Updates on the Epidemiology and transmission of COVID-19

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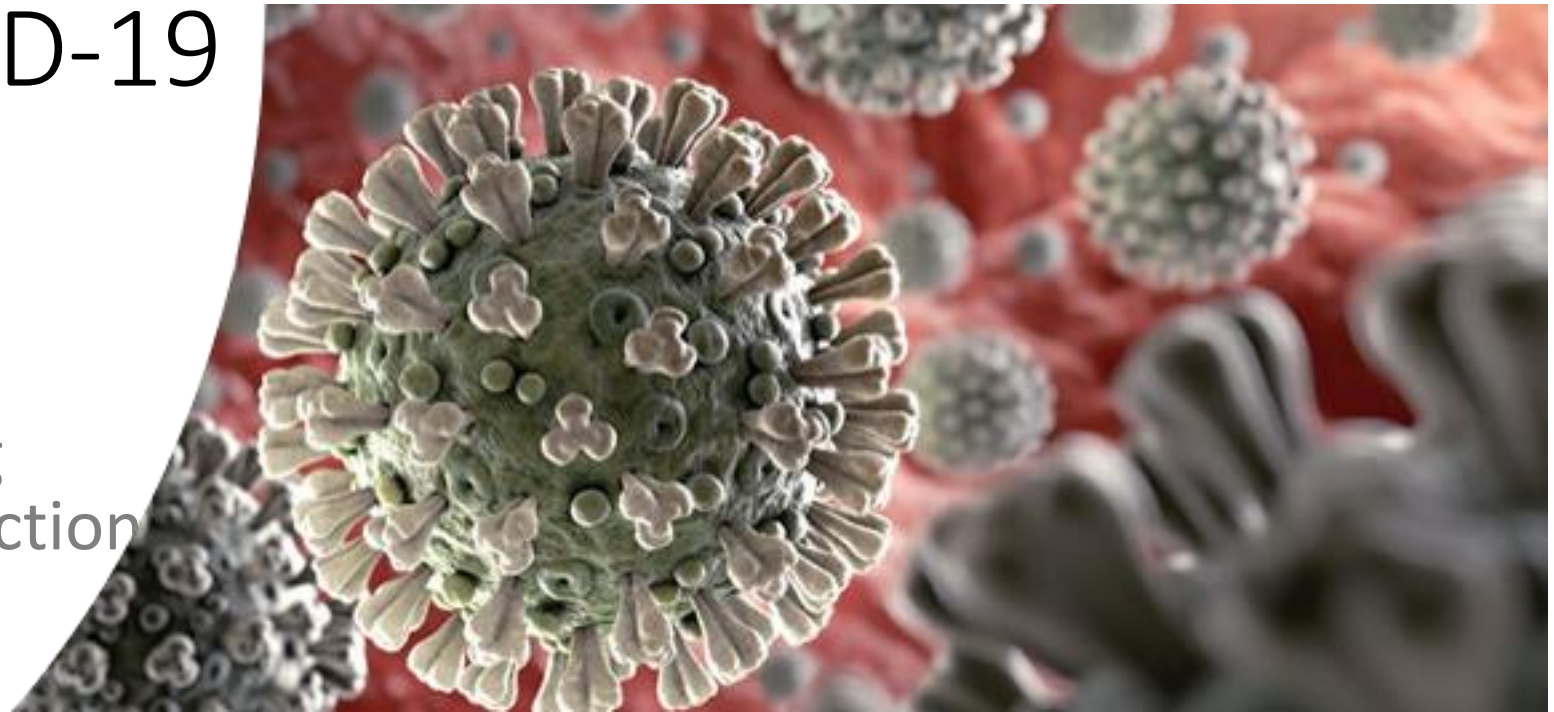
Chair ICAN
3rd June 2020

Preventing and Controlling Transmission of COVID-19 Infection



Objectives

CHAIN OF TRANSMISSION

UPDATES ON TRANSMISSION DYNAMICS, CLINICAL FEATURES

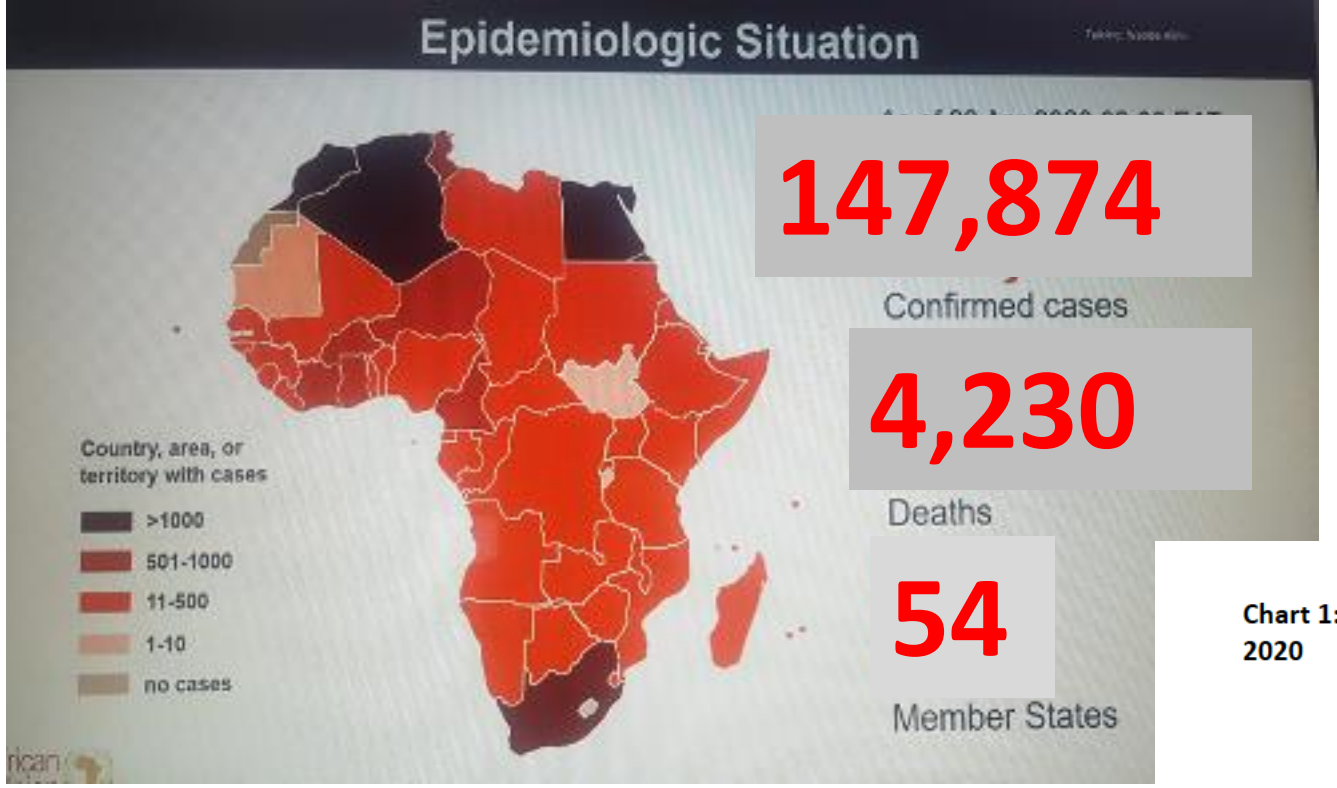
UPDATES ON PREVENTION STRATEGIES

Epidemic is evolving rapidly…..

December 31, 2019	• WHO alerted about a cluster of pneumonia cases of unknown aetiology in Wuhan City, China
January 9, 2020	• Chinese CDC identified a novel Corona Virus from respiratory secretions of patients
January 30, 2020	• WHO declares Public Health Emergency of International Concern
February 11, 2020	• Disease named **COVID-19.** Virus named **SARS-2-CoV2**
February 14, 2020	• Africa records first case of COVID 19 in Egypt
March 11, 2020	• **COVID-19 declared a Pandemic**
April 15, 2020	• 1st webinar - Global 2,047,731, 133,000-dead, 547,092 – recovered
May 31, 2020	• Global: 6,057,853 cases, 371,166 -dead 2,640,000 –recovered

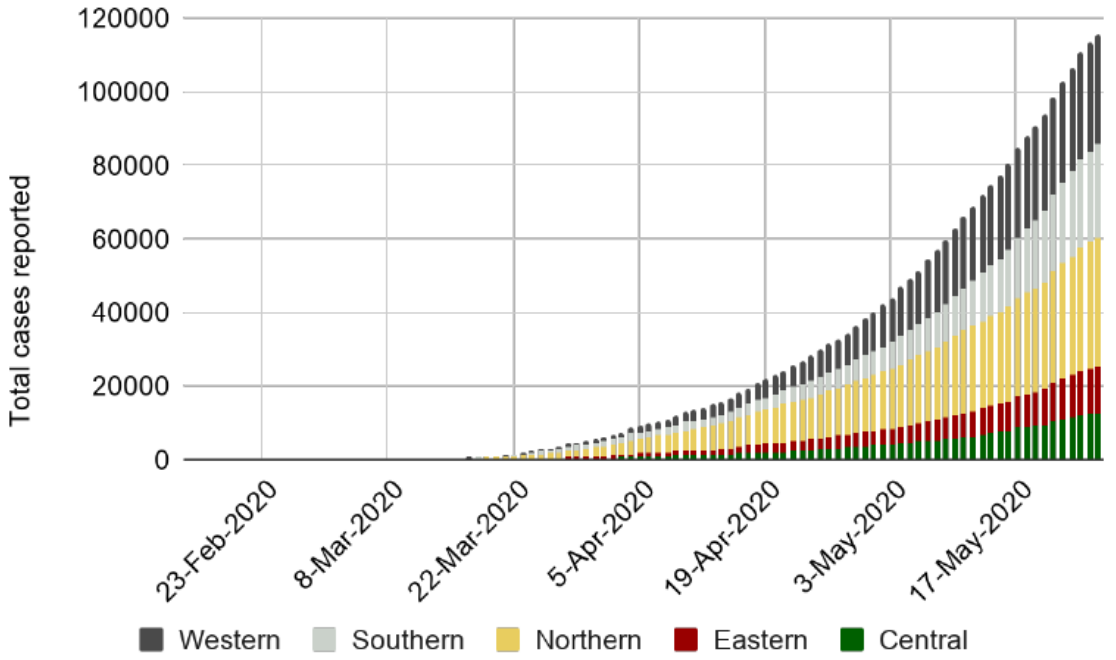
Situation in Africa

Soft landfall?

