

# Coronavirus Disease 2019 (COVID-2019)

Training slides based on guidelines for case-finding,  
diagnosis, management and public health response in  
South Africa

Compiled by

Centre for Respiratory Diseases and Meningitis and Outbreak Response, Division of Public Health  
Surveillance and Response, National Institute for Communicable Diseases (NICD) of the National Health  
Laboratory Services (NHLS)

and

National Department of Health, South Africa  
Including Communicable Diseases Cluster, Zoonotic Diseases Cluster, Port Health, Environmental Health  
and Emergency Medical Services

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**health**

Department:  
Health  
REPUBLIC OF SOUTH AFRICA



**NATIONAL INSTITUTE FOR  
COMMUNICABLE DISEASES**

Division of the National Health Laboratory Service

# Outline

- Welcome and objectives
- Microbiology, epidemiology and clinical presentation
- Surveillance for imported cases including case definitions
- Laboratory diagnosis
- Infection prevention and hospital readiness
- Patient flow and actions required at each step
- Co-ordinating a public health response



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**THIS SITUATION IS RAPIDLY EVOLVING**

**BEFORE USING THIS POWERPOINT AND GUIDELINES PLEASE  
CHECK FOR UPDATES ON THE NICD AND NDOH WEBSITES**

**( [www.nicd.ac.za](http://www.nicd.ac.za) and [www.ndoh.gov.za](http://www.ndoh.gov.za) )**

**or**

**CALL YOUR PROVINCIAL COMMUNICABLE  
DISEASE CO-ORDINATOR**

# Objective of training

- To familiarise attendees with RSA guidelines for
  - surveillance,
  - case detection/diagnosis
  - and management, and
  - public health response to suspected and confirmed cases of infection with COVID-2019

Microbiology, epidemiology  
and clinical presentation



# Introduction

- 31 December 2019, the World Health Organization (WHO) China country office reported a cluster of pneumonia cases in Wuhan, Hubei Province of China
- 7 January 2020, causative pathogen identified as a novel coronavirus (COVID-2019)
- Initially person-to-person transmission not apparent and the majority of the cases were epidemiologically linked to a seafood, poultry and live wildlife market (Huanan Seafood Wholesale Market) in Jiangnan District of Hubei Province
- Number of cases continued to increase rapidly, and evidence of person-to-person transmission mounted

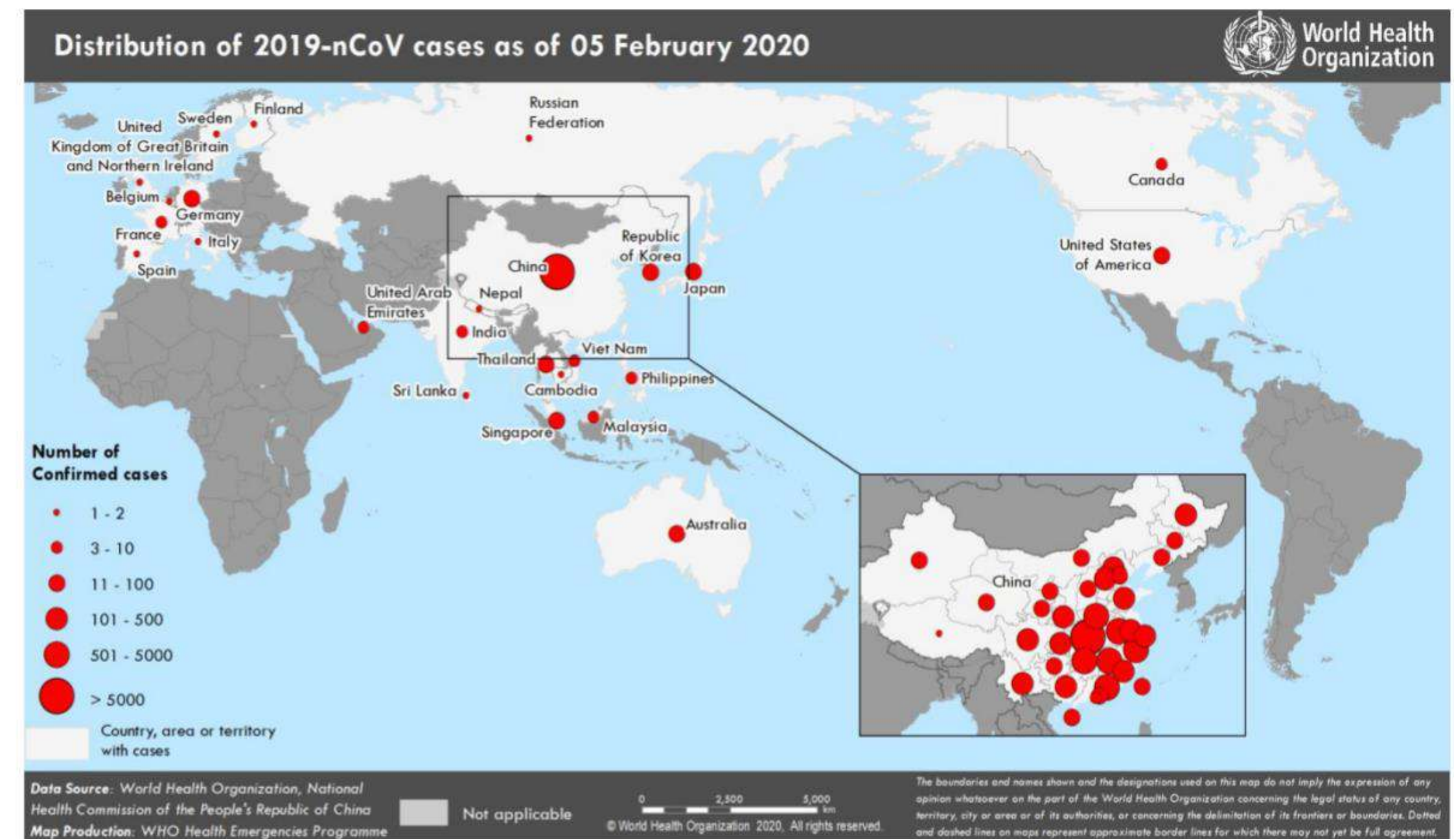
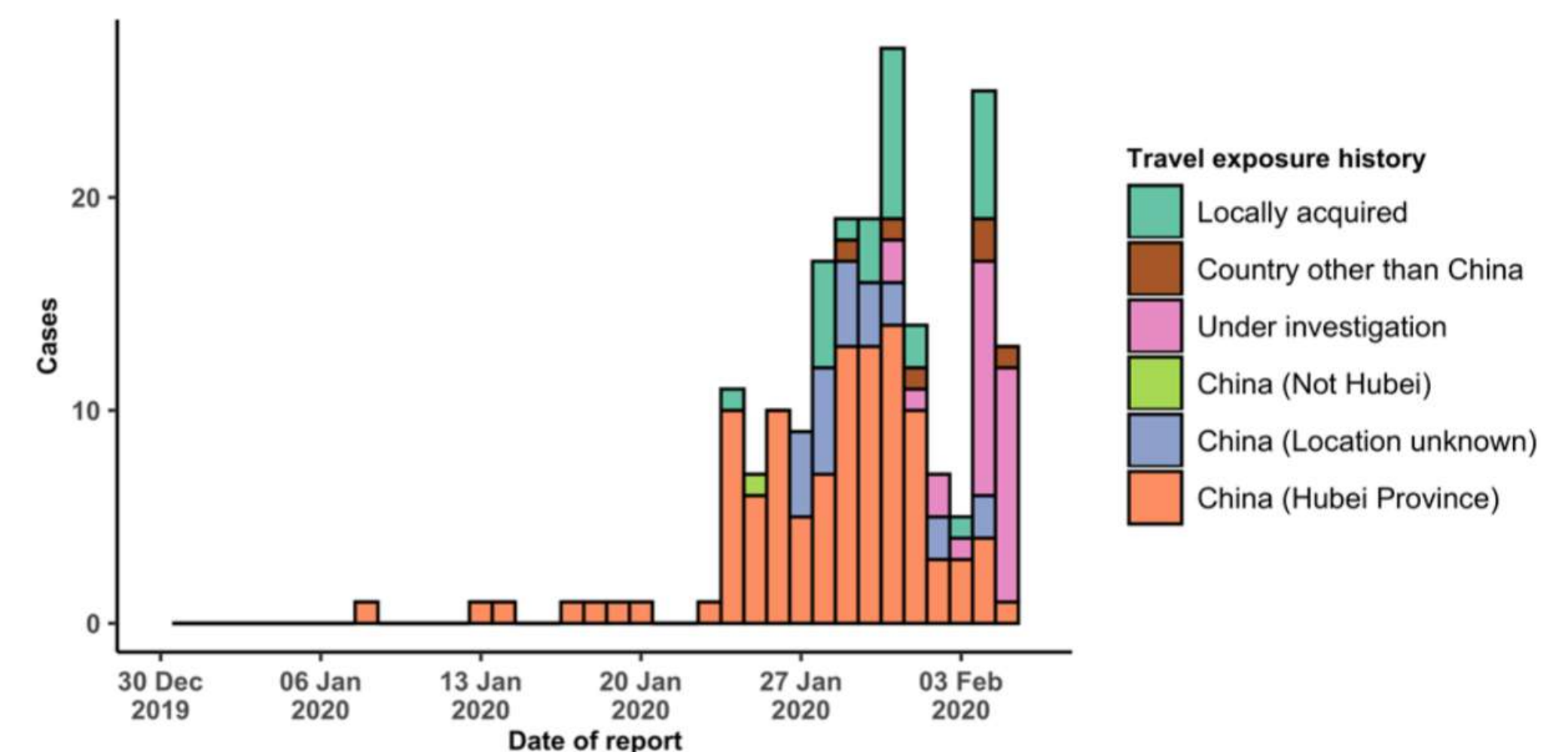


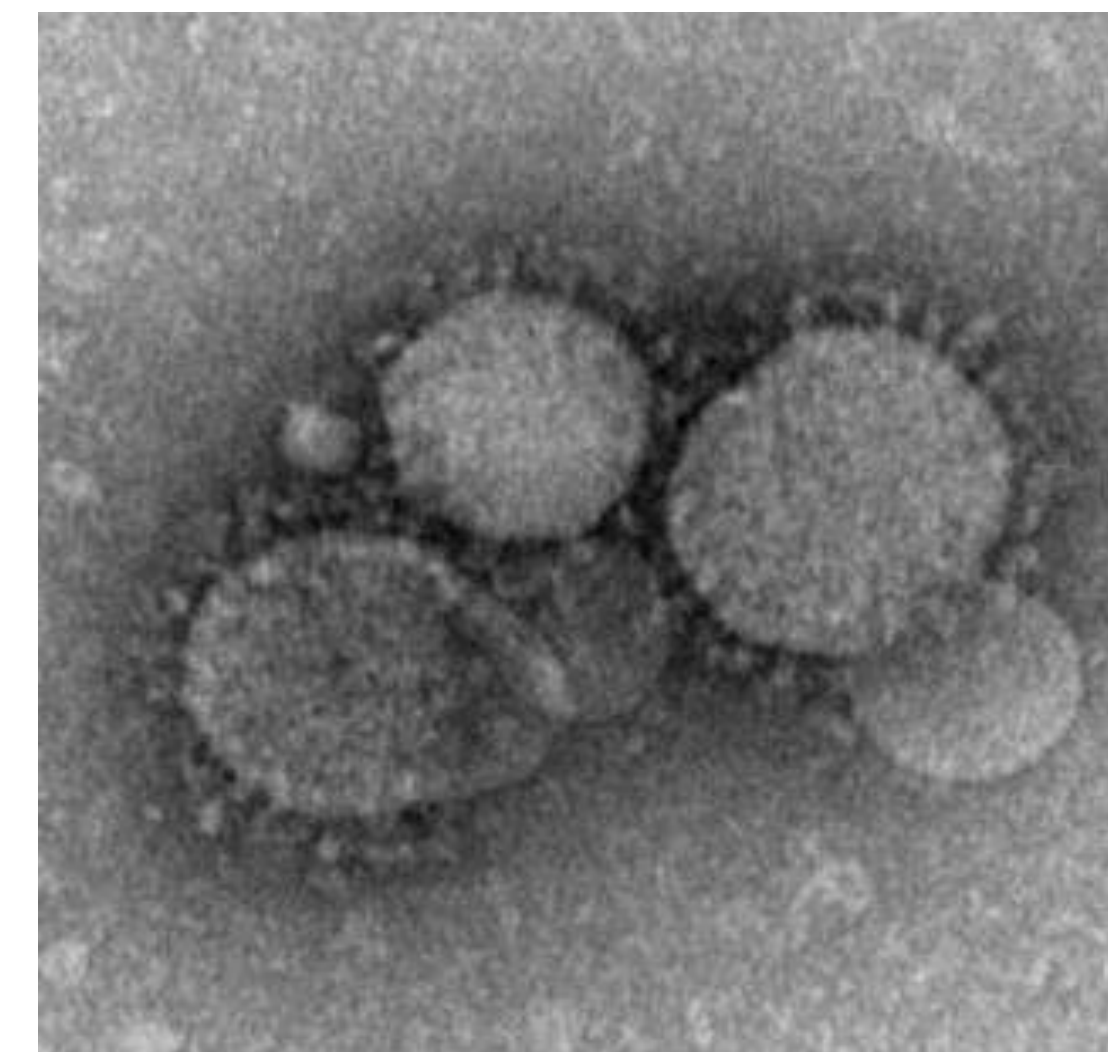
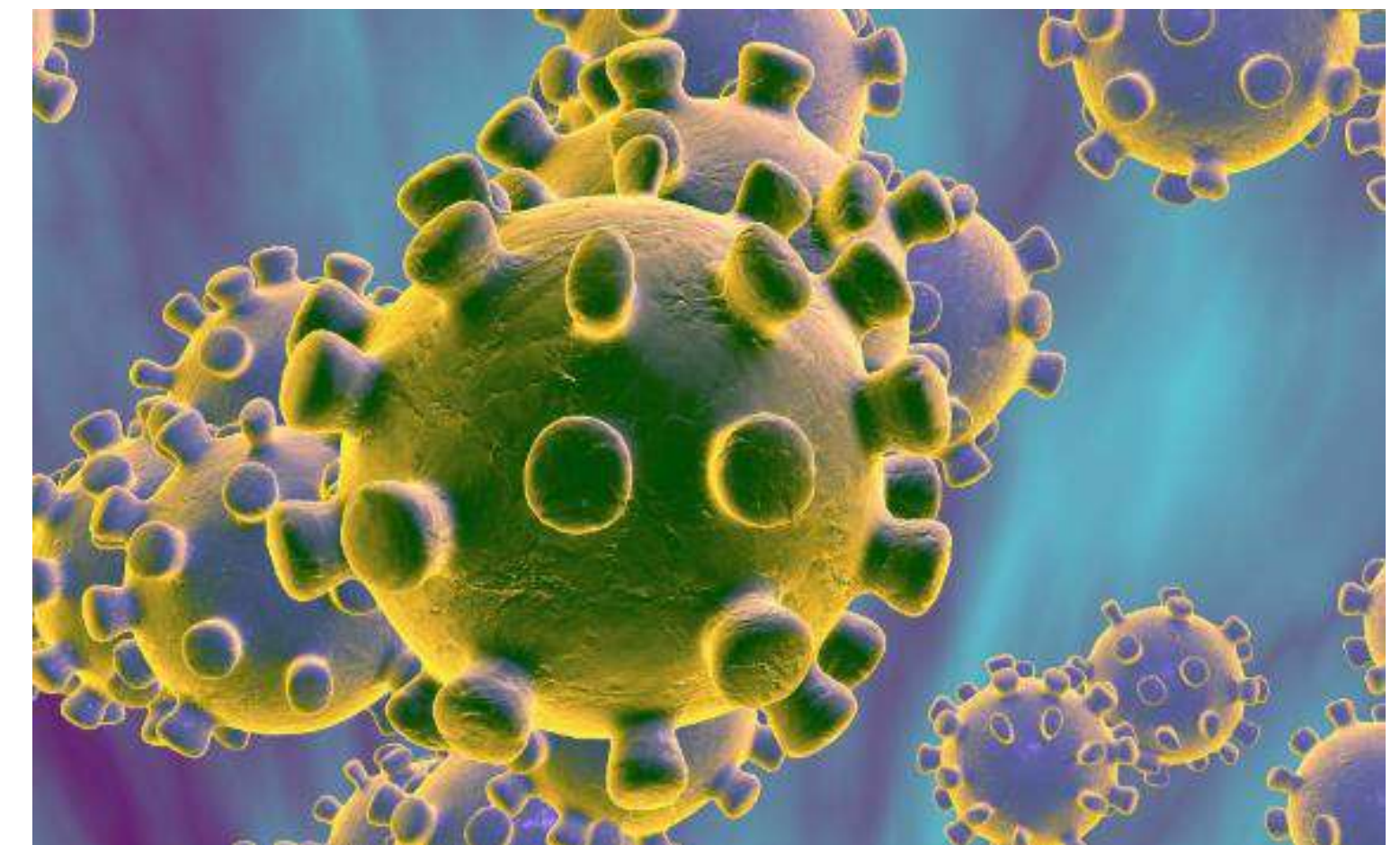
Figure 3: Epidemic curve of 2019-nCoV cases (n=191) identified outside of China, by date of reporting and travel history, 5 February 2020





