
   If the respirator has a respirator, it should be fitted to the face with both hands, not bent or twisted. Do not pinch the nosepiece with one hand. Respirator/facemask should be extended under chin. Both your mouth and nose should be protected. Do not wear respirator/facemask under your chin or store in a pocket between patients.
   ⊳ Respirator: Respirator straps should be placed on crown of head (top strap) and base of neck (bottom strap). Perform a nose seal check each time you put on the respirator.
   ⊳ Facemask: Mask ties should be secured on crown of head (top tie) and base of neck (bottom tie). If mask has loops, hook them appropriately around your ears.
5. Put on face shield or goggles. When wearing an N95 respirator or half facepiece elastomeric respirator, select the proper eye protection to ensure that the respirator does not interfere with the correct positioning of the eye protection, and the eye protection does not affect the fit or seal of the respirator. Face shields provide full face coverage. Goggles also provide excellent protection for eyes, but fogging is common.
6. Put on gloves. Gloves should cover the cuff (sleeve) of gown.
7. HCP may now enter patient room.

Deffing (taking off the gear):
More than one deffing method may be acceptable. Training and practice using your healthcare facility’s procedure is critical. Below is one example of deffing.

1. Remove gloves. Ensure glove removal does not cause additional contamination of hands. Gloves can be removed using more than one technique (e.g., glove-to-glove or bird beak).
2. Remove gown. Untie all ties (or unbutton all buttons). Some gown ties can be broken rather than untied. Do so in gentle manner, avoiding a forceful movement. Reach up to the shoulders and carefully pull gown down and away from the body. Rolling the gown down is an acceptable approach. Dispose in trash receptacle. *
3. HCP may now exit patient room.
4. Perform hand hygiene.
5. Remove face shield or goggles. Carefully remove face shield or goggles by grabbing the strap and pulling upwards and away from head. Do not touch the front of the face shield or goggles.
6. Remove and discard respirator (or facemask if used instead of respirator). * Do not touch the front of the respirator or facemask.
   ⊳ Respirator: Remove the bottom strap by touching only the strap and bring it carefully over the head. Grasp the top strap and bring it carefully over the head, and then pull the respirator away from the face without touching the front of the respirator.
   ⊳ Facemask: Carefully untie (or unbutton from the ears) and pull away from face without touching the front.
7. Perform hand hygiene after removing the respirator/facemask and before putting it on again if your workplace is practicing reuse.

*Facilities implementing reuse or extended use of PPE will need to adjust their donning and deffing procedures to accommodate these practices.

www.cdc.gov/coronavirus
Hierarchy of IPC

Administrative and Managerial Controls
Environmental Controls
Personal Protective Equipment

Worker
Patient
Facility
How to Make a Mask

Tutorial: How to Sew a Face Mask for Hospitals | Coronavirus COVID-19
Hierarchy of IPC

Administrative and Managerial Controls
Environmental Controls
Personal Protective Equipment

Respiratory Protection Program
Respirator
Surgical Mask
Hierarchy of IPC

- Administrative and Managerial Controls
- Environmental Controls
- Personal Protective Equipment
- Education

Worker
Patient
Facility
## Prioritization Table for IPC Assessment & Intervention

<table>
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<tr>
<th>IC Hierarchy</th>
<th>Priority</th>
<th>Description</th>
<th>How to implement?</th>
<th>When to implement?</th>
<th>Budget (short- and long-term)</th>
<th>What obstacles might you face?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative Controls</td>
<td></td>
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<tr>
<td>Environmental Controls</td>
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<tr>
<td>Respiratory Protection</td>
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</table>
IPC is a Continuous Process

Start

Plan
Implement
Evaluate
Assess
Engage
Hierarchy of IPC

- Administrative and Managerial Controls
- Environmental Controls
- Personal Protective Equipment
- Worker
- Patient
- Facility
Hierarchy of IPC

Package of Measures!!!
Plan for sustainability!!!
This presentation was made possible through the support of Stop TB Partnership’s End TB Transmission Initiative (ETTi) Working Group provided by the United States Agency for International Development (USAID), under the terms of cooperative agreement number STBP/USAID/GSA/2018-04.
Future Webinars

- Administrative Controls
  - Overview of administrative controls
  - Airborne IPC – Implementation planning and development of an action plan
  - Implementation of administrative controls
  - Designing layout to optimize airborne IPC
• **Environmental Controls**
  • Overview of environmental controls
  • Ventilation for airborne IPC: Natural and mechanical ventilation
  • Practical and sustainable ventilation solutions
  • Room air cleaners for airborne IPC
  • Commissioning of mechanical and natural ventilation systems (from concept through acceptance testing)
  • How to test Ventilation (mechanical, natural, hybrid) systems
  • Overview of UVGI/GUV systems
  • Practical and sustainable UVGI/GUV systems
  • Commissioning of UVGI/GUV systems (from concept through acceptance testing)
  • How to test UVGI systems (including instruments)
  • Supply-chain management of environmental controls
• Personal Protective Equipment
  • Respiratory protection for TB, COVID-19, et al.
  • Respirator fit testing (including how to make a fit test kit)
  • Re-use of respirators, including decontamination
  • Supply-chain management of Respirators & masks
Summary

- Work hard!
- Play hard!
- Promote good public health!
- Be safe!
- Enjoy life!