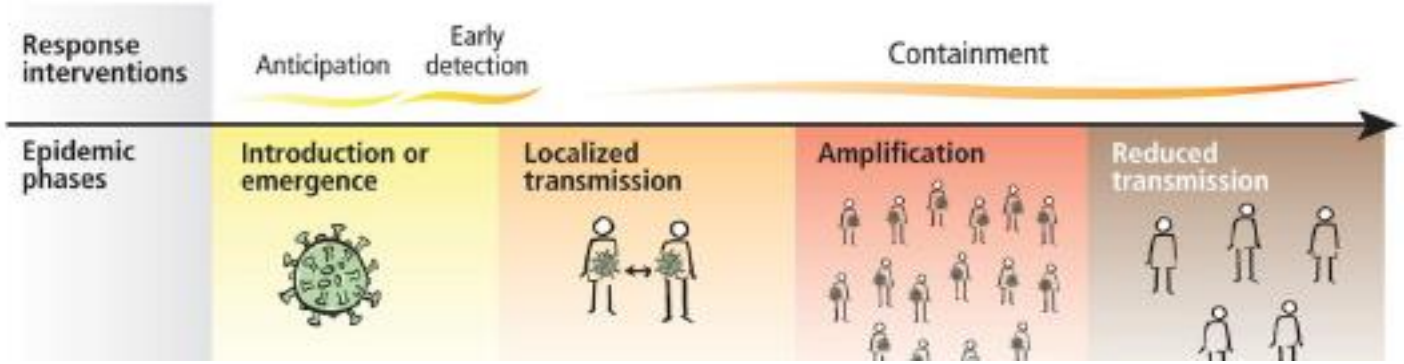


Account for 2% of cases globally
Case fatality rate 3%

Chart 1: Cumulative number of confirmed COVID-19 cases reported by region, 23 Feb - 26 May 2020

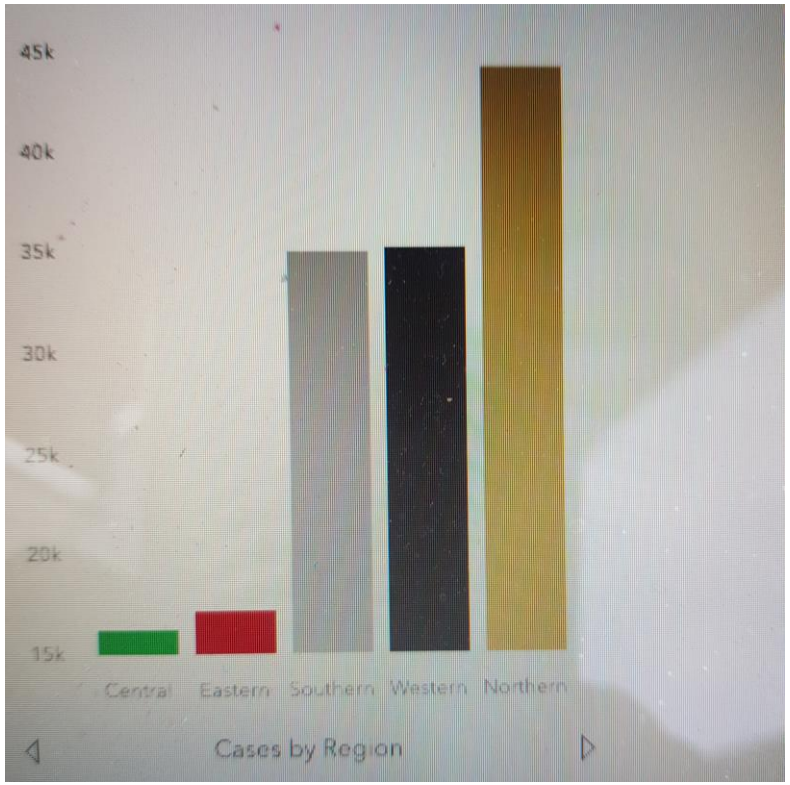


Countries are at different stages of the epidemic



On April 15

- 15,284 cases
- 816 deaths (CFR: 5%
- 52 African countries.

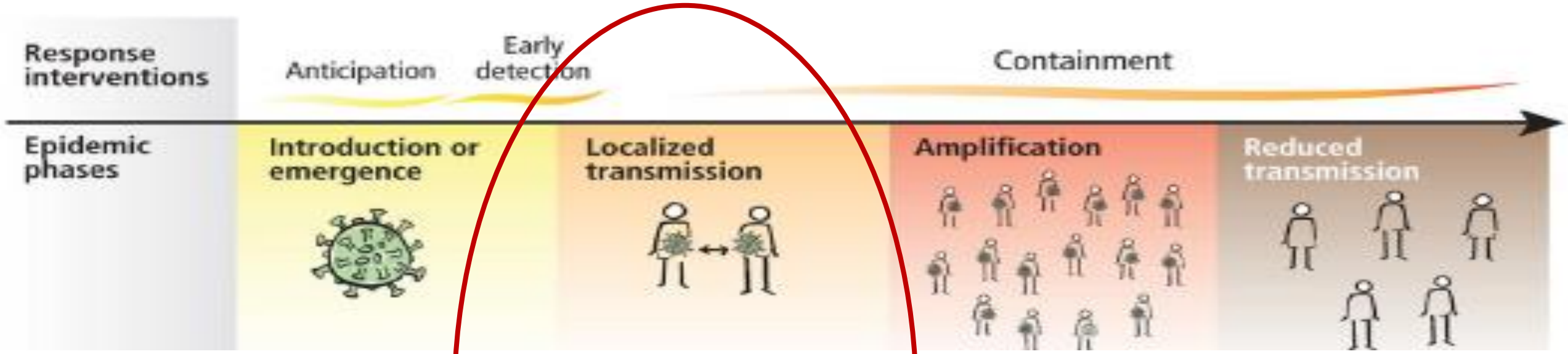


Number of cases in Africa 147, 874

Number of cases per Region - 31st May

- **16,241 – Central**
- **17,446 - Eastern**
- **34,921 – Southern**
- **35,298 - Western**
- **43,968 - Northern**