# Microbiology and epidemiology

- Coronaviruses are enveloped, single-stranded positive-sense RNA viruses.
- The envelope of the coronaviruses is covered with club-shaped glycoproteins which look like ‘crowns’, or ‘halos’ – hence the name ‘coronavirus.’
- Coronaviruses are responsible for the common cold, and usually cause self-limited upper respiratory tract infections.
  - **Examples 229E, NL63, OC43 and HKU1**





# Microbiology and epidemiology

- In 2003, a new coronavirus emerged leading to the SARS (severe acute respiratory syndrome) outbreak.
- In 2012, the Middle East respiratory syndrome (MERS) was found to be caused by a coronavirus associated with transmission from camels.
- Following the identification of a cluster of pneumonia cases in Wuhan, Hubei Province of China, Chinese authorities reported on 7 January 2020 that the causative pathogen was identified as a novel coronavirus (COVID-2019).
- These new coronaviruses have RNA sequences that are very similar to coronaviruses from animals
  - MERS-CoV = camel coronavirus
  - SARS = bat coronavirus







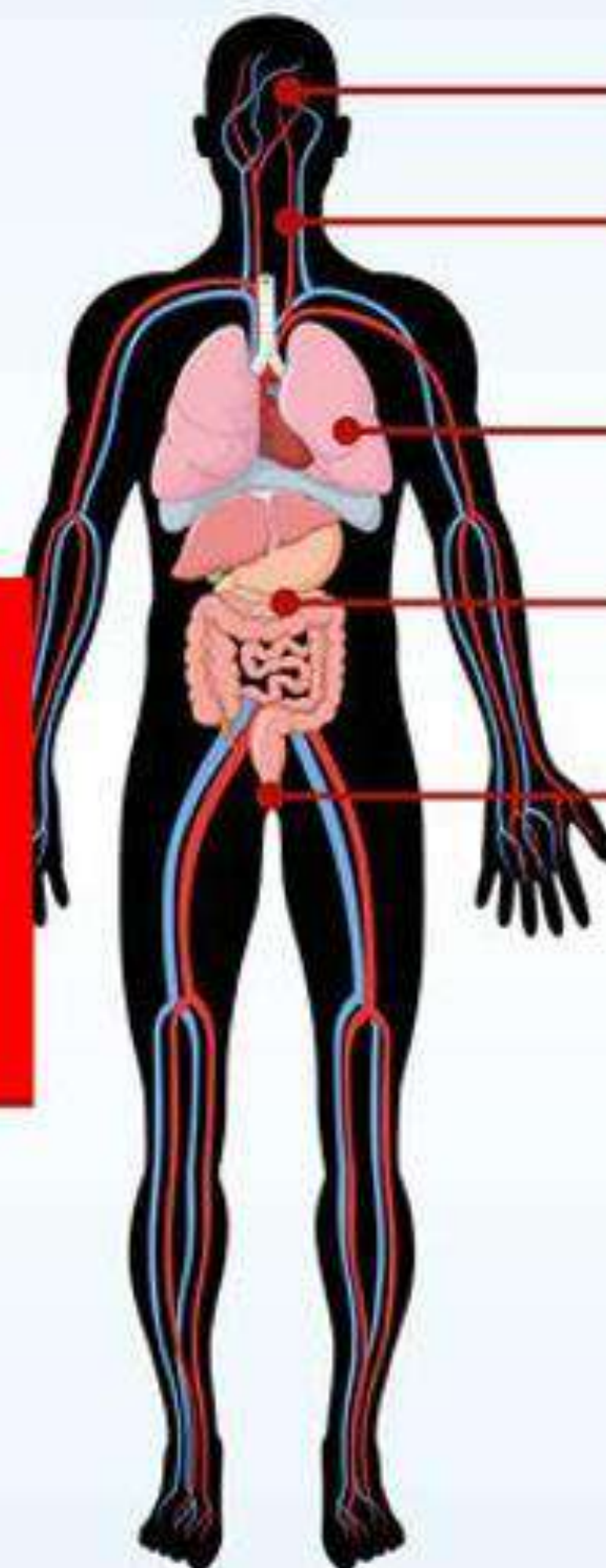
# What is Coronavirus?

Coronaviruses are a large family of viruses that cause illness ranging from the common cold to more severe diseases like pneumonia, MERS and SARS

- Severe Symptoms
- High Fever
- 38°C
- Pneumonia
- Kidney Failure
- Death

## TRANSMISSION

Coughs or sneezes from infected person or touching contaminated objects



## COMMON SYMPTOMS

- Fever
- After 2 to 7 days develop a dry cough
- Mild breathing difficulties at the outset
- Gastrointestinal issues
- Diarrhea
- General body aches

\* Source: Centers for Disease Control and Prevention/ USA Today



# Transmissibility

- Main route of transmission respiratory droplets (airborne transmission has not proven)
- Excreted in stool (possibly faeco-oral)
- Mean incubation period 5.2 days (95% confidence interval [CI], 4.1 to 7.0), 95th percentile of the distribution at 12.5 days.
- 14 days of isolation or quarantine is suggested as it allows a window of 1.5 additional days. (Li, 2020)
- In early stages, epidemic doubled in size every 7.4 days
- Basic reproductive number was estimated 2.2 (95% CI, 1.4 to 3.9) - on average each infectious case gives rise to just over 2 infectious cases.





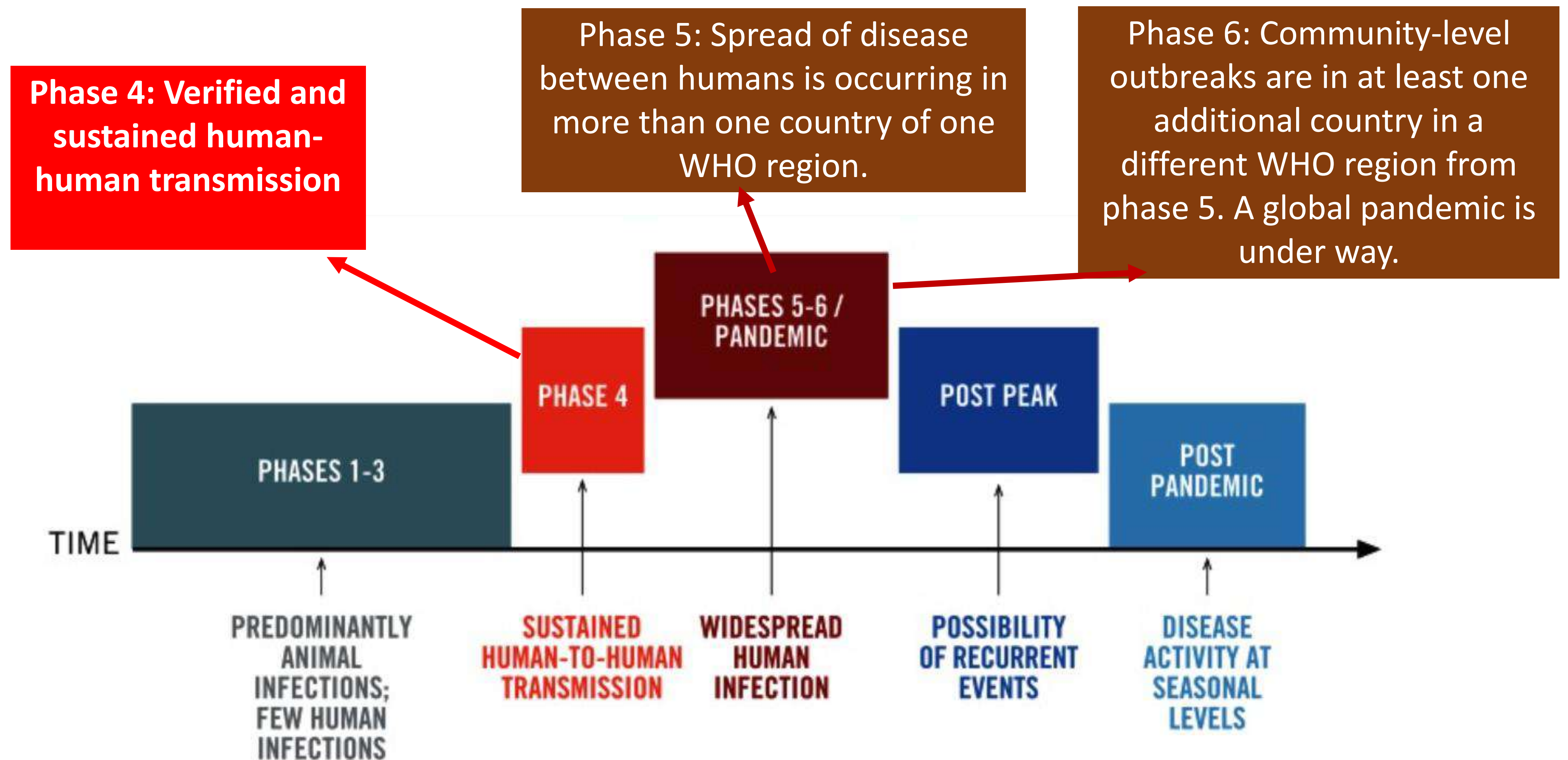
# Clinical presentation

- **Who is at highest risk?**
  - Largest published series to date from China - 99 COVID-2019 patients with pneumonia the commonest symptoms were fever (83%), cough (82%) and shortness of breath (31%).(Chen et al Lancet 2020)
  - The majority (but not all) of severe cases are elderly or have severe underlying illness
  - Among pneumonia patients 51% had chronic diseases
  - 11 patients who died, 7 aged >60 years, 3 had long history of smoking and 3 had hypertension
- **Number of cases and deaths continue to increase**
  - Approximately 2% of reported confirmed cases have died
  - Likely a substantial overestimation of the true case fatality ratio:
    - More severe disease tends to be reported first
    - Initial case definition in China really focused on patients with pneumonia
    - Possible backlog in testing and confirming cases in China

# Surveillance and case definitions



# Phases of a pandemic – and appropriate responses



# Phases of a pandemic – and appropriate responses

PHASE 4	Human to human transmission of an animal or human-animal influenza reassortant virus able to sustain community-level outbreaks has been verified.	Direct and coordinate rapid pandemic <b>containment</b> activities in collaboration with WHO to limit or delay the spread of infection.	<b>Increase</b> surveillance. Monitor containment operations. Share findings with WHO and the international community.
PHASE 5	The same identified virus has caused sustained community level outbreaks in two or more countries in one WHO region.	Provide <b>leadership and coordination to multisectoral resources</b> to mitigate the societal and economic impacts.	<b>Actively monitor and assess</b> the evolving pandemic and its impacts and mitigation measures.
PHASE 6	In addition to the criteria defined in Phase 5, the same virus has caused sustained community level outbreaks in at least one other country in another WHO region.		

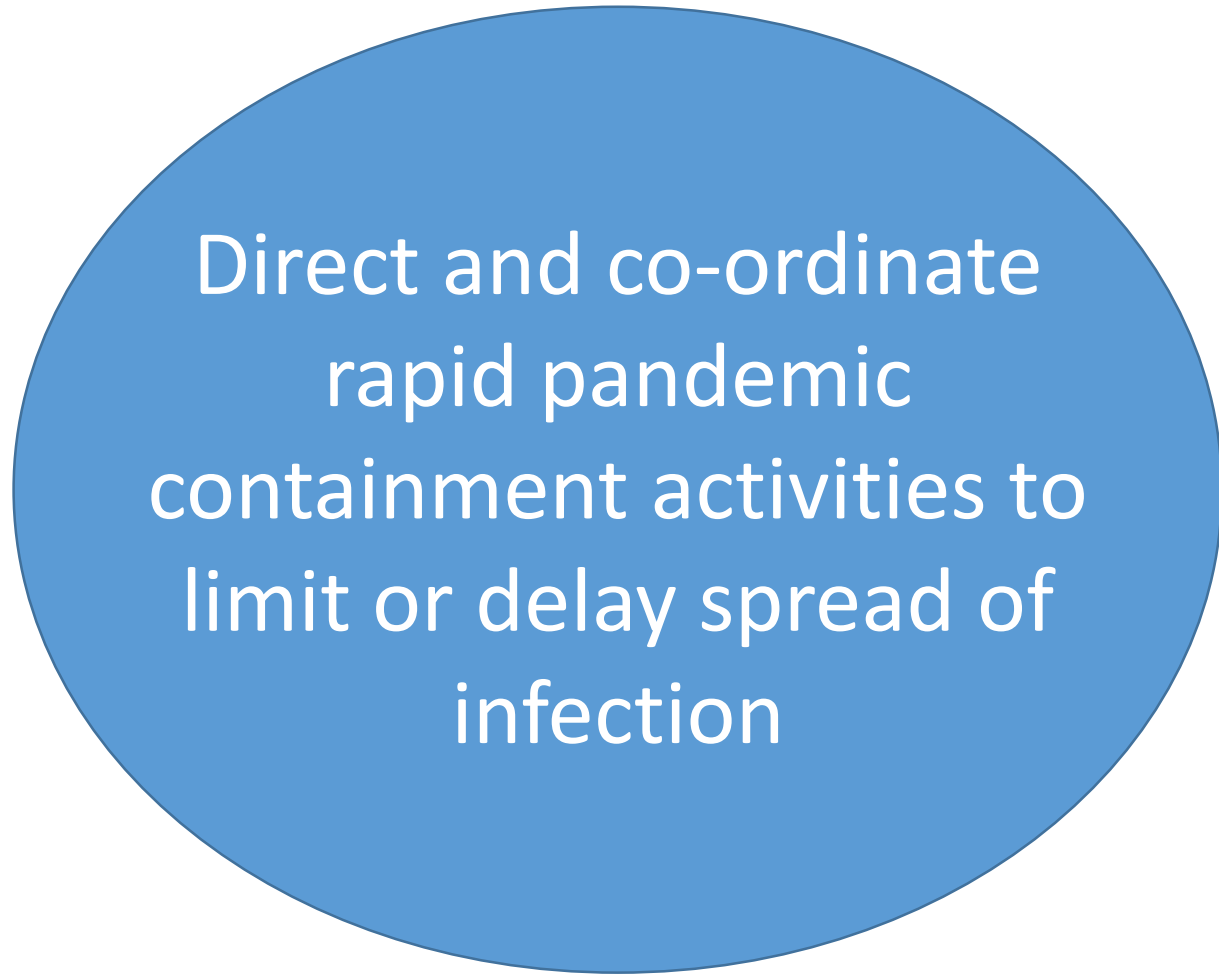


# Phases of a pandemic – and appropriate responses


PHASE 4	Human to human transmission of an animal or human-animal influenza reassortant virus able to sustain community-level outbreaks has been verified.	Direct and co-ordinate rapid pandemic containment activities to limit or delay spread of infection	Increase surveillance. Monitor containment operations. Share findings with WHO and the international community.	
PHASE 5	The same identified virus has caused sustained community level outbreaks in two or more countries in one WHO region.		Provide leadership and coordination to multisectoral resources to mitigate the societal and economic impacts.	Actively monitor and assess the evolving pandemic and its impacts and mitigation measures.
PHASE 6	In addition to the criteria defined in Phase 5, the same virus has caused sustained community level outbreaks in at least one other country in another WHO region.			

# Phases of a pandemic – and appropriate responses

- All of our public health responses at the moment are directed to ‘containing’ the disease
- If the outbreak arrives in RSA, and we cannot contain it, we will move to a ‘mitigation’ strategy



Direct and co-ordinate rapid pandemic containment activities to limit or delay spread of infection



Provide leadership and co-ordination to multisectoral resources to mitigate the societal and economic implications



# Clinical and epidemiological criteria for person under investigation (PUI)

- Patients with acute respiratory infection (sudden onset of at least one of the following: cough, sore throat, shortness of breath) requiring hospitalisation or not

**AND**

In the 14 days prior to onset of symptoms, met at least one of the following epidemiological criteria:

- Were in close contact with a confirmed or probable case of COVID-2019 infection;

**OR**

- Had a history of travel to areas with presumed ongoing community transmission of COVID-2019; i.e. China

**OR**

- Worked in or attended a health care facility where patients with COVID-2019 infections were being treated.

# Who Should be tested

- Presently, the only persons who should undergo testing for COVID-2019 are those described above under Person Under Investigation (PUI).
- All case to be discussed with NICD doctor on call before collecting samples
- The test will be free of charge for patients meeting the case definitions above

**NICD Hotline**  
**082-883-9920**



# If testing is indicated, what next?

- **Isolate the patient** using appropriate infection prevention control (see next section)
- Collect a specimen ASAP (see next section)
- Identify contacts



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- Collect a specimen ASAP (see next section)
- Identify contacts



## Who is a close contact

- A person having had face-to-face contact (within 2 metres) or was in a closed environment with a COVID-2019 case; this includes,
  - amongst others, all persons living in the same household as a COVID-2019 case and, people working closely in the same environment as a case.
  - A healthcare worker or other person providing direct care for a COVID-2019 case.
  - A contact in an aircraft sitting within two seats (in any direction) of the COVID-2019 case, travel companions or persons providing care, and crew members serving in the section of the aircraft where the index case was seated.



# How to do contact tracing and monitoring of close contacts

- Once laboratory testing confirms COVID-2019 infection:
- Provincial CDCC needs to identify close contacts, and make a contact line list using Appendix in guidelines (see next slide)
- EVERY contact to complete the contact demographic section on the contact monitoring form PDF version at: <http://www.nicd.ac.za/diseases-a-z-index/novel-coronavirus-infection/> (see next slide)
- Completed linelist and contact form also to be emailed to [ncov@nicd.ac.za](mailto:ncov@nicd.ac.za)
- Close contacts will be asked to self-quarantine at home for 14 days since exposure to the confirmed COVID-2019 and take their temperature daily (thermometers need to be issued)
- CDC / NICD/ delegated person will call contacts telephonically to identify if symptoms are present

# Monitoring of close contacts and Health workers with occupational exposure

- Monitoring of close contacts may switch from telephonic monitoring to self-monitoring dependant on the number of contacts to be followed up.
- **Close contacts under monitoring should be advised to:**
  - Remain at home (NICD can provide an official letter for employment or education facilities)
  - Avoid unnecessary social contact
  - Avoid travel
  - Remain reachable for monitoring
- **Health Worker with occupational Exposure**
  - Lists of healthcare workers with occupational exposure should be compiled by the health facility
  - They should be actively monitored for symptoms and rapidly isolated and tested should symptoms develop



# Quarantine

- Quarantine means separating asymptomatic persons who are exposed to a disease from non-exposed persons
- Quarantine is to be distinguished from isolation, which is the act of separating a sick individual with a contagious disease from healthy individuals without that contagious disease
- Quarantine procedures can be effective in limiting and slowing the introduction of a novel pathogen into a population but may entail the use of considerable resources and may infringe on the rights of members of society.
- Quarantine may take place
  - in the home
  - or in a designated facility.
- Depending on level of risk, and intensity of the exposure, different levels of quarantine will be employed, for example
  - If a person is expatriated from Wuhan, voluntary quarantine at a facility will be recommended.
  - A household member of a confirmed case will be asked to stay in their home for 14 days
  - if health worker wearing appropriate PEP is exposed to a confirmed case, the health worker would be allowed to work but would be requested to self-quarantine if symptoms develop within 14 days.

# Contact line List



## 2019-nCoV CONTACT LINE LIST

Complete a contact line list for every case under investigation and every confirmed case



Details of case under investigation/confirmed case			Details of health official completing this form		Today's date
NICD Identifier	Date Symptom Onset	DD/MM/YYYY	Surname	Name	DD/MM/YYYY
Surname	Name		Role	Facility name	
Contact number	Alternative number		Email address	Telephone number(s)	
Travel (provide details of all: 7 days before onset)		Travelled by		Bus <input type="checkbox"/> Plane <input type="checkbox"/>	
Air/bus line	Flight/bus #	Seat #			

Details of contacts (With close contact<sup>1</sup> 7 days prior to symptom onset, or during symptomatic illness.)

	Surname	First name(s)	Sex (M/F)	Age (Y)	Relation to case <sup>2</sup>	Date of last contact with case	Place of last contact with case (Provide name and address)	Residential address (for next month)	Phone number(s), separate by semicolon	HCW? <sup>3</sup> (Y/N) If Yes, facility name
1						DD/MM/YYYY				
2						DD/MM/YYYY				
3						DD/MM/YYYY				
4						DD/MM/YYYY				
5						DD/MM/YYYY				
6						DD/MM/YYYY				
7						DD/MM/YYYY				
8						DD/MM/YYYY				

<sup>1</sup> Close contact: A person having had face-to-face contact ( $\leq 2$  metres) or was in a closed environment with a 2019-nCoV case; this includes, amongst others, all persons living in the same household as a 2019-nCoV case and, people working closely in the same environment as a case. A healthcare worker or other person providing direct care for a 2019-nCoV case, while not wearing recommended personal protective equipment or PPE (e.g., gowns, gloves, NIOSH-certified disposable N95 respirator, eye protection). A contact in an aircraft sitting within two seats (in any direction) of the 2019-nCoV case, travel companions or persons providing care, and crew members serving in the section of the aircraft where the index case was seated. <sup>2</sup> Chose from: Aunt, Child, Class mate, Colleague, Cousin, Father, Friend, Grandfather, Grandmother, Healthcare worker taking care of, Mother, Nephew, Niece, Other relative, Uncle. <sup>3</sup> Healthcare worker.



# Close Contact Monitoring Tool



## 2019-nCoV DAILY SYMPTOM MONITORING TOOL



Complete for each contact of confirmed case.  
Use electronic database if possible.

If not captured electronically at site, forward to [ncov@nicd.ac.za](mailto:ncov@nicd.ac.za), on completion of last day of monitoring.

Details of contact of case under investigation/confirmed case			
NICD Identifier	Date last contact	DD/MM/YYYY	Place last contact
Surname	Name		
Date of birth	DD/MM/YYYY	Age (Years)	Sex M <input type="checkbox"/> F <input type="checkbox"/>
Contact #	Alternative contact #		
Relation to case	Place of contact		
Healthcare worker	Facility name		
Traced	Contact type* Close <input type="checkbox"/> Casual <input type="checkbox"/>		
Email	Monitoring method** Direct <input type="checkbox"/> Self-digital <input type="checkbox"/> Self-telephonic <input type="checkbox"/> Active-telephonic <input type="checkbox"/>		
Quarantine	Facility where quarantined		
Physical address (for next month, in South Africa)			
House #	Street	Suburb	
Town	Municipality		
District	Province		
Next of kin or alternative contact person details			
Name, surname	Contact number(s)		

Details of health official completing form		Today's date
Surname	Name	DD/MM/YYYY
Role	Facility name	
Email address	Telephone number(s)	

**Instructions for completion:** Mark "Y" if symptom present and "N" if not. If any symptoms are present collect, contact \_\_\_\_\_ immediately and make immediate arrangements for the collection of a combined nasopharyngeal and oropharyngeal swab. Refer to 2019-nCoV Quick Guide on the NICD website for additional details.