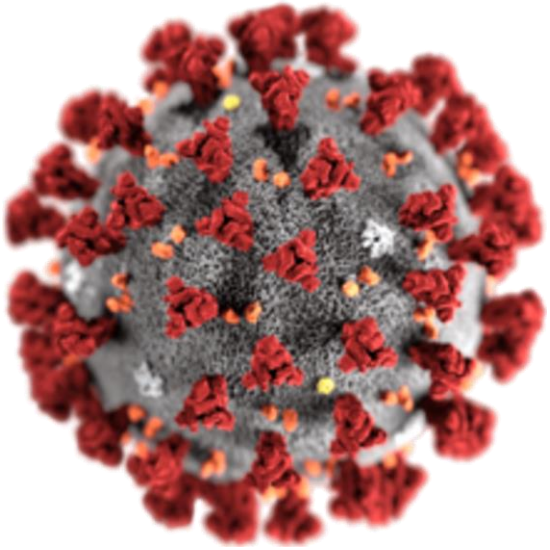
Various levels of response to COVID -19



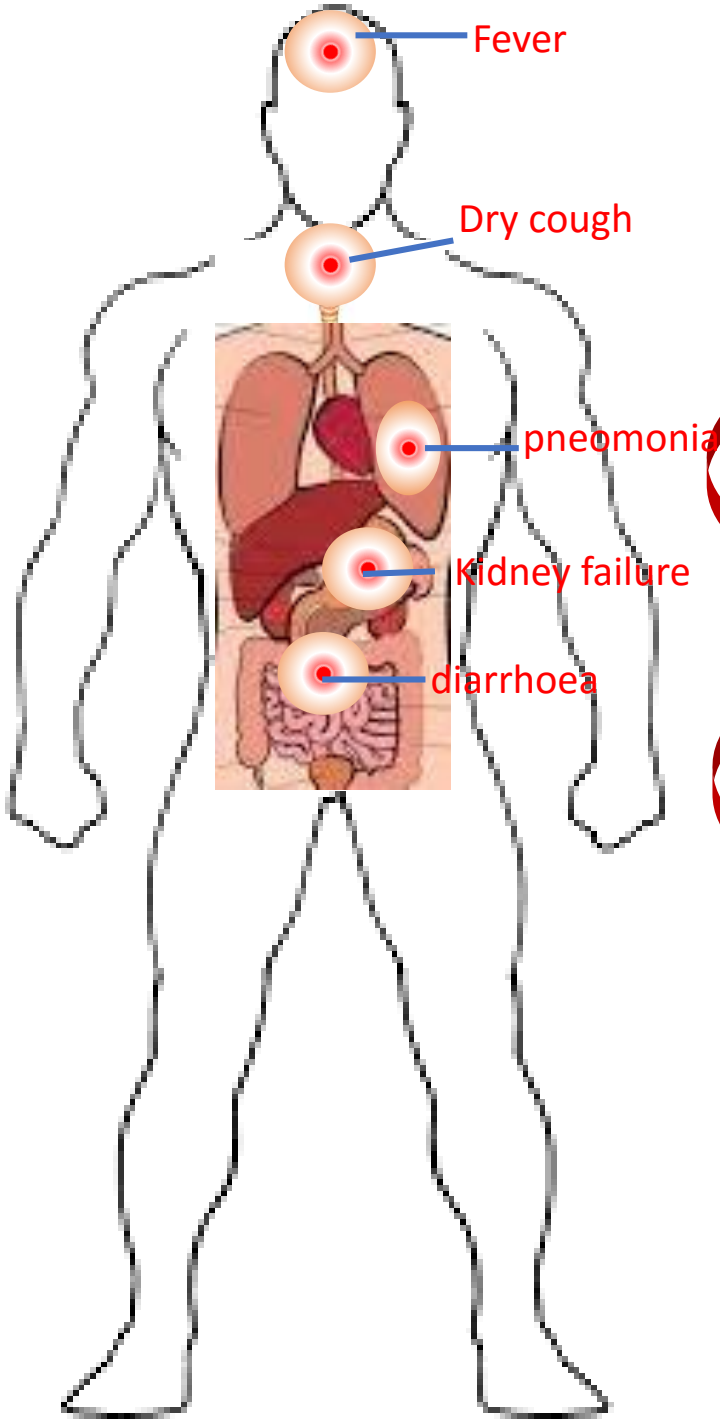
Isolation of positives in Health facilities
Quarantine
Intense Contact tracing
Testing
Social distancing
Cough etiquette
Hand hygiene

Isolation of positives in community and Home
Quarantine
Intense Contact tracing
Testing
Lock down
Social distancing
Universal Masking

The Virus



- Respiratory borne infection
- Incubation period: Estimated 1- 12.5 days median 5-6 days
- RNA Virus
- Corona similar to MERS and SARS CoV2
- Zoonotic in origin
- Origin unconfirmed – Bats?
- Efficient human to human transfer
- 80% asymptomatic/mild will recover without treatment
- 15% - moderate-severe
- 5% critically ill – life threatening



Clinical signs and symptoms

Early/mild disease

Fever >38°C and headache, Dry cough

General malaise, fatigue, shortness of breath, Diarrhoea, nausea & vomiting, Loss of smell and Loss of Taste

Cytokine storm: Severe acute respiratory syndrome/ pneumonia / Bronchitis /kidney failure/Death

Severe disease may require hospitalisation

Most infections do not require hospitalization

No perfect treatment but Remdesivir has a positive impact on severe cases

Laboratory Testing

- No commercially available antibody test yet
- Nasopharyngeal swabs, Sputum.
- Can be identified by real-time PCR
- The genome sequence is available on the World Health Organization website for reference.
- Infectious Viral particles not detected in Urine blood and stool
- Viral RNA detected in stool

https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance

Wölfel *et al. Nature*(2020). https://doi.org/10.1038/s41586-020-2196-x

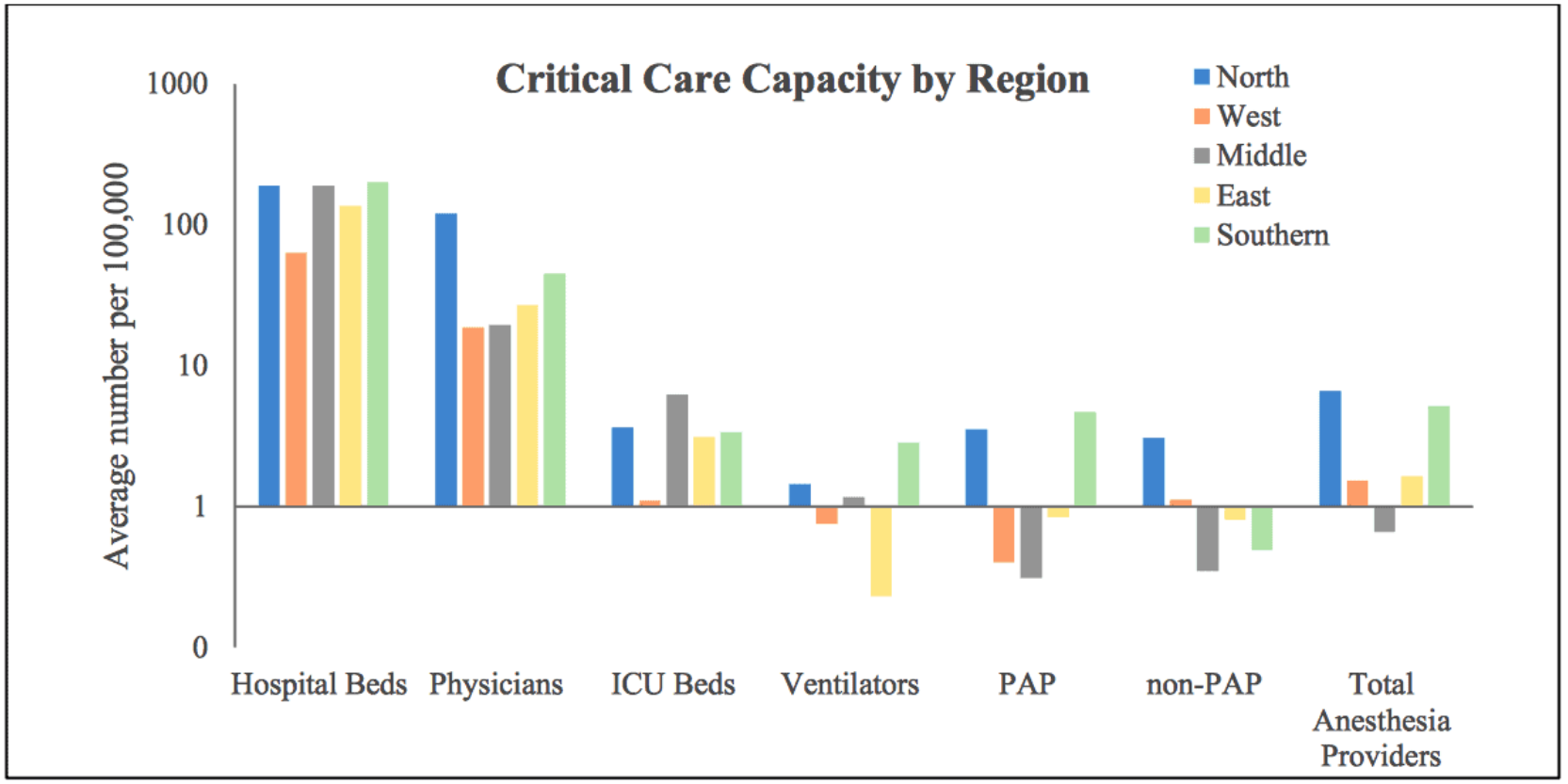
Recognising the patient with Covid-19 Case Definitions

- A. A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath), AND A history of travel to or residence in a location reporting community transmission of COVID-19 disease during the 14 days prior to symptom onset;

- B. A patient with any acute respiratory illness AND having been in contact with a confirmed or probable COVID-19 case in the last 14 days prior to symptom onset;

- C. A patient with severe acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath; AND requiring hospitalization) AND in the absence of an alternative diagnosis that fully explains the clinical presentation.