DAY	1	2	3	4	5	6	7
Date (DD/MM)							
Fever ( $\geq 38^{\circ}\text{C}$ )	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N
Chills	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N
Cough	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N
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Myalgia/body pains	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N
Diarrhoea	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N

DAY	8	9	10	11	12	13	14
Date (DD/MM)							
Fever ( $\geq 38^{\circ}\text{C}$ )	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N
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Shortness of breath	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N
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Diarrhoea	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N

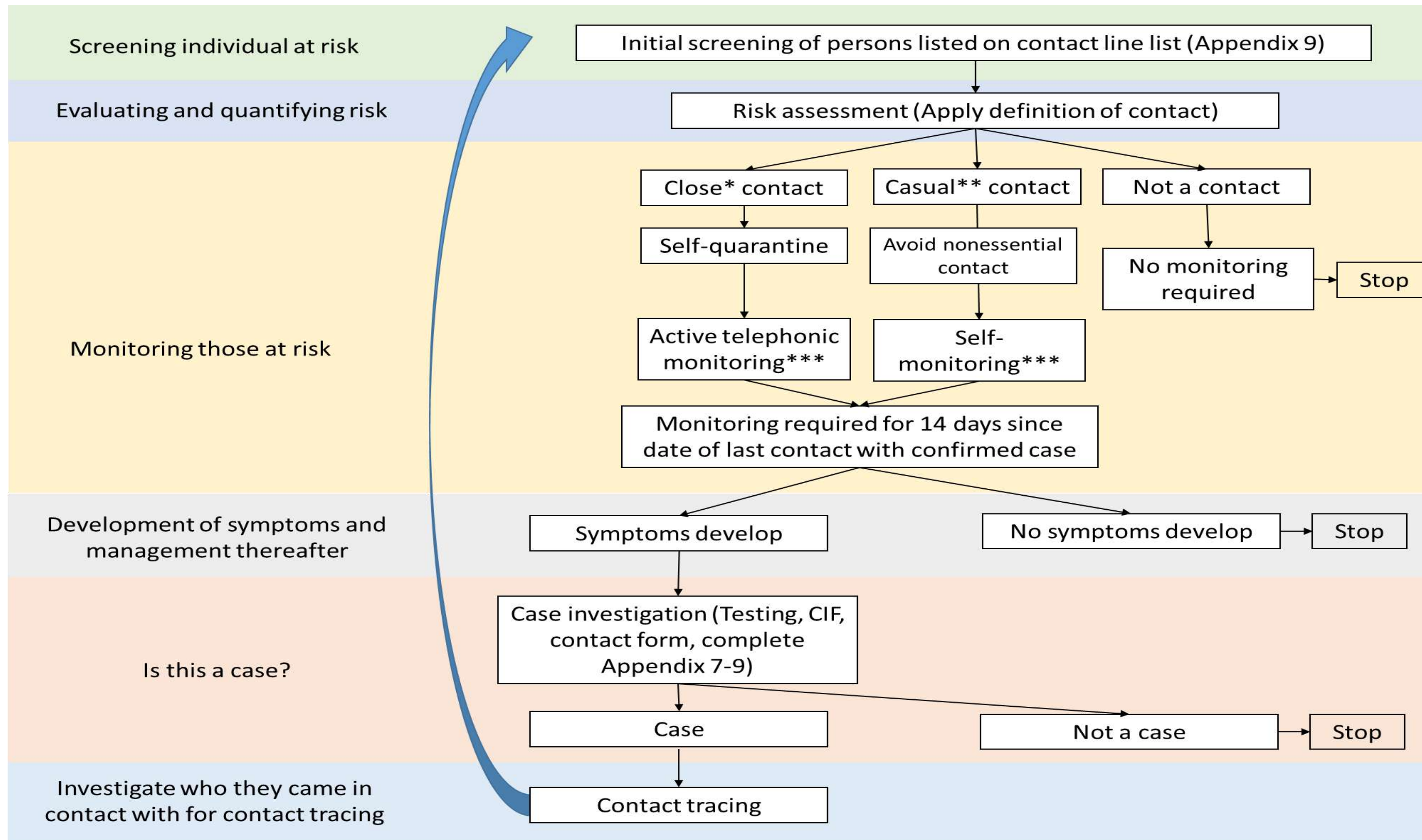
PDF version at: <http://www.nicd.ac.za/diseases-a-z-index/novel-coronavirus-infection/>

# Management of close contacts who develop symptoms

- Should a contact develop symptoms, both the provincial CDCC and NICD call centre team should be informed
- Arrangements will be made by the provincial CDCC with assistance from NICD to visit the patient in their home on the same day to collect a specimen and to complete the required documentation.
  - Appropriate PPE should be used (e.g., gowns, gloves, NIOSH-certified disposable N95 respirator, eye protection) during home visits.
  - If a healthcare worker is not available, the patient will be requested to visit their nearest healthcare facility to have a specimen collected.
- The CDCC should inform the healthcare facility of the incoming patient in order for the healthcare facility to use appropriate infection prevention and control (IPC) measures.



# Contact tracing summary



\* Close contact: A person having had face-to-face contact ( $\leq 2$  metres) or was in a closed environment with a 2019-nCoV case; this includes, amongst others, all persons living in the same household as a 2019-nCoV case and, people working closely in the same environment as a case. A healthcare worker or other person providing direct care for a 2019-nCoV case, while **not** wearing recommended personal protective equipment or PPE (e.g., gowns, gloves, NIOSH-certified disposable N95 respirator, eye protection). A contact in an aircraft sitting within two seats (in any direction) of the 2019-nCoV case, travel companions or persons providing care, and crew members serving in the section of the aircraft where the index case was seated.

\*\* Casual contact: Anyone not meeting the definition for a close contact but with possible exposure.

\*\*\*Monitoring methods: Active-telephonic monitoring: NICD call centre will phone person who is home-quarantined each day for a symptom report; Self-monitoring: person to consult healthcare practitioner in the event of symptom development.



**Laboratory diagnostics**

# Who should be tested?

- Only patients under investigation (PUI) for COVID-2019 should be tested
- **Please discuss plans to collect samples with doctor on call before collecting sample: NICD hotline – 082 883 9920**
- Rapid collection, transport and testing of appropriate specimens from PUI is a priority
- Patients should be managed as potentially infected when the clinical and epidemiological data strongly suggest COVID-2019 infection

# Specimen Collection

- Lower respiratory tract samples are preferred.
- Respiratory samples are the primary method of diagnosis.
- Respiratory samples include:
  - Combined nasopharyngeal and oropharyngeal swab (placed in the same tube) in ambulatory patients and
  - sputum (if produced)
  - Tracheal aspirate or Broncho alveolar lavage in patients with more severe respiratory disease.
- Serum for serological testing - acute and convalescent samples may be submitted in addition to respiratory samples.
- Use universal/viral transport medium for swabs if available and if not dry swabs; sterile container for sputum and aspirates; clotted blood container for serum



**Table 1. Type of specimens that can be collected for 2019-nCoV diagnostics and the transport requirements of these specimens**



Specimen type	Collection materials	Storage and transportation	Dangerous goods shipping category	Comment
<b>FOR SYMPTOMATIC PATIENTS:</b>				
Sputum*	Deep cough sputum in sterile leak proof container	Refrigerate and ship at 2-8 °C up to 48 hrs, if >48 hrs freeze at -70°C and ship on dry ice	Biological substance, Category B	The preferred sample but need to ensure the material is from the lower respiratory tract
Bronchoalveolar lavage*	2-3 ml in sterile leak proof container	Refrigerate and ship at 2-8 °C up to 48 hrs, if >48 hrs freeze at -70°C and ship on dry ice	As above	There may be some dilution of virus but still a worthwhile specimen
(Endo)tracheal or nasopharyngeal aspirate*	2-3 ml in sterile leak proof container	Refrigerate and ship at 2-8 °C up to 48 hrs, if >48 hrs freeze at -70°C and ship on dry ice	As above	
Nasopharyngeal and oropharyngeal swab	Dacron or nylon flocced swab in Universal Transport Medium (UTM) in a sterile leak proof container	Refrigerate at 2-8 °C up to 5 days, if >5 days freeze at -70°C and ship on dry ice	As above	Nasopharyngeal and oropharyngeal swabs should be placed in the same tube to increase the viral load
Serum	Serum separator tube**	Store upright for at least 30 minutes after collection. a Refrigerate and ship at 2-8 °C within 5 days	As above	Collect paired samples: <ul style="list-style-type: none"> <li>• Acute – first week of illness</li> <li>• Convalescent – 2-3 weeks later</li> </ul>
Lung tissue from biopsy or autopsy	Sterile container with saline	Refrigerate and ship at 2-8 °C up to 24 hrs, if >24 hrs freeze at -70°C and ship on dry ice		

\* Aerosol-generating procedures may pose an infection risk for health care workers. \*\* Children and adults: collect 1 tube (5-10ml) of whole blood. Infant: a minimum of 1ml in a serum separator tube.



# Collection of naso/oropharyngeal swabs for detection of respiratory viruses

## COLLECTION OF NASO/OROPHARYNGEAL SWABS FOR DETECTION OF RESPIRATORY VIRUSES:

Respiratory viruses are best isolated from material that contains infected cells and secretions. Therefore, swabs should aim to brush cells and secretions off the mucous membranes of the upper respiratory tract. **Good specimen quality** (ie. containing sufficient cells and secretions), appropriate **packaging and transport** (i.e. to keep virus viable/detectable) is essential. **Please discuss plans to collect samples with doctor on call before collecting sample at NICD hotline - 0828839920**

### Step 1: Equipment and materials

1. Specimen submission form and case investigation form
2. Nasopharyngeal (NP) and oropharyngeal (OP) flocked swab
3. Tube containing universal transport medium (UTM)
4. Tongue depressor
5. Gloves
6. N95 mask (fit tested)
7. Biohazard bag for disposal of non-sharp materials
8. Tissue for patient to wipe nose after sample collection
9. Cooler box and cooled ice packs
10. Ziploc plastic specimen bag

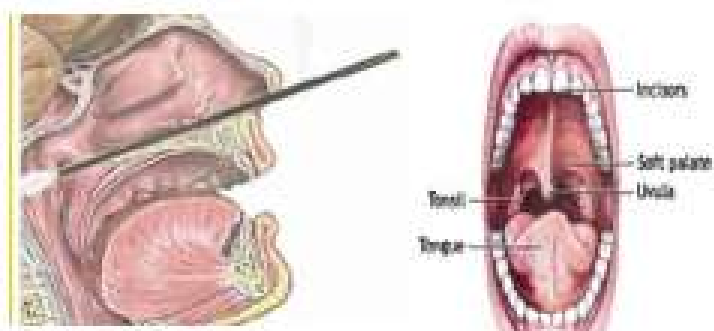
### Step 2: Record keeping

1. Complete the specimen submission form and case investigation form (available on NICD website)
2. Place the specimen submission form into a ziplock bag
3. Label the tube of universal transport media (UTM) with the patient's name and date of birth

### Step 3: Collection of nasopharyngeal swab (NPS)

1. Don a pair of gloves, and an N95 respirator, making sure the respirator has a good fit. Open a sterile flocked swab at the plastic shaft
2. Ask the patient to tilt his/her head back. Estimate the distance from the patient's nose to the ear: This is how far the swab should be inserted
3. Gently insert swab into the nostril and back (not upwards) to the nasopharynx until a slight resistance is met
4. Rotate swab 2-3 times and hold in place for 2-3 seconds
5. If resistance is met remove and try another nostril
6. Slowly withdraw swab and without touching it, put it into a UTM
7. Break plastic shaft at the break point line and close the tube

**Diagram:** How to collect a nasopharyngeal swab (left) and oropharyngeal swab (right)



### Step 4: Collection of oropharyngeal swab (OPS)

1. Keeping the same pair of gloves on, and holding the UTM with the nasopharyngeal swab in, take a second flocked swab and open it at the plastic shaft
2. Ask the patient to tilt their head back and open mouth wide
3. Hold the tongue down with a tongue depressor
4. Have the patient say "aahh" to elevate the uvula
5. Swab each tonsil first, then the posterior pharynx in a "figure 8" movement
6. Avoid swabbing the soft palate and do not touch the tongue with the swab tip as this procedure can induce the gag reflex.
7. Place the swab into the same UTM tube with the NPS already in and break off the shaft at the break point line
8. Tightly close the tube
9. Place the closed tube with two swabs in the Ziploc
10. Remove gloves and N95 mask
11. Wash hands with soap and water

### Step 5: Transport of specimens

1. Ensure the cooler box and ice packs stay at 2-8°C
2. Transport to CRDM, NICD on same day as collection
3. Mark: Suspected Novel coronavirus, CRDM NHLS/NICD, Centre for Respiratory Disease and Meningitis (CRDM) Lower North Wing, SAVP building 1 Modderfontein Rd, Sandringham, Johannesburg, 2131
4. NHLS laboratories use usual overnight regional courier service
5. Private laboratories/clinics to organise shipment using existing systems, or contact CRDM for assistance if not available

### Step 6: Contact details for additional assistance

#### Sample collection

Sibongile Walaza sibongilew@nicd.ac.za 011-386-6410/  
083-657-4741

#### Sample transport

Linda de Gouveia lindad@nicd.ac.za 011-555-0327  
Amelia Buys ameliab@nicd.ac.za 011-386-6373  
Cardia Fourie cardiaf@nicd.ac.za 011-386-6373



health

Department:  
Health  
REPUBLIC OF SOUTH AFRICA



NATIONAL INSTITUTE FOR  
COMMUNICABLE DISEASES

Division of the National Health Laboratory Service



# Swabs Important Information

- Clearly mark each specimen ( e.g. Left Nasal Swab Tight Nasal Swab)
- If you send multiple swabs unmarked the lab has no idea where they come from
- You must identify which facility the swab comes from
- Clinicians name and contact details are important





**DO NOT**  
**send any specimen to NICD without prior**  
**discussion and notification**

# Hand hygiene before and after any interaction with the patient



# Equipment and materials

1. Specimen submission form and case investigation form.
2. Nasopharyngeal (NP) and oropharyngeal (OP) flocked swab.
3. Tube containing universal transport medium (UTM).
4. Tongue depressor.
5. Gloves.
6. N95 mask (fit tested).
7. Biohazard bag for disposal of non-sharp materials.
8. Tissue for patient to wipe nose after sample collection.
9. Cooler box and cooled ice packs.
10. Ziploc plastic specimen bag.



# Step 1: Report the PUI

- 1. Report the PUI to the NICD to allow a risk assessment to be carried out and guide laboratory testing**
2. Contact the NICD Hotline +27 82 883 9920
3. The test will be free of charge for patients meeting the case definitions above

# Step 2: Record keeping

- 1. Complete the specimen submission form and case investigation form (available on NICD website). <http://www.nicd.ac.za/diseases-a-z-index/novel-coronavirus-infection/>
- 2. Place the specimen submission form into a ziplock bag.
- 3. Label the tube of universal transport media (UTM) with the patient's name and date of birth.