Why Infection Prevention and Control is important



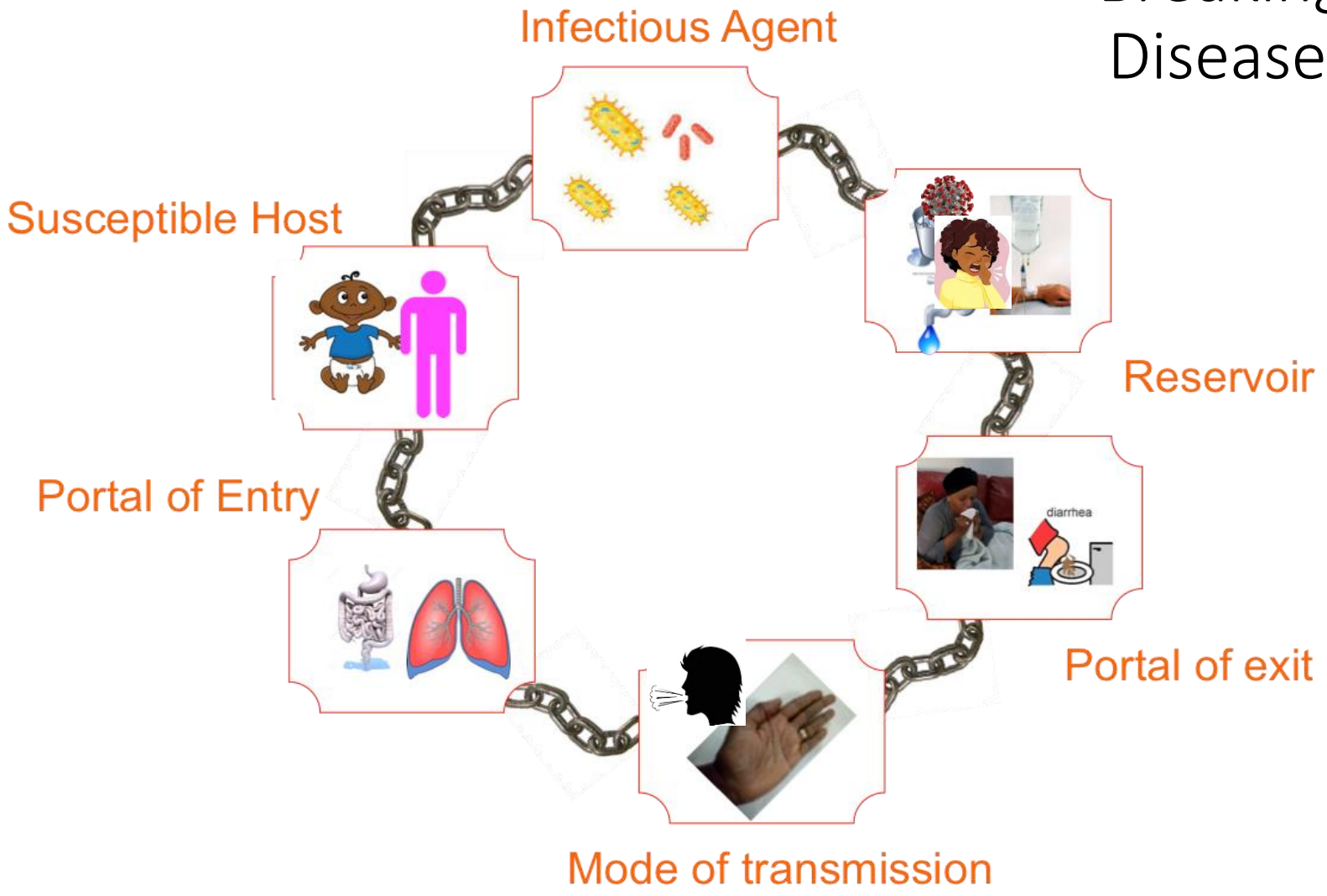
https://cddep.org/covid-19/covid-19-in-africa/critical-care-capacity-in-africa/

What is infection prevention and control?

- Infection prevention and control is:
  - a scientific approach with
  - practical solutions designed to prevent harm, caused by infections, to patients and health care workers
  - grounded in principles of infectious disease, epidemiology, social science and health system strengthening, and
  - rooted in patient safety and health service quality

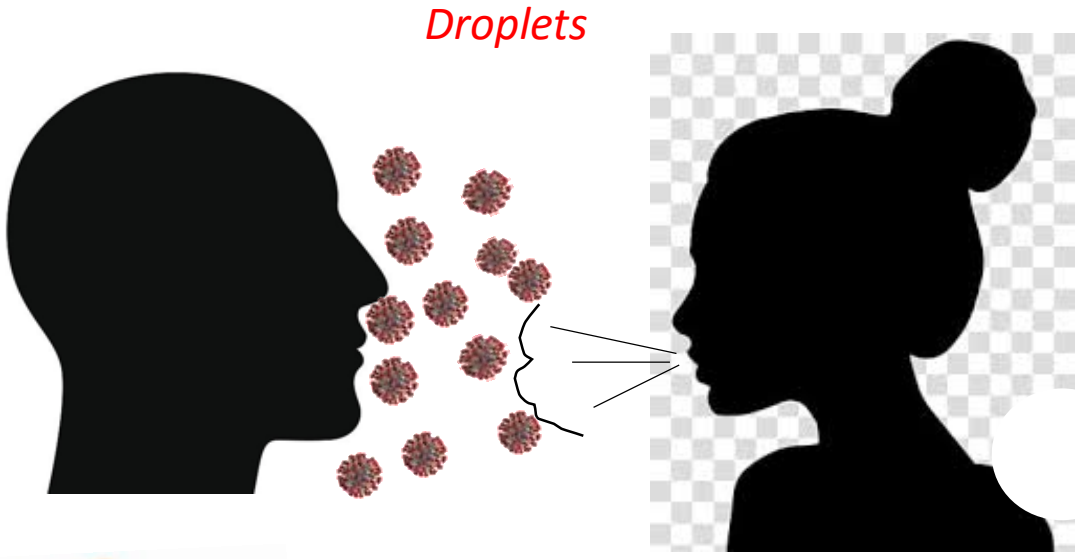
- Source: WHO Infection Prevention and control web pages;; https://www.who.int/gpsc/ipc/en/

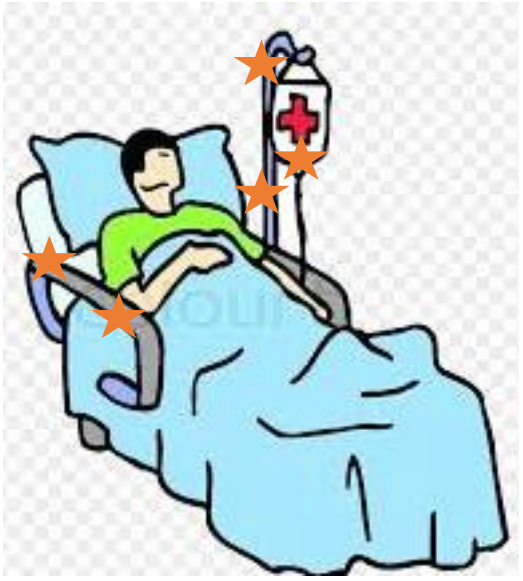
Breaking The Chain of Disease Transmission



Leaves Host → Reach a susceptible host → Enter through the susceptible part of the body → Survive the immune system → Multiply and cause an infection → Leaves Host

How does this virus cause infection?





- Virus Transmitted through
- Inhalation of droplets expelled from infected persons respiratory tract through coughing, sneezing in close proximity
- Contact with patient respiratory secretions
  - Via hands through contact with surfaces contaminated with patient respiratory secretions
- Airborne
  - When aerosol generating procedures are performed

Transmission facilitated by

- **Close contacts**
- **Crowds**
- **Closed spaces**

Transmission facilitated by

- **Close contacts:** keep a minimum distance of 3ft from others
- **Crowds:** Avoid crowds.
- **Closed spaces:** rooms with people in it allow for a concentration of droplets in the air.

How droplets spread

- Coughing
- Sneezing
- Talking
- singing

Number and size of organisms expelled

- Number of droplets expelled during:

  Talking - 0-200

  Coughing - 0-3,500

  Sneezing - 4,500-1,000,000

- Spread of droplets affected by air velocity or force:

  Sneeze 50 to 300m/s

  Sneeze ~75% of droplets are 10µ

Fate of droplets in the environment

- **Large droplets** (5 - 10microns)
  - fall to the ground or other horizontal surfaces quickly
  - Large droplets can begin to evaporate, to form tiny droplet nuclei

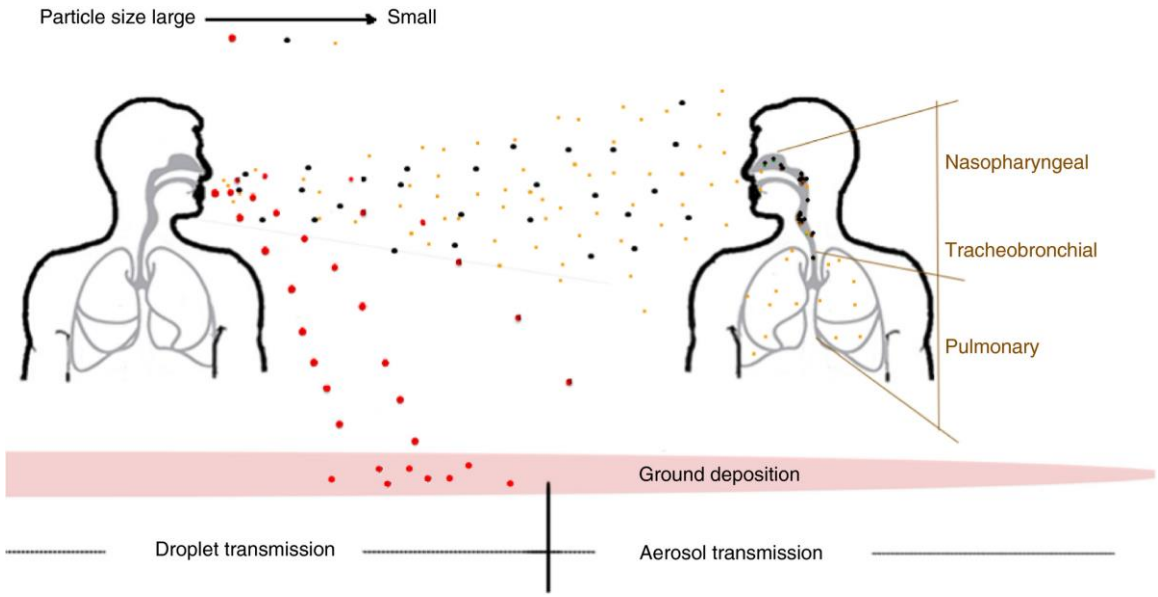
- Small droplet nuclei (<5 microns)
  - **can remain suspended in the air for long periods of time**

Transmission via the respiratory route

- Respiratory pathogens released when an infected person **sneezes, coughs, or talks are** inhaled by a second person

- **Large particles** land in the upper respiratory tract
  - Outcome: they cause infection or are swallowed

- **Smaller particles** land in trachea, bronchi or bronchioles and alveoli
  - Outcome: they cause infection or are brought to the upper respiratory tract by ciliated epithelium and then swallowed or are removed by macrophages



Pan et al.j appl. Biology 2019; 127:1596-1611 https://sfamjournals.onlinelibrary.wiley.com/toc/13652672/2019/127/6

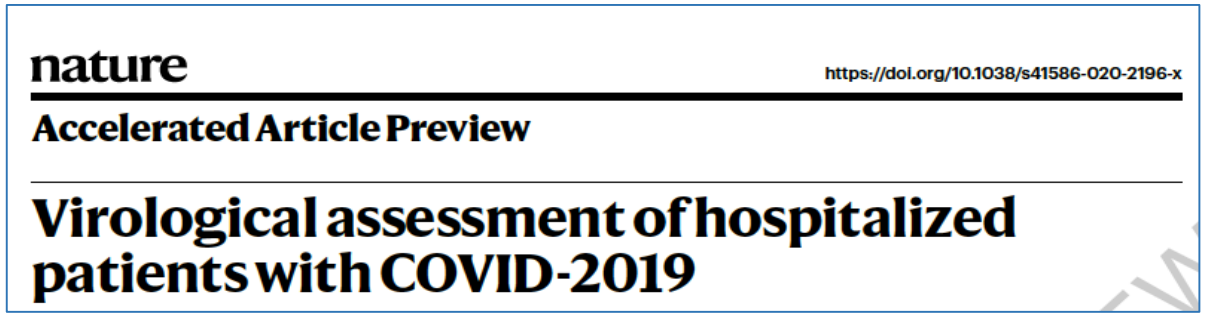
Transmission routes of Common infections

- **Contact:**
  - Direct: MDROs (*Staph aureus* (including MRSA), Enterococcus (VRE), and *E. coli*; STDs –*N.gonorrhea, C. Trachomatis*
  - Indirect: *Clostridium difficile*, norovirus, MDRO: such as *Staph aureus* (also MRSA), Enterococcus (VRE), and *E. coli*;
- **Droplet:**
  - Pertussis; meningococcus; seasonal, pandemic, and Avian influenza; Group A Streptococcus (1st 12 hours after prescription); adenovirus, **Covid19**
- **Airborne:**
  - Pulmonary TB; measles; varicella; and aerosol-generating procedures in suspected TB, influenza, SARS or COVID 19 patients

Aerosol generating Procedures

- Open suctioning of respiratory tract
- Intubation
- Bronchoscopy
- Cardiopulmonary resuscitation

Where is the virus Found? More Evidence.



- Active virus replication in upper respiratory tract tissues and Lungs.
  - Infectious virus - readily isolated from throat and lung-derived samples,
- Pharyngeal virus shedding very high during the first week of symptoms - peak on day 4
  - Shedding was more than 1000x higher than in SARS
- Blood and urine never yielded virus
- No virus from stool samples, in spite of high virus RNA concentration.

Wölfel *et al. Nature*(2020). https://doi.org/10.1038/s41586-020-2196-x

SARS-CoV-2 Viral Load in Upper Respiratory Specimens of Infected Patients

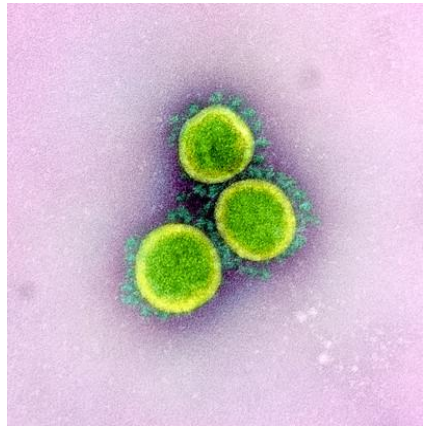
- Higher viral loads were detected soon after symptom onset, with higher viral loads detected in the nose than in the throat.
  - Viral nucleic acid shedding pattern of patients similar to patients with influenza and different from patients infected with SARS-CoV.

- The viral load in asymptomatic patient was similar to that in symptomatic patients,
  - Suggests transmission may occur early in the course of infection

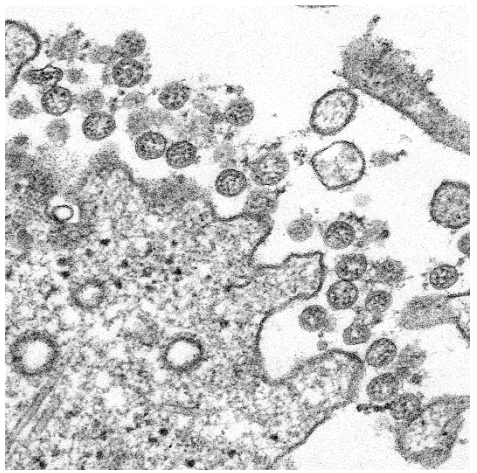
N Engl J Med 2020; 382:1177-1179 DOI: 10.1056/NEJMc2001737

How long does an infected person continue to shed SARS-CoV-2 ?

- Highest shedding early in the course of disease
- Virus can be detected in the 24-48 hours prior to disease onset in throat samples
- Peak viral loads occur within first 5 days and shedding may continue for 7-12 days in mild/moderate cases, and for > 2 weeks in severe cases. Up to 20 days post symptoms in some.



Credit NIAID-RML



Wölfel *et al. Nature*(2020). https://doi.org/10.1038/s41586-020-2196-

WHO 2020 https://www.who.int/docs/default-source/coronaviruse/who- china-joint-mission-on-covid-19-final-report.pdf.

nature

https://doi.org/10.1038/s41586-020-2196-x

Accelerated Article Preview

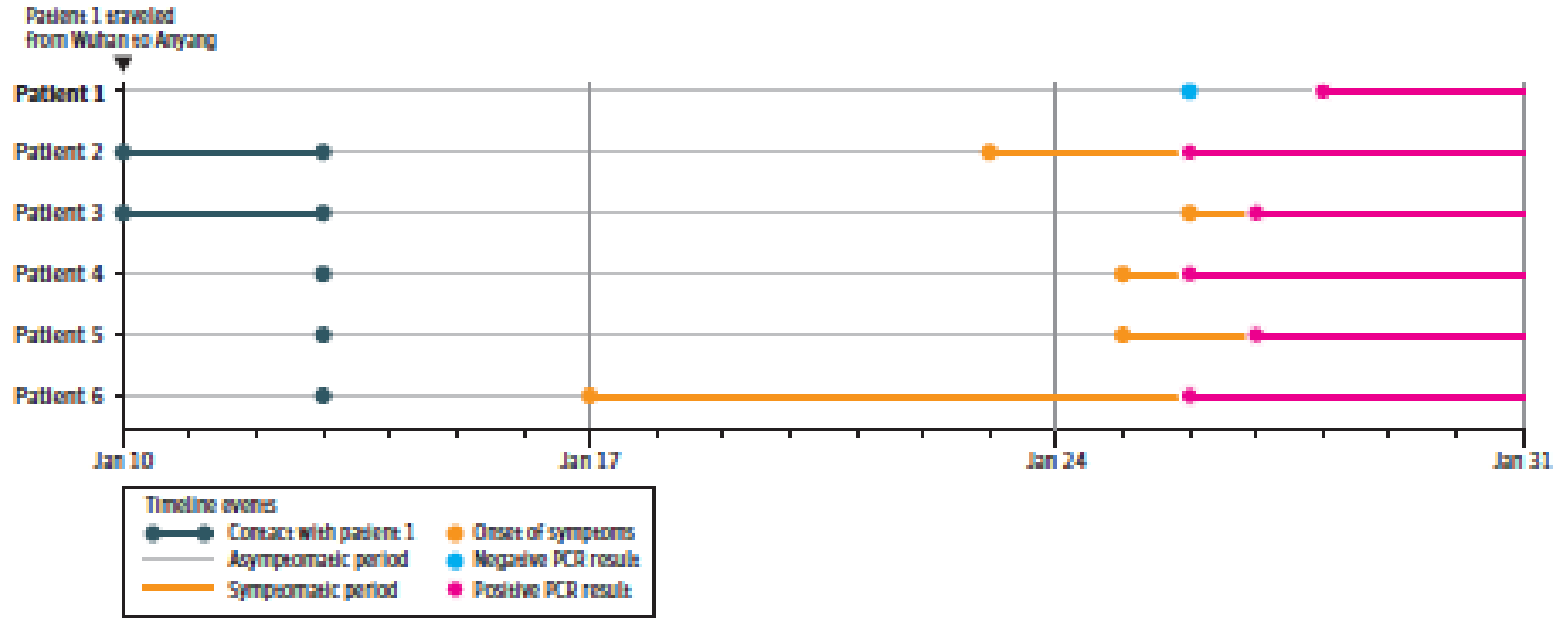
Virological assessment of hospitalized patients with COVID-2019

- Shedding of viral RNA from sputum outlasted the end of symptoms.
  - Seroconversion occurred after 7 days in 50% of patients but was not followed by a rapid decline in viral load.
  - All patients seroconverted by 14days
- No virus isolated after day 8 despite high viral loads
- Active virus replication in the upper respiratory tract puts the prospects of COVID-19 containment in perspective.
- Patients may still be infectious after seroconversion if before 8 days since symptoms

Asymptomatic/Presymptomatic transmission

Presumed Asymptomatic Carrier Transmission of COVID-19

Figure. Timeline of Exposure to the Asymptomatic Carrier of the Novel Coronavirus That Causes COVID-19 in a Familial Cluster



PCR indicates polymerase chain reaction test for the coronavirus disease 2019 (COVID-19) nucleic acid.