# Complete the correct forms

- For each person under investigation (PUI) a laboratory specimen submission form and a person under investigation (PUI) form has to be completed and submitted together with the specimens
- Always check on the NICD website that you have the current version of the forms <http://www.nicd.ac.za/diseases-a-z-index/novel-coronavirus-infection/>

CRDM episode no:      CRDM lab no:      Trak no:      Date received:

Centre for Respiratory Diseases and Meningitis Specimen Submission form			
<b>Patient Information</b>		<b>Submitter Information (contact person for results)</b>	
Identifier or Hospital no		Surname	
Surname		First name	
First name		Laboratory	
Age/Date of birth		City, Country	
Gender		Contact number (country code) + (    )	
Facility/Hospital		Email address	
<b>Specimen Details</b>			
Specimen collection date:	dd-mm-yyyy		
Specimen type:	<input type="checkbox"/> Combined NP/OP swab	<input type="checkbox"/> Nasopharyngeal (NP) aspirate	<input type="checkbox"/> Nasal swab
	<input type="checkbox"/> Nasopharyngeal (NP) swab	<input type="checkbox"/> Bronchoalveolar lavage (BAL)	<input type="checkbox"/> Sputum
	<input type="checkbox"/> Oropharyngeal (OP) swab	<input type="checkbox"/> Pleural fluid	<input type="checkbox"/> CSF
	<input type="checkbox"/> Tracheal aspirate (TA)	<input type="checkbox"/> Blood culture	<input type="checkbox"/> Serum
	<input type="checkbox"/> Whole blood	<input type="checkbox"/> Other, specify:	
<b>Laboratory Test Details (please consult with CRDM if testing other than influenza, RSV or B. pertussis is required)</b>			
Tests requested:	<input type="checkbox"/> Avian influenza	<input type="checkbox"/> Influenza / RSV	<input type="checkbox"/> MERS-CoV
	<input type="checkbox"/> Bordetella pertussis	<input type="checkbox"/> Legionella spp.	<input type="checkbox"/> Atypical pneumonia*
	<input type="checkbox"/> C. diphtheriae	<input type="checkbox"/> Respiratory panel (bacterial & viral)*	<input type="checkbox"/> Neonatal sepsis*
	<input type="checkbox"/> Group A streptococcus	<input type="checkbox"/> Community-acquired pneumonia (bacteria)*	<input type="checkbox"/> Bacterial meningitis*
	<input type="checkbox"/> Group B streptococcus	<input type="checkbox"/> Hospital-acquired pneumonia (bacteria)*	<input type="checkbox"/> Viral meningitis*
			<input type="checkbox"/> Other, specify:
<b>Clinical Presentation and Outcome</b>			
Date of symptom onset: dd-mm-yyyy			
Clinical diagnosis:	<input type="checkbox"/> Acute rheumatic fever	<input type="checkbox"/> Meningococcal disease	<input type="checkbox"/> Lower respiratory tract infection
	<input type="checkbox"/> Diphtheria	<input type="checkbox"/> Influenza-like illness	<input type="checkbox"/> Upper respiratory tract infection
	<input type="checkbox"/> Pertussis	<input type="checkbox"/> Meningitis	<input type="checkbox"/> Other, specify: _____
Symptoms:	<input type="checkbox"/> Fever (≥38°C)	<input type="checkbox"/> Sore Throat	<input type="checkbox"/> Cough
	<input type="checkbox"/> Shortness of breath	<input type="checkbox"/> Vomiting	<input type="checkbox"/> Diarrhoea
	<input type="checkbox"/> Apnoea	<input type="checkbox"/> Other, specify: _____	<input type="checkbox"/> Unknown
Underlying Risk Factors:	<input type="checkbox"/> Asthma	<input type="checkbox"/> Chronic Lung Disease	<input type="checkbox"/> Diabetes
	<input type="checkbox"/> Heart Disease	<input type="checkbox"/> Other, specify: _____	<input type="checkbox"/> HIV
			<input type="checkbox"/> Pregnancy
			<input type="checkbox"/> TB
			<input type="checkbox"/> Unknown
Hospitalisation:	<input type="checkbox"/> Outpatient	<input type="checkbox"/> Inpatient – not admitted ICU	<input type="checkbox"/> Inpatient – admitted to ICU
	<input type="checkbox"/> Unknown	<b>Outcome:</b>	
		<input type="checkbox"/> Still hospitalised	<input type="checkbox"/> Survived
		<input type="checkbox"/> Died	<input type="checkbox"/> Unknown
		<input type="checkbox"/> Unknown	
<b>Exposure History</b>			
Did the patient travel in the 14 days prior to symptom onset? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown			
Area/Country travelled to:	Date of travel to this area	Date of travel from this area	
1.	dd-mm-yyyy	dd-mm-yyyy	
2.			
Did the patient have animal contact in the 14 days prior to symptom onset? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown			
Animal type	Date of exposure	Exposure type	
<input type="checkbox"/> Swine <input type="checkbox"/> Wildbirds <input type="checkbox"/> Poultry (eg. chickens, ostrich, ducks)	dd-mm-yyyy		
<input type="checkbox"/> Other, specify: _____			
Tel: +27 (0)11 555 0315   0317 NICD Hotline: 082 883 9920 Email: lindad@nicd.ac.za/orienkah@nicd.ac.za Please attach any relevant information			

CRDM episode no:      CRDM lab no:      Trak no:      Date received:

## CRDM PCR Diagnostic Test Panels:

Test name:	Pathogens:
Respiratory panel	<p><b>Viruses:</b></p> <p>Influenza A, influenza B, influenza C, rhinovirus, human coronavirus, parainfluenza virus, human bocavirus, human metapneumovirus, enterovirus, adenovirus, parechovirus, respiratory syncytial virus (RSV)</p> <p><b>Bacteria:</b></p> <p><i>Mycoplasma pneumoniae</i>, <i>Chlamydia pneumoniae</i>, <i>Haemophilus influenzae</i>, <i>Haemophilus influenzae</i> type B, <i>Staphylococcus aureus</i>, <i>Klebsiella pneumoniae</i>, <i>Legionella spp.</i>, <i>Salmonella</i>, <i>Bordetella pertussis</i>, <i>Moraxella catarrhalis</i></p> <p><b>Fungi:</b></p> <p><i>Pneumocystis jiroveci</i></p>
Community-acquired pneumonia	<i>Streptococcus pneumoniae</i> , <i>Staphylococcus aureus</i> , <i>Haemophilus influenzae</i> , <i>Moraxella catarrhalis</i>
Hospital-acquired pneumonia	<i>Klebsiella pneumoniae</i> , <i>Pseudomonas aeruginosa</i>
Atypical pneumonia	<i>Mycoplasma pneumoniae</i> , <i>Chlamydia pneumoniae</i> , <i>Legionella spp.</i>
Neonatal sepsis	Group B streptococcus, <i>Listeria monocytogenes</i> , <i>Staphylococcus aureus</i> , <i>Chlamydia trachomatis</i> , <i>Ureaplasma urealyticum/parvum</i> , cytomegalovirus
Bacterial meningitis	<i>Streptococcus pneumoniae</i> , <i>Neisseria meningitidis</i> , <i>Haemophilus influenzae</i>
Viral meningitis	Adenovirus, cytomegalovirus, epstein barr virus, herpes simplex virus 1, herpes simplex virus 2, varicella zoster virus, enterovirus, parechovirus, human herpesvirus 6, human herpesvirus 7, parvovirus B19, mumps virus



# Person under investigation form (CIF)



Final version 2\_ 31JANUARY 2020  
CENTRE FOR RESPIRATORY DISEASES AND MENINGITIS  
OUTBREAK RESPONSE, DIVISION OF PUBLIC HEALTH SURVEILLANCE  
AND RESPONSE

Internal use  
CRDM PUI form no: \_\_\_\_\_  
CRDM unique no: \_\_\_\_\_

## Patient under investigation (PUI) form: Request for 2019-nCoV Testing

Please note that the original case investigation forms should be sent together with the specimen collection form  
Furthermore, the completed case investigation form must be scanned and emailed to [ncov@nicd.ac.za](mailto:ncov@nicd.ac.za) as detailed below  
Tel: (+27)3866392/ (+27) 3866410 | Fax: (+27)11 8829979 | Hotline: 082 883 9920 | Queries / submission: [ncov@nicd.ac.za](mailto:ncov@nicd.ac.za)

Today's date:  Form completed by (Name, Surname): \_\_\_\_\_ Contact number(s): \_\_\_\_\_

Is this a:  New clinical query  If contact of a known case, provide case details: \_\_\_\_\_  
 Contact of a known case  Known case first name: \_\_\_\_\_  
 Known case surname: \_\_\_\_\_  
 Known case DOB:

Detected at point of entry?  Y  N  Unkn  If yes, date:  Please specify the point of entry: \_\_\_\_\_

PATIENT DETAILS		DOCTOR'S DETAILS	
Patient hospital number (if available):	_____	First name:	_____
First name:	_____ Surname: _____	Surname:	_____
DOB:	<input type="text" value="DD/MM/YYYY"/> Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/>	Facility name:	_____
Residency:	<input type="checkbox"/> SA resident <input type="checkbox"/> Non-SA resident <input type="checkbox"/> (specify) _____	Contact number/s:	_____
Current residential Address <sup>1</sup> :	_____	Email address:	_____
Patient's contact number(s):	_____		_____
Please include alternative number			_____
Please indicate occupation (tick any if apply):	<input type="checkbox"/> Student <input type="checkbox"/> Unemployed <input type="checkbox"/> Working with animals <input type="checkbox"/> Health laboratory worker <input type="checkbox"/> Healthcare worker <input type="checkbox"/> Facility name: _____ <input type="checkbox"/> Other <input type="checkbox"/> Specify _____		

**NEXT OF KIN CONTACT DETAILS (alternative contact details)**

First name: \_\_\_\_\_ Surname: \_\_\_\_\_  
 Relationship to the patient: \_\_\_\_\_ Contact number(s): \_\_\_\_\_

**CLINICAL PRESENTATION AND HISTORY**

Date of symptom onset:  Date of current consultation/admission:

Symptoms (tick all that apply):

Fever (≥38°C) <input type="checkbox"/>	Sore throat <input type="checkbox"/>	Myalgia/body pains <input type="checkbox"/>
History of fever <input type="checkbox"/>	Shortness of breath <input type="checkbox"/>	General weakness <input type="checkbox"/>
Cough <input type="checkbox"/>	Nausea/vomiting <input type="checkbox"/>	Irritability/confusion <input type="checkbox"/>
Chills <input type="checkbox"/>	Diarrhoea <input type="checkbox"/>	Other <input type="checkbox"/> (specify if other) _____

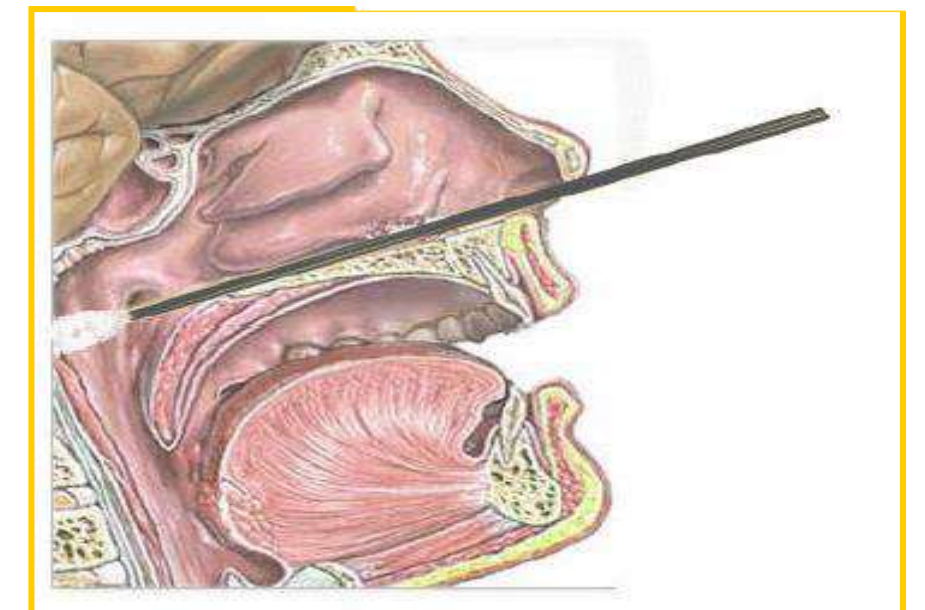
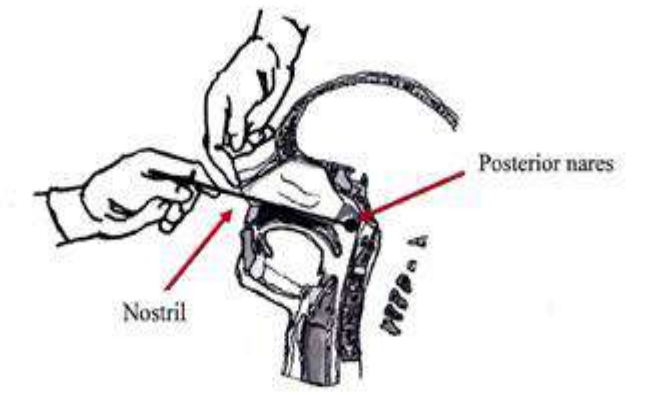
**DIAGNOSIS**

- Did the patient have clinical or radiological evidence of pneumonia  Y  N
- Were chest X-rays (CXR) done:  Y  N If yes, CXR Findings: \_\_\_\_\_
- Did the patient have clinical or radiological evidence of acute respiratory distress syndrome (ARDS)?  Y  N
- Does the patient have another diagnosis/etiology for their respiratory illness?  Y (specify) \_\_\_\_\_  N  Unknown



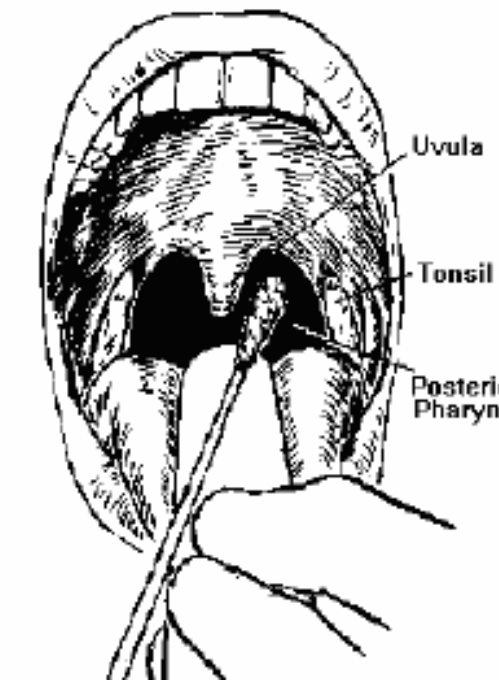
# Step 3: Collection of nasopharyngeal swab (NPS)