JAMA Published online February 21, 2020

CORRESPONDENCE

Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1

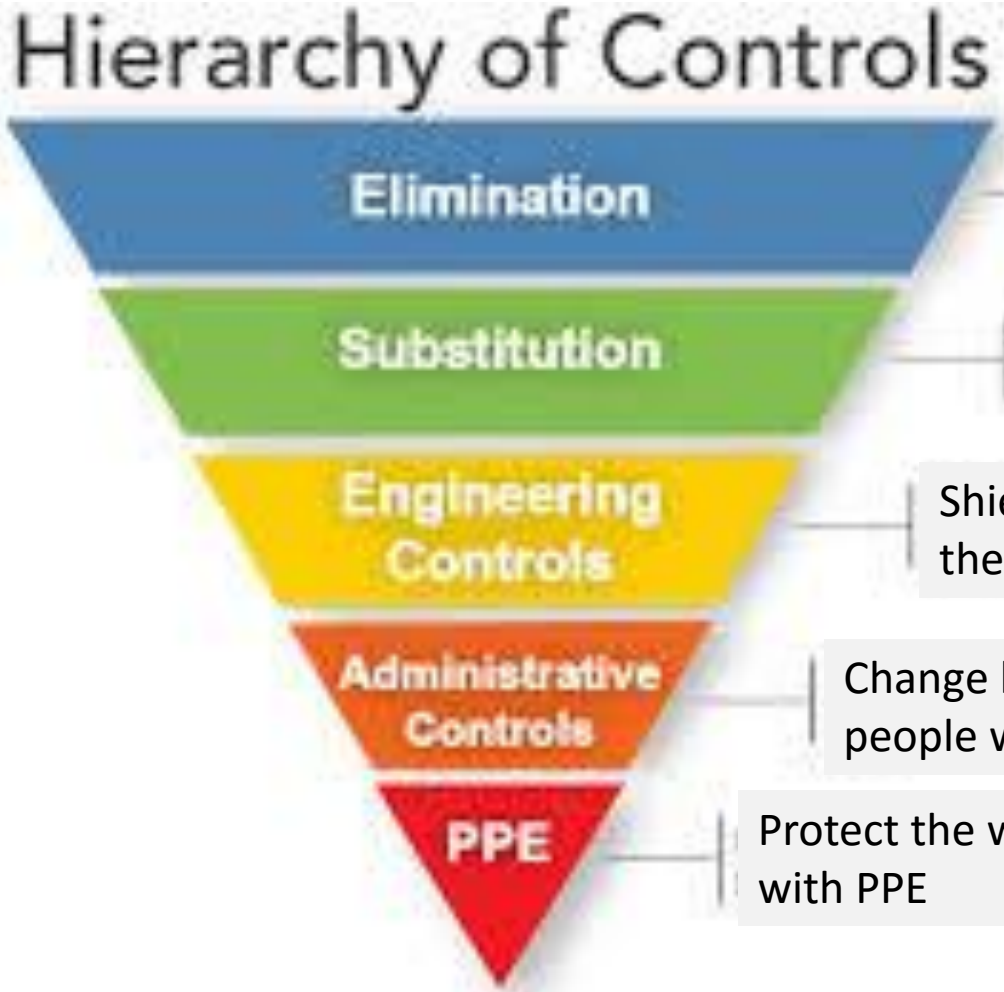
- The coronavirus can live for hours to days on surfaces like countertops and doorknobs
  - Air – 3hrs
  - Metal – 5days
  - Wood – 4 days
  - Plastic - 72hrs
  - Copper - <4hrs
  - Card board -<24hrs

van Doremalen et al. N Engl j med 382;16 DOI: 10.1056/NEJMc2004973

Who is vulnerable?

- Everyone can be infected and TRANSMIT to Others
- But severe disease appears to affect the
  - Elderly
  - People with underlying disease such as Diabetes mellitus, Obesity, Asthma
  - People with prior disease
- Most deaths have been in the old and people with underlying disease
- New phenomenon of Paediatric covid beginning to show up

Most effective



Physically remove the hazard

Replace the hazard

Shield people from the hazard

Change how people work

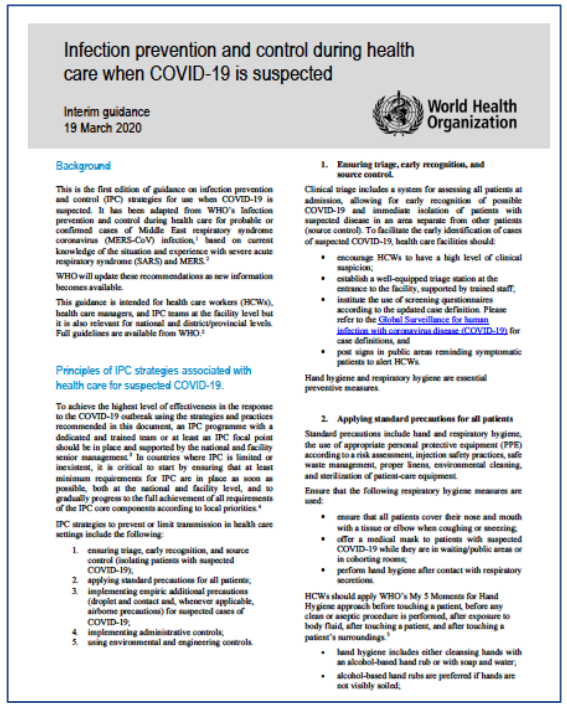
Protect the worker with PPE

Least effective

Break Chain of Infection

SOURCE CONTROL	INTERRUPT THE MODE OF TRANSFER	PROTECT SUSCEPTIBLE HOST
• Isolation of infected patient • Treatment of Infected patients • Mask affected persons	• Wash hands • Cleaning Disinfection of environment and equipment • Cough etiquette • PPE • Screening and triage	• Isolation • Prophylaxis • Vaccination • PPE

Strategies for effective IPC IN COVID-19



Infection prevention and control during health care when COVID-19 is suspected

Interim guidance
19 March 2020

World Health Organization

Background

This is the first edition of guidance on infection prevention and control (IPC) strategies for use when COVID-19 is suspected. It has been adapted from WHO's Infection prevention and control during health care for probable or confirmed cases of Middle East respiratory syndrome coronavirus (MERS-CoV) infection,[1] based on current knowledge of the situation and experience with severe acute respiratory syndrome (SARS) and MERS.[2]

WHO will update these recommendations as new information becomes available.

This guidance is intended for health care workers (HCWs), health care managers, and IPC teams at the facility level but it is also relevant for national and district/provincial levels. Full guidelines are available from WHO.[3]

Principles of IPC strategies associated with health care for suspected COVID-19.

To achieve the highest level of effectiveness in the response to the COVID-19 outbreak using the strategies and practices recommended in this document, an IPC programme with a dedicated and trained team or at least an IPC focal point should be in place and supported by the national and facility senior management.[4] In countries where IPC is limited or inexistent, it is critical to start by ensuring that at least minimum requirements for IPC are in place as soon as possible, both at the national and facility level, and to gradually progress to the full achievement of all requirements of the IPC core components according to local priorities.[4]

IPC strategies to prevent or limit transmission in health care settings include the following:

1. ensuring triage, early recognition, and source control (isolating patients with suspected COVID-19);
2. applying standard precautions for all patients;
3. implementing empiric additional precautions (droplet and contact and, whenever applicable, airborne precautions) for suspected cases of COVID-19;
4. implementing administrative controls;
5. using environmental and engineering controls.

1. Ensuring triage, early recognition, and source control.

Clinical triage includes a system for assessing all patients at admission, allowing for early recognition of possible COVID-19 and immediate isolation of patients with suspected disease in an area separate from other patients (source control). To facilitate the early identification of cases of suspected COVID-19, health care facilities should:

- encourage HCWs to have a high level of clinical suspicion;
- establish a well-equipped triage station at the entrance to the facility, supported by trained staff;
- institute the use of screening questionnaires according to the updated case definition. Please refer to the Global Surveillance for human infection with coronavirus disease (COVID-19) for case definitions, and
- post signs in public areas reminding symptomatic patients to alert HCWs.

Hand hygiene and respiratory hygiene are essential preventive measures.

2. Applying standard precautions for all patients

Standard precautions include hand and respiratory hygiene, the use of appropriate personal protective equipment (PPE) according to a risk assessment, injection safety practices, safe waste management, proper linens, environmental cleaning, and sterilization of patient-care equipment.

Ensure that the following respiratory hygiene measures are used:

- ensure that all patients cover their nose and mouth with a tissue or elbow when coughing or sneezing;
- offer a medical mask to patients with suspected COVID-19 while they are in waiting/public areas or in cohorting rooms;
- perform hand hygiene after contact with respiratory secretions.

HCWs should apply WHO's My 5 Moments for Hand Hygiene approach before touching a patient, before any clean or aseptic procedure is performed, after exposure to body fluid, after touching a patient, and after touching a patient's surroundings:[5]

- hand hygiene includes either cleansing hands with an alcohol-based hand rub or with soap and water;
- alcohol-based hand rubs are preferred if hands are not visibly soiled;

1. Ensuring triage, early recognition, and source control (isolating patients with suspected COVID-19);
2. Applying standard precautions for all patients;
3. Implementing empiric additional precautions (droplet and contact and, whenever applicable, airborne precautions) for suspected cases of COVID-19;
4. Implementing administrative controls; - Policies, Guidance work schedules etc
5. Using environmental and engineering controls -

All these strategies are based on Breaking the chain of transmission

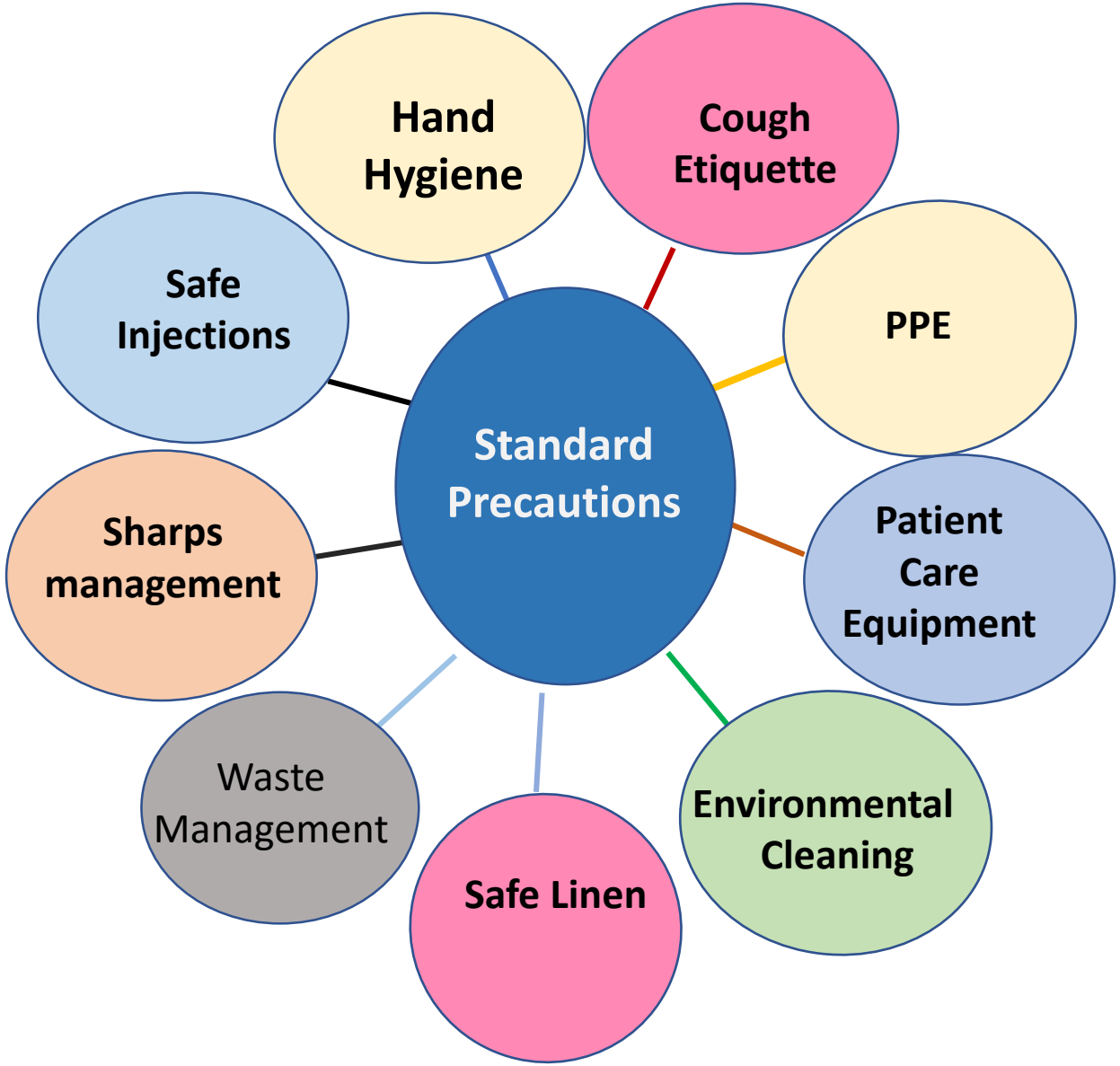
https://www.who.int/emergencies/diseases/novel-coronavirus-2019

Ensuring triage, early recognition, and source control

- Triage is for early identification of patients with acute respiratory infection (ARI) to prevent the transmission to health care workers and other patients.
- Establish a well-equipped triage station at the entrance/entry point supported by trained staff
- Encourage HCWs to have a high level of clinical suspicion
- Institute the use of screening questionnaires according to the updated case definition
- Post signs in public areas reminding symptomatic patients to alert HCWs and/or relevant authorities

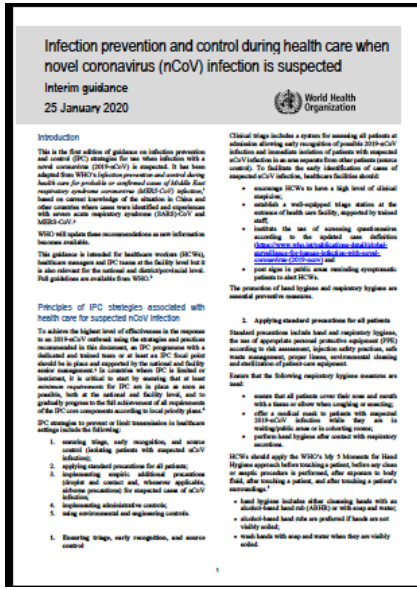
Applying standard precautions for all patients;

- Cough into tissue and discard in covered bin or cough into elbow
- Hand Hygeine according to 5 moments of hand hygeine
- PPE according to Risk assessment
- Ensure safe patient care equipment by appropriate cleaning disinfection and sterilisation
- Increased frequency of Environmental cleaning with regular disinfection of high touch surfaces
- Safe Waste management
- Safe handling of Linen



Implementing empiric additional precautions

- **Contact and droplet precautions** should be used by family members, visitors and HCWs, before entering patient room or ward.
- Place patient in adequately ventilated single rooms or cohorted in a general ward with natural ventilation,
  - Adequate ventilation is considered to be 60 L/s per patient
- All patients' beds should be placed at least 1 m apart.
- Designate a team of HCWs to care exclusively for suspected or confirmed cases
- Use dedicated equipment or disposable items (e.g., stethoscopes, blood pressure cuffs and thermometers).
- Clean and disinfect any equipment that needs to be shared with e.g., 70% ethyl alcohol between patients.



Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected

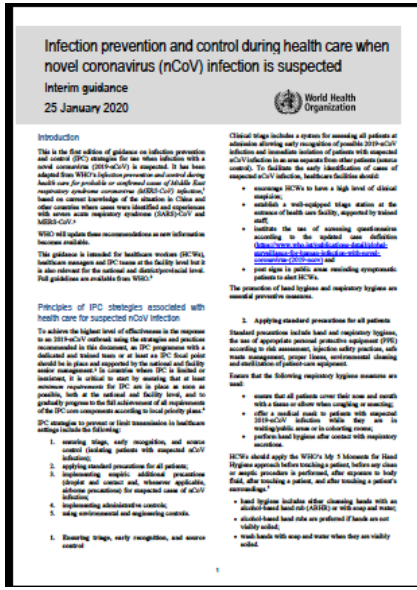
Interim guidance

25 January 2020

World Health Organization

Implementing empiric additional precautions

- HCWs should use surgical masks, eye protection (goggles) or facial protection (face shield) for routine tasks to avoid contamination of mucous membranes;
- HCWs should wear a clean, non-sterile, long-sleeved gown and gloves;
- **Boots, coverall and apron are not required during routine care;**
- After patient care, Doff and dispose of all PPE's in the infectious waste bin and Perform hand hygiene
- Use a new set of PPE's between patients



Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected

Interim guidance

25 January 2020

World Health Organization

Introduction

This is the first edition of guidance on infection prevention and control (IPC) strategies for use when infection with a novel coronavirus (2019-nCoV) is suspected. It has been adapted from WHO's *Infection prevention and control during health care for probable or confirmed cases of Middle East respiratory syndrome coronavirus (MERS-CoV) infection*,[1] based on current knowledge of the situation in China and other countries where cases were identified and experiences with severe acute respiratory syndrome (SARS)-CoV and MERS-CoV.[2]

WHO will update these recommendations as new information becomes available.