1. Don a pair of gloves, and an N95 respirator, making sure the respirator has a good fit. Open a sterile flocked swab at the plastic shaft
2. Ask the patient to tilt his/her head back. Estimate the distance from the patient's nose to the ear: This is how far the swab should be inserted
3. Gently insert swab into the nostril and back (not upwards) to the nasopharynx until a slight resistance is met
4. Rotate swab 2-3 times and hold in place for 2-3 seconds
5. If resistance is met remove and try another nostril
6. Slowly withdraw swab and without touching it, put it into a UTM
7. Break plastic shaft at the break point line and close the tube



# Step 4: Collection of oropharyngeal swab (OPS)

1. Keeping the same pair of gloves on, and holding the UTM with the nasopharyngeal swab in, take a second flocked swab and open it at the plastic shaft
2. Ask the patient to tilt their head back and open mouth wide
3. Hold the tongue down with a tongue depressor
4. Have the patient say “aahh” to elevate the uvula
5. Swab each tonsil first, then the posterior pharynx in a “figure 8” movement
6. Avoid swabbing the soft palate and do not touch the tongue with the swab tip as this procedure can induce the gag reflex.
7. Place the swab into the same UTM tube with the NPS already in and break off the shaft at the break point line
8. Tightly close the tube
9. Place the closed tube with two swabs in the Ziploc
10. Remove gloves and N95 mask
11. Wash hands with soap and water



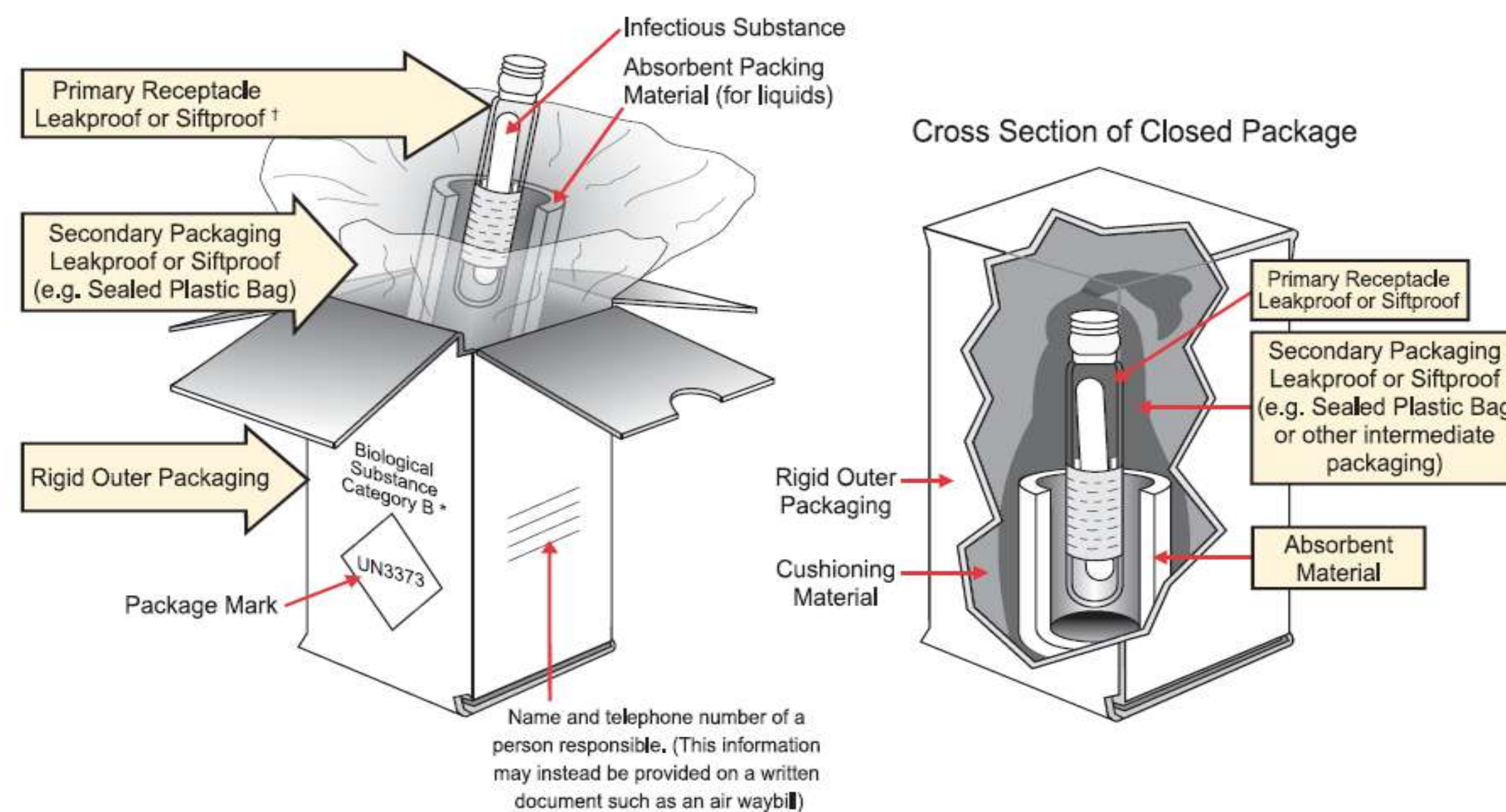


# Step 5: Transport of specimens

- 1. Ensure the cooler box and ice packs stay at 2-8 degrees Centigrade.
- 2. Transport to CRDM, NICD on same day as collection.
- 3. Mark: **Suspected Novel coronavirus, CRDM NHLS/NICD, Centre for Respiratory Disease and Meningitis (CRDM) Lower North Wing, SAVP building 1 Modderfontein Rd, Sandringham, Johannesburg, 2131.**
- 4. NHLS laboratories use usual overnight regional courier service.
- 5. Private laboratories/clinics to organise shipment using existing systems, or contact CRDM for assistance if not available.

# Packaging of specimens for transfer to NICD

- The principle of triple layer packaging should be followed (Figure 1).
- UN/WHO approved shipping containers for hazardous specimens are commercially available, e.g. SAF-T-PAK<sup>®</sup> ([www.saftpak.com](http://www.saftpak.com)) or PATHOPAK<sup>®</sup> ([www.intelsius.com](http://www.intelsius.com)).



**Figure 1.** Example of the triple packaging system for the packing and labelling of Category B substances.

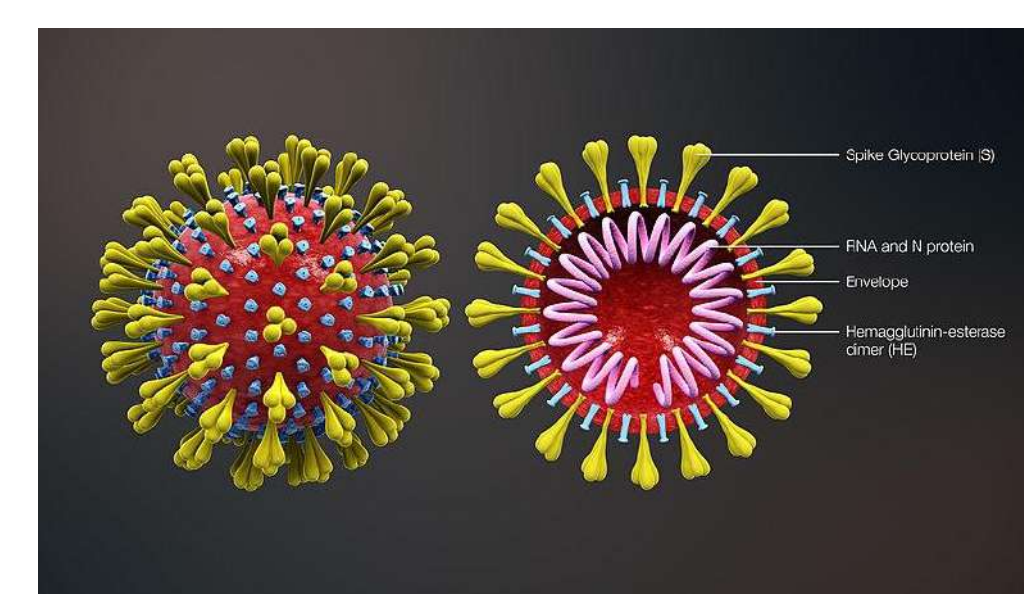


# Step 6: Contact details for additional assistance

- Sample collection
  - Sibongile Walaza sibongilew@nicd.ac.za 011-386-6410
- Sample transport
  - Linda de Gouveia lindad@nicd.ac.za 011-555-0327
  - Amelia Buys ameliab@nicd.ac.za 011-386-6373
  - Cardia Fourie cardiaf@nicd.ac.za 011-386-6373
- <http://www.nicd.ac.za/wp-content/uploads/2020/02/2019-nCov-Quick-reference-v3-03.02.2020-final.pdf>



# Laboratory diagnostic assays



- Real-time reverse-transcription polymerase chain reaction (rRT-PCR) - amplification and detection of unique COVID-2019 viral nucleic acid sequences
- TAT - 24 hours
- Positive specimens - characterised by viral culture and whole genome sequencing

Eurosurveillance Jan 2020

## Detection of 2019 novel coronavirus (2019-nCoV) by real-time RT-PCR

Victor M Corman<sup>1</sup>, Olfert Landt<sup>2</sup>, Marco Kaiser<sup>2</sup>, Richard Molenkamp<sup>3</sup>, Adam Meijer<sup>4</sup>, Daniel KW Chu<sup>5</sup>, Tobias Bleicker<sup>1</sup>, Sebastian Brünink<sup>1</sup>, Julia Schneider<sup>1</sup>, Marie Luisa Schmidt<sup>1</sup>, Daphne GJC Mulders<sup>3</sup>, Bart L Haagmans<sup>3</sup>, Bas van der Veer<sup>4</sup>, Sharon van den Brink<sup>4</sup>, Lisa Wijsman<sup>4</sup>, Gabriel Goderski<sup>4</sup>, Jean-Louis Romette<sup>6</sup>, Joanna Ellis<sup>7</sup>, Maria Zambon<sup>7</sup>, Malik Peiris<sup>5</sup>, Herman Goossens<sup>8</sup>, Chantal Reusken<sup>4</sup>, Marion PG Koopmans<sup>3</sup>, Christian Drosten<sup>1</sup>

# Interpretation of rRT-PCR results

- Negative result does not rule out possibility of infection
- Factors that could lead to a false –negative result:
  - Poor specimen quality
  - Specimen was collected late or very early in the illness
  - Specimen was not handled and shipped appropriately, ( eg. the cold chain)
  - Technical reasons inherent in the test, e.g virus mutation

If negative results are obtained from patients with a high index of suspicion for COVID-2019 infection, especially when only upper respiratory tract samples were collected, additional specimens, including lower respiratory samples should be collected and tested.



# Infection prevention and control

# Principles of disease transmission



## Direct contact

- Touching an ill person or a contaminated surface
- E.g. agents of diarrhoea, skin infections, common cold, ebola virus

## Control

- Gloves, +/- gowns, masks, visors (to prevent mucous membrane splashes, contamination of clothing)



## Droplet transmission

- Inhaling droplets (up to 1/4mm in diameter)
- Persons within 2m radius are at risk. On aircraft, 2 rows behind and in front
- E.g. agents of bacterial pneumonia, Neisseria meningitidis

## Control

- Gloves, surgical masks, +/- gowns, masks, visors (to prevent mucous membrane splashes, contamination of clothing)

## Airborne transmission

- Inhaling droplets nuclei (10-20um in diameter)
- Persons breathing the same air
- E.g. influenza, measles, chickenpox,

## Control

- Gloves, N95 masks, +/- gowns, masks, visors (to prevent mucous membrane splashes, contamination of clothing)

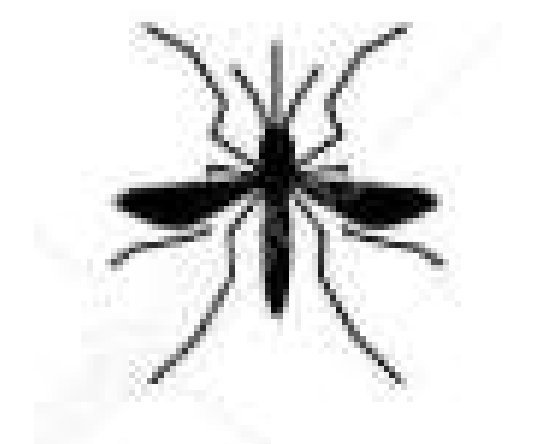


## Vector transmission

- Contact with vector
- E.g. malaria, dengue, Zika,

## Control

- Prevent/eliminate exposure to vector
- Chemoprophylaxis if possible





# Principles of disease transmission

## Coronavirus ?



### Direct contact

- Touching an ill persons or a contaminated surface
- E.g. agents of diarrhoea, skin infections, common cold, ebola virus

### Control

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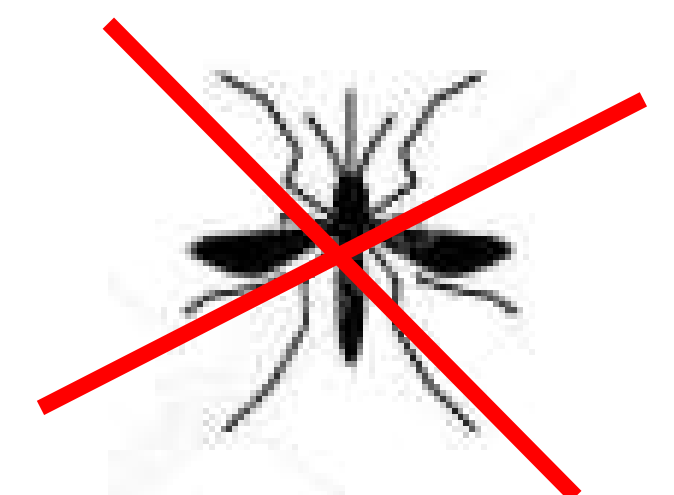


### Vector transmission

- Contact with vector
- E.g. malaria, dengue, Zika,

### Control

- Prevent/eliminate exposure to vector
- Chemoprophylaxis if possible



# IPC strategies to address suspected COVID infection

- Ensure triage, early recognition and source control (early isolation of persons with suspected COVID infection)
- Apply standard precautions for all patients
- Implement empiric additional precautions for suspected cases (droplet, contact and airborne where applicable)
- Implement administrative controls (*IPC committee, checklist, assign responsibility for opening windows and triaging*)
- Use environmental controls (*open windows, UV light, ensure airflow direction protects HCW*)
- Use engineering controls (*ensure air-conditioning is working, Uvlight germicidal irradiation unit is functional*)

# In all facilities....

- Implement screening for COUGH, respiratory symptoms and TRAVEL HISTORY at entrance to the facility / clinic / casualty / hospital
- Put a sign up asking for persons with a travel history to China in last 14 days to identify themselves to staff
- Provide surgical masks to persons who sneeze, cough etc
- See persons who have symptoms first
- Encourage hand hygiene amongst patients and HCW



# In all facilities.....

- Ensure hand hygiene for HCW and patients is possible, and done!
- Provide soap, basins
- Use posters to show 5-movements of hand hygiene
- Provide hand sanitiser
- Use health promotion staff to demonstrate hand and cough hygiene



# When caring for someone with suspected COVID-

- Implement contact and droplet precautions
  - Put in a well ventilated isolation room
  - Provide them with a mask
  - Implement contact and droplet precautions
  - Limit the number of staff who can enter the isolation room
- Implement contact and droplet precautions:
  - Surgical/medical mask
  - Disposable gown
  - Gloves
  - Eye protection
- Not required for droplet precautions
  - Boots, apron not required
  - Negative pressure respiratory isolation room not required.