This guidance is intended for healthcare workers (HCWs), healthcare managers and IPC teams at the facility level but it is also relevant for the national and district/provincial level. Full guidelines are available from WHO.[3]

Principles of IPC strategies associated with health care for suspected nCoV infection

To achieve the highest level of effectiveness in the response to an 2019-nCoV outbreak using the strategies and practices recommended in this document, an IPC programme with a dedicated and trained team or at least an IPC focal point should be in place and supported by the national and facility senior management.[4] In countries where IPC is limited or inexistent, it is critical to start by ensuring that at least minimum requirements for IPC are in place as soon as possible, both at the national and facility level, and to gradually progress to the full achievement of all requirements of the IPC core components according to local priority plans.[5]

IPC strategies to prevent or limit transmission in healthcare settings include the following:

1. ensuring triage, early recognition, and source control (isolating patients with suspected nCoV infection);
2. applying standard precautions for all patients;
3. implementing empiric additional precautions (droplet and contact and, whenever applicable, airborne precautions) for suspected cases of nCoV infection;
4. implementing administrative controls;
5. using environmental and engineering controls.

1. Ensuring triage, early recognition, and source control

Clinical triage includes a system for assessing all patients at admission allowing early recognition of possible 2019-nCoV infection and immediate isolation of patients with suspected nCoV infection in an area separate from other patients (source control). To facilitate the early identification of cases of suspected nCoV infection, healthcare facilities should:

- encourage HCWs to have a high level of clinical suspicion;
- establish a well-equipped triage station at the entrance of health care facility, supported by trained staff;
- institute the use of screening questionnaire according to the updated case definition (https://www.who.int/publications-detail/global-surveillance-for-human-infection-with-novel-coronavirus-(2019-ncov)) and
- post signs in public areas reminding symptomatic patients to alert HCWs.

The protection of hand hygiene and respiratory hygiene are essential preventive measures.

2. Applying standard precautions for all patients

Standard precautions include hand and respiratory hygiene, the use of appropriate personal protective equipment (PPE) according to risk assessment, injection safety practices, safe waste management, proper linens, environmental cleaning and sterilization of patient-care equipment.

Ensure that the following respiratory hygiene measures are used:

- ensure that all patients cover their nose and mouth with a tissue or elbow when coughing or sneezing;
- offer a medical mask to patients with suspected 2019-nCoV infection while they are in waiting/public areas or in cohorting rooms;
- perform hand hygiene after contact with respiratory secretions.

HCWs should apply the WHO's My 5 Moments for Hand Hygiene approach before touching a patient, before any clean or aseptic procedure is performed, after exposure to body fluid, after touching a patient, and after touching a patient's surroundings:[6]

- hand hygiene includes either cleaning hands with an alcohol-based hand rub (ABHR) or with soap and water;
- alcohol-based hand rubs are preferred if hands are not visibly soiled;
- wash hands with soap and water when they are visibly soiled.

Administrative controls

- Provide adequate training for HCWs
- Monitor HCW compliance with standard precautions and provide mechanisms for improvement as needed.
- Establish a surveillance process for acute respiratory infections potentially caused by COVID-19 among HCWs;
- Ensure that HCWs and the public understand the importance of promptly seeking medical care
- Ensure adequate patient-to-staff ratio

Engineering/Environmental controls

- Address the basic infrastructure of the health care facility.
- Adequate ventilation in all areas in the healthcare facility,
- Spatial separation of at least 1 meter should be maintained between all patients.
- Adequate WASH infrastructure and environmental cleaning.
- Safe and effective laundry services
- Safe medical waste management

Use PPE based on Risk assessment

- Based on risk assessment of type and duration of exposure to body fluids

- Use gloves to
  - Protect your skin from blood and body fluid exposure
  - Prevent spread of pathogens to other patients

- Use Gowns to
  - prevent contamination of your clothing
  - Prevent entry through cuts in the skin

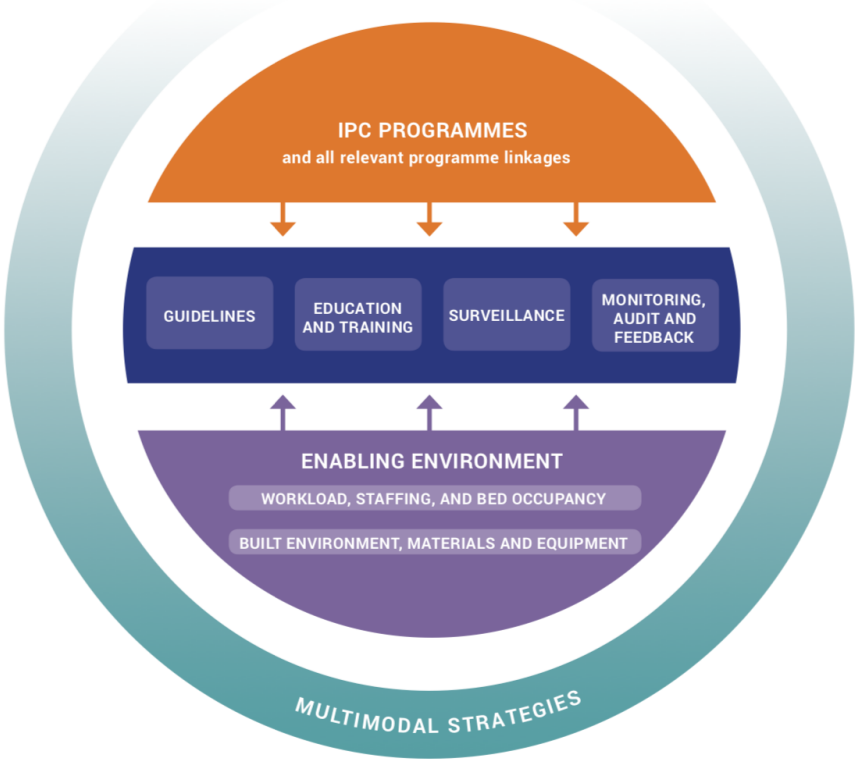
  Protect yourself, protect your patients

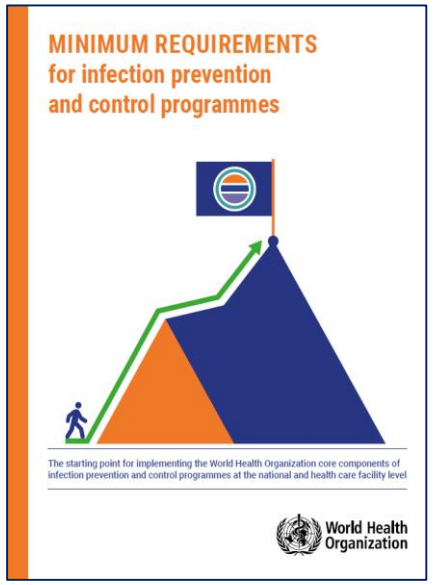
- Use masks, goggles or face shields to
  - Protect yourself from exposure to potentially infectious material by blocking droplets, splashes or sprays to mucous membranes such as the eyes and mouth

Control of COVID-19 needs multi-modal strategies

Success in controlling the spread of COVID-19 in different countries has come from:

- Screening at airports +fever checks throughout selected population groups
- Isolation, contact tracing and follow-up; quarantine; travel restrictions
- Designation of dedicated hospitals to minimize the risk of spread and strengthening IPC
- Mass media campaigns to educate public and encourage prompt reporting of symptoms and implementation of transmission reduction measures – cough hygiene and hand hygiene





- To achieve the highest level of effectiveness in the response to the COVID-19 outbreak…..

1. An IPC programme with a dedicated and trained team or at least an IPC focal point
2. Should be supported by the national and facility senior management.
3. Countries where IPC is limited or non-existent will require support and will need to start by ensuring that at least minimum requirements for IPC are in place as soon as possible, both at the national and facility level,

https://www.who.int/emergencies/diseases/novel-coronavirus-2019

How do you achieve effective IPC

1. Prepare for action : you know the threat, you identify your needs: human, finance, infrastructure, Supplies, PPE
2. Assess your present situation:what do you have what are the gaps
3. Set up a team, Develop a work plan, Develop the budget, set targets, and work the plan.
4. Assess your impact. Daily review: Checklists, observations, regular feedback to the EOC
5. Fill the gaps: correct errors, strengthen weaknesses and improve on strengths

Responsibility of IPC focal points/Team with Covid-19

- Training of frontline workers. Share the science: Douse the fear
- To Identify risks over which they have some control
- To take appropriate and cost-effective measures to minimize or eliminate those risks.
- Help healthcare facility to set priorities and put in place the required interventions

Summary

- Virus is a respiratory Infection
- Portal of Entry is throgh the respiratory tract
- Transmission is mainly by droplet infection. It can be opportunistically spread by aerosols
- Prevention is by preventing virus from getting to the respiratory tract
  - By limiting presence of virus in the air (cough etiquette, Masks, good ventilation)
  - By preventing the entry into the respiratory tract (Masks, hand hygeiene, environmental cleaning,)
  - By limiting contact: Social /physical distancing, isolation/quarantine, Masking

Finally

- The Pandemic curve in Africa is still on the upward swing
  - Practice Cough Etiquette
  - Mask when in public spaces
  - **Avoid**
    - Close contact with others
    - Avoid crowds
    - Avoid Closed spaces