# When caring for someone with suspected COVID-

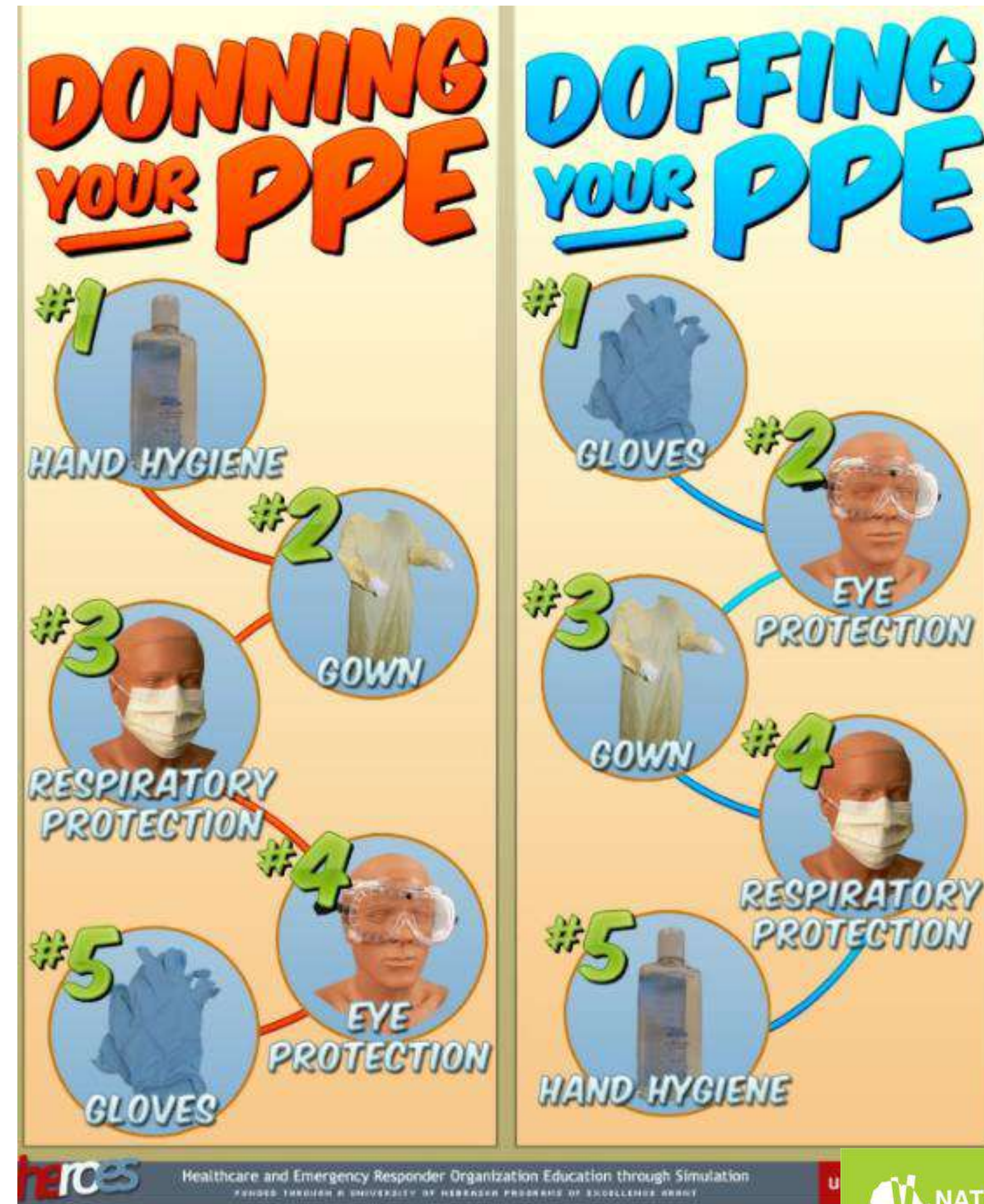
- When taking a sputum specimen or nasopharyngeal swab use airborne and contact precautions are required
  - E.g. nasopharyngeal swabs, intubation, tracheal aspirate
- Use N95 respirator
- Use waterproof apron, boots
- Use a face-shield or goggles





# Training in use of IPC

- Ensure staff are trained and familiar with
  - Triage
  - Handwashing
  - Screening
  - Case definitions
  - Use of PPE



health

Department:  
Health  
REPUBLIC OF SOUTH AFRICA



NATIONAL INSTITUTE FOR  
COMMUNICABLE DISEASES

Division of the National Health Laboratory Service



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

Interim guidance

25 January 2020



[WHO/2019-nCoV/IPC/v2020.2](https://www.who.int/publications-detail/WHO/2019-nCoV/IPC/v2020.2)

## 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*,<sup>1</sup> 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.<sup>2</sup>

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.<sup>2</sup>

## 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.<sup>3</sup> In countries where IPC is limited or inexistent, it is critical to start by ensuring that at least

### 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 questionnaires according to the updated case definition ([https://www.who.int/publications-detail/global-surveillance-for-human-infection-with-novel-coronavirus-\(2019-ncov\)](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 promotion 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

- If in doubt, refer to this WHO guideline
- It is ESSENTIAL to distribute this guideline to your facility staff and follow up on implementation

# Management of the deceased

- Confirm the diagnosis in deceased persons who are close contacts of COVID cases.
  - NP swabs, bronchial washings can be taken post mortem
- Use contact and droplet precautions when handling the body
  - Airborne precautions not required as the deceased do not create airborne particles
- Environmental Health Practitioners are informed following the assist with procedures
- Follow Appendix 12 of RSA guideline
  - Triple body bag, first two are transparent and sealed, and third is black and unsealed
  - A biohazard warning tab should be attached as per SOP



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# How can I know if my facility is ready?

- Use our facility readiness checklist
- Call your facility IPC committee
- Talk through the checklist
- Talk through a 'desktop simulation scenario'

Novel Coronavirus (nCoV) Readiness Checklist			
		Total in Facility	
General information	Number of HCW employed / working at your facility		
	Number of designated points of entry for ill patients		
	Do you have isolation units in the Facility if yes how many beds		
	Private wards		
	Private ward airborne precautions(-ve Pressure cubicles )		
	Large cohort area identified Number of beds		
	Isolation area in emergency department identified		
	ICU Isolation cubicles number		
ICU isolation cubicles -ve pressure			
<b>Intervention area</b>	<b>Indicators</b>	<b>Values</b>	<b>Yes/No</b>
Coordination	Is there a Facility preparedness and response plan for events caused by respiratory pathogens?		No
	Do you have a committee established in the Facility to ensure all plans are in place		No
	Do you maintain minutes of the meetings of this committee		No
	Do you have and have you reviewed plans for implementation of surge capacity procedures and crisis standards of care.		No
	Do you believe you have everything in place to identify and isolate patients with 2019-nCoV and inform key facility staff and public health authorities		No
	Do you have supplies of PPE for staff in front line areas		No
	Do you have supplies of PPE for staff in Facility care areas in case of a positive or suspected case		No
	Do you have contingency plans if the demand for PPE or other supplies exceeds supply.		No
	Have you designated an area for the isolation of patients who may be at risk for Corona virus		No
	Have plans been made to ensure that stock is accessible in the Facility		No
	Do you have a screening tool in place in all areas of entry for the Facility		No
	Has Training on n- Cov been commenced in your Facility?		No

# Facility self assessment

( SOUTH AFRICA Facility ) Novel Coronavirus (nCoV) Country Readiness Checklist				Hospital Name		
<b>General information</b>		Total in Facility		CEO Name		
	Number of HCW employed / working at your facility			CEO Contact details		
	Number of designated points of entry for ill patients			Cell		
	Do you have isolation units in the Facility if yes how many beds			Office		
	Private wards			email		
	Private ward airborne precautions ( -ve Pressure cubicles )			Fax		
	Large cohort area identified Number of beds			Date of Report		
	Isolation area in emergency department identified			<b>Facility CEO / Manager Signature</b>		
	ICU Isolation cubicles number					
ICU isolation cubicles -ve pressure						
<b>Intervention area</b>	<b>Indicators</b>	<b>Values</b>	<b>Yes/No</b>	<b>Comments</b>	<b>Gaps</b>	<b>Resources</b>
	Is there a Facility preparedness and response plan for events caused by respiratory pathogens?		No			
	Do you have a committee established in the Facility to ensure all plans are in place		No			
	Do you maintain minutes of the meetings of this committee		No			
	Do you have and have you reviewed plans for implementation of surge capacity procedures and crisis standards of care.		No			
	Do you believe you have everything in place to identify and isolate patients with 2019-nCoV and inform key facility staff and public health authorities		No			
	Do you have supplies of PPE for staff in front line areas		No			
	Do you have supplies of PPE for staff in Facility care areas in case of a positive or suspected case		No			
	Do you have contingency plans if the demand for PPE or other supplies exceeds supply.		No			
	Have you designated an area for the isolation of patients who may be at risk for Corona virus		No			
	Have plans been made to ensure that stock is accessible in the Facility		No			
	Do you have a screening tool in place in all areas of entry for the Facility		No			
	Has Training on n-Cov been commenced in your Facility?		No			

Find the complete facility readiness checklist (an excel spreadsheet) on the NICD website under 'Diseases A-Z' 'Coronavirus infection' or on the home page under 'Coronavirus toolkit'.

Complete the tool and email it to your Provincial Hospital/PHC co-ordinator and cc [agent01eoc@nicd.ac.za](mailto:agent01eoc@nicd.ac.za)

# Patient and PUI\* flow and actions required at each step

\*PUI=person under investigation



# Process Flow for detection and response to cases

## 1.1 Appendix 1 – process flow for detection and response to cases

### DETECTION AND REPORTING OF SUSPECTED 2019-nCoV CASE

- The case definition must be strictly adhered to
- For any suspected case, isolate the patient in a suitable room/ unit for assessment, apply IPC measures, contact NICD Hotline to confirm if case definition is met and if sample collection is warranted.
- If so, collect specimen and complete accompanying documentation (Appendix 7).
- Guidelines for the collection and submission of specimens to NICD available on NICD website: <http://www.nicd.ac.za/diseases-a-z-index/novel-coronavirus-infection/> (see quick reference for healthcare workers) or appendix 5 and 6
- The facility IPC focal point, clinician or designated port health officer should complete the case investigation form and contact line list (Appendix 8, 9), forward the forms to the Provincial Communicable Disease Control and [ncov@nicd.ac.za](mailto:ncov@nicd.ac.za).
- All suspected cases who meet the case definition should be notified as Class 1 notifiable medical condition under “Respiratory Disease caused by a novel respiratory pathogen”

**Contacts and details:**  
**Consultant on call for  
Infectious Diseases**  
According to site-specific  
protocol

**NICD Hotline**  
082-883-9920

**National Health  
Operations Centre**  
012-395-9636/37

**Contacts and details: see  
Appendix 14**

**National and Provincial  
CDC**

**Provincial Port Health**

**EMS**

### MEDICAL MANAGEMENT

- For all cases irrespective of symptom severity, isolate the patient and apply infection precautions in accordance with site-specific standard operating procedures for this purpose. When the number of confirmed cases becomes too high, mild cases may be managed at home (self-isolation)



# Process Flow for detection and response to cases

## TRANSPORT AND/OR REFERRAL OF SUSPECTED nCoV-2019 CASE TO HOSPITAL

- If facility is able to provide required clinical care for patient in isolation, referral or transfer is not indicated. If facility cannot offer required care, transfer or referral should be discussed by calling NICD Hotline.
- Transfer of patients from port of entry to healthcare facilities to be discussed with NICD Hotline, EMS will facilitate the transport arrangements.

Laboratory testing  
**excludes** 2019-nCoV

- Finalize reporting and do gap analysis for responses to the case.
- Perform mitigation of any shortcomings identified during case management

Laboratory testing  
**confirms** 2019-nCoV

## MULTI-DISCIPLINARY PUBLIC HEALTH RESPONSE

- NICD report back case was confirmed to healthcare facility, clinician, patient, provincial CDC
- Provincial CDC/designated NICD personnel to perform contact tracing as described in appendix 3
- Collate information and share reports with key stakeholders.
- Handling of mortal remains of a **confirmed or suspected** case must be in accordance with guidelines
- Efficient and transparent communication with the media (press release/briefs) must be provided
- Writing of reports e.g. daily updates, preliminary and final (Appendix 13)



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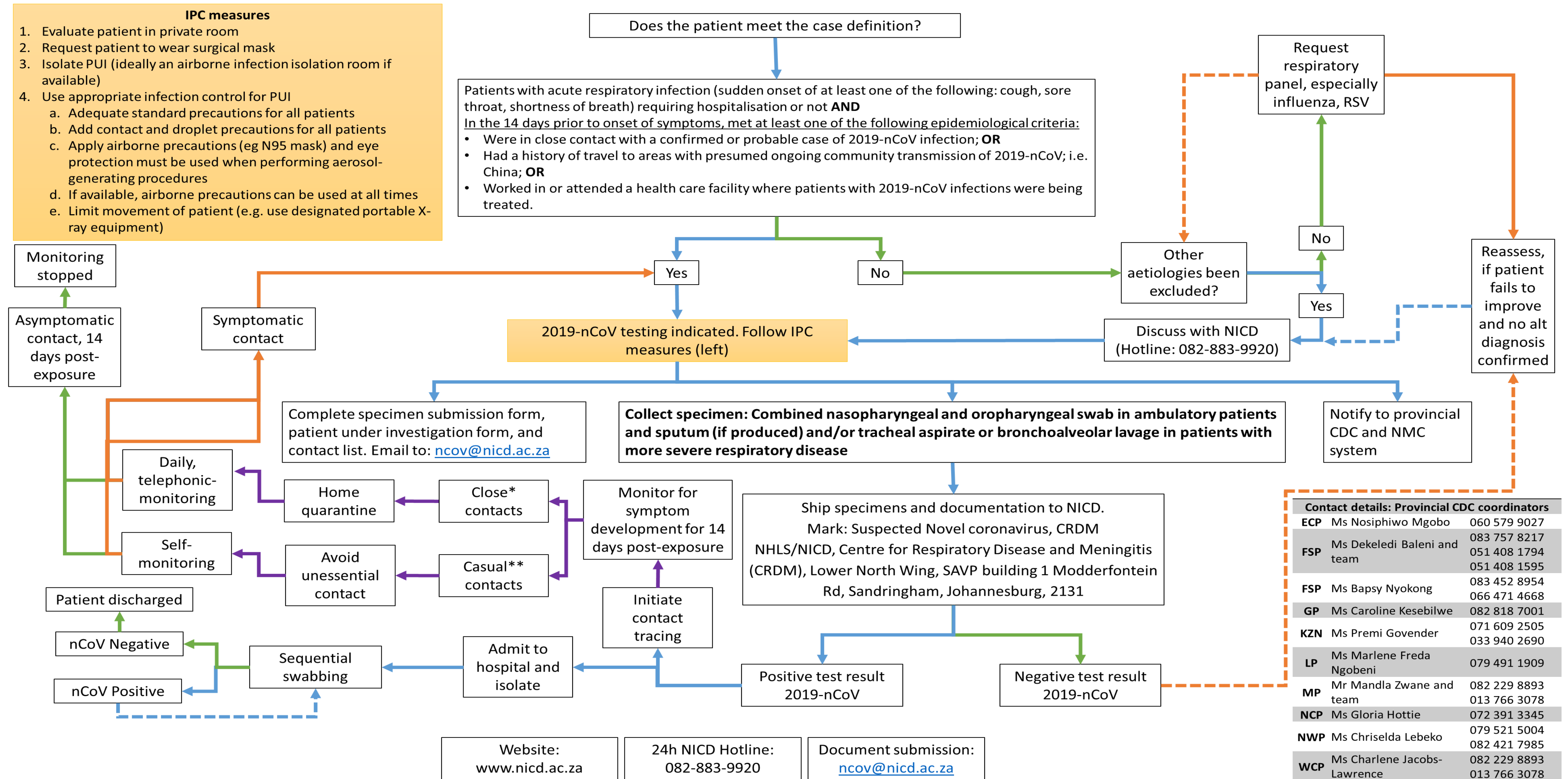
NATIONAL INSTITUTE FOR  
COMMUNICABLE DISEASES

Division of the National Health Laboratory Service



# Initial diagnosis and management of suspected case (PUI), including infection control measures

## 2019 novel coronavirus (2019-nCoV) process flow for use in healthcare facilities



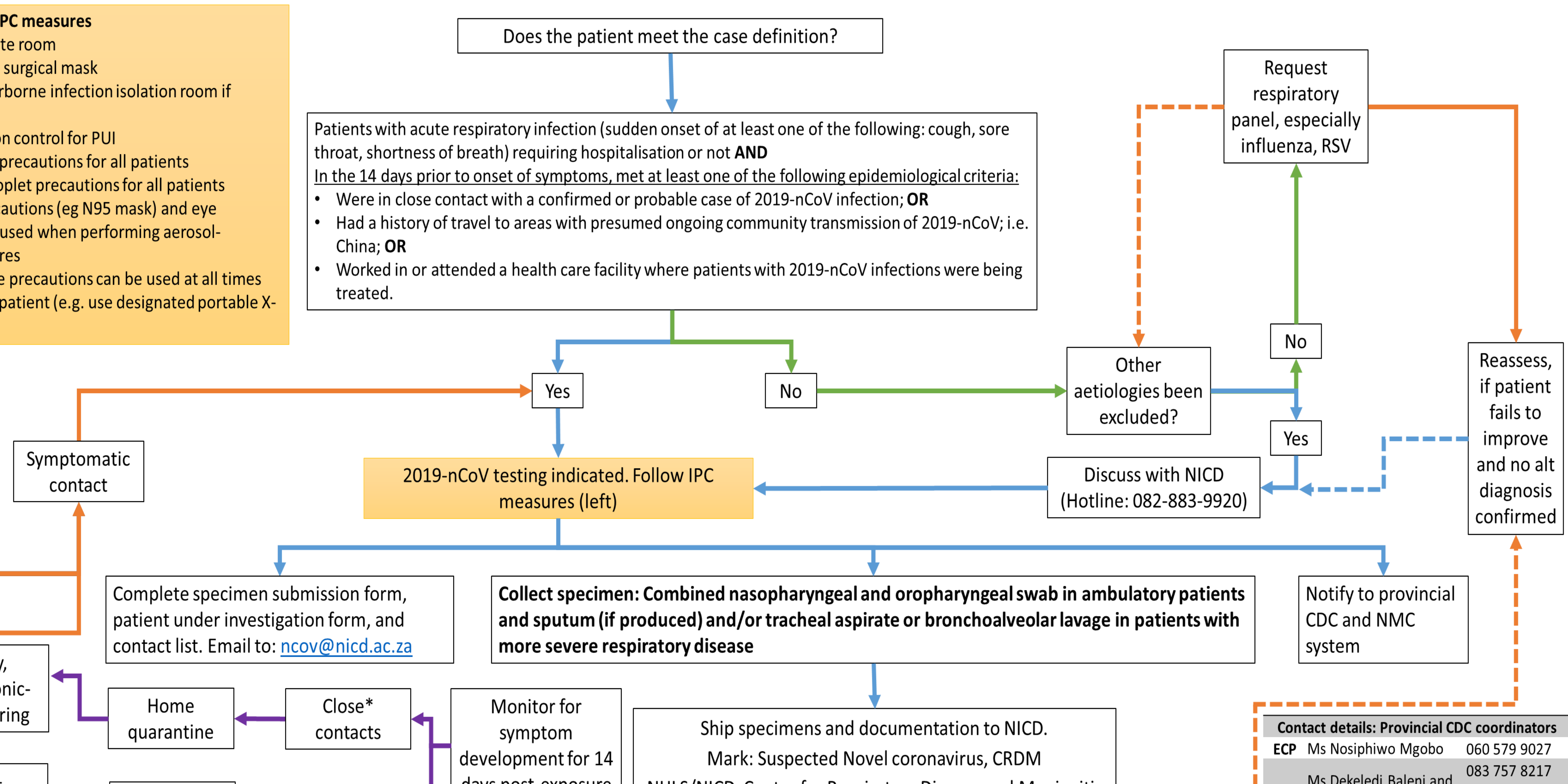
\* *Close contact:* A person having had face-to-face contact ( $\leq 2$  metres) or was in a closed environment with a 2019-nCoV case; this includes, amongst others, all persons living in the same household as a 2019-nCoV case and, people working closely in the same environment as a case. A healthcare worker or other person providing direct care for a 2019-nCoV case, while **not** wearing recommended personal protective equipment or PPE (e.g., gowns, gloves, NIOSH-certified disposable N95 respirator, eye protection). A contact in an aircraft sitting within two seats (in any direction) of the 2019-nCoV case, travel companions or persons providing care, and crew members serving in the section of the aircraft where the index case was seated.

\*\* *Casual contact:* Anyone not meeting the definition for a close contact but with possible exposure.



# Initial diagnosis and management of suspected case (PUI), including infection control measures

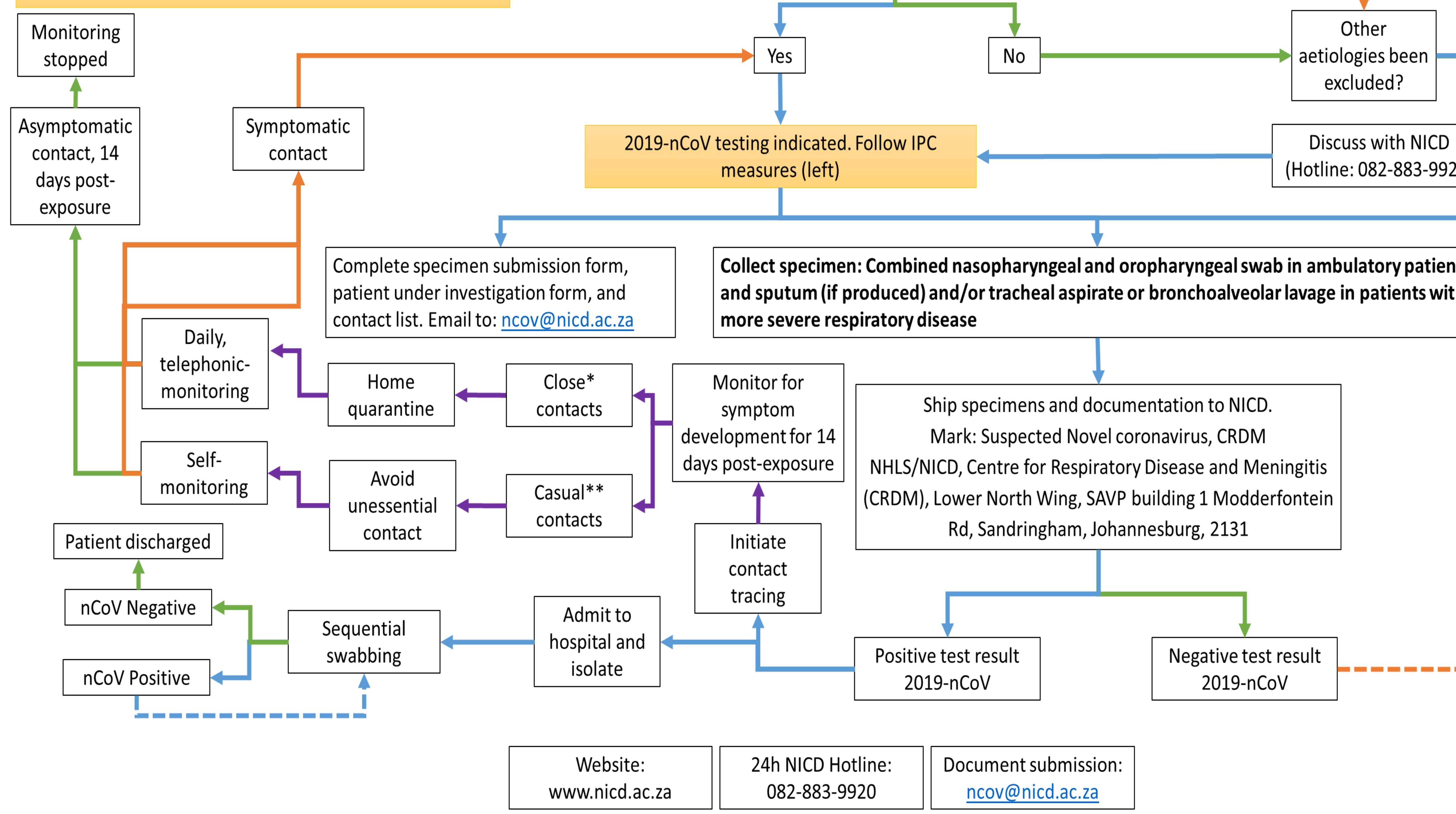
## 2019 novel coronavirus (2019-nCoV) process flow for use in healthcare facilities



- c. Apply airborne precautions (eg N95 mask) and eye protection must be used when performing aerosol-generating procedures
- d. If available, airborne precautions can be used at all times
- e. Limit movement of patient (e.g. use designated portable X-ray equipment)

- Were in close contact with a confirmed or probable case of 2019-nCoV infection; **OR**
- Had a history of travel to areas with presumed ongoing community transmission of 2019-nCoV; i.e. China; **OR**
- Worked in or attended a health care facility where patients with 2019-nCoV infections were being treated.

on



Website: [www.nicd.ac.za](http://www.nicd.ac.za)

24h NICD Hotline: 082-883-9920

Document submission: [ncov@nicd.ac.za](mailto:ncov@nicd.ac.za)



STAGE OF ASSESSMENT OF TRAVELLERS/PERSONS UNDER INVESTIGATION FOLLOWING ARRIVAL AT PORT										
Symptom status	Arrival and disembarkation	Screening by Port Health	Screening by Port Health	Seen at Immigration and customs	In depth assessment at Port Health	Meets case definition, awaiting transfer by EMS	Transported by EMS to health facility	In Emergency Medicine Department (casualty)	Admission pending COVID result	Confirmed positive test
Unknown	X			X						
No symptoms, does not meet case definition		X		X						
Thermoscan positive			X		X					
Meets case definition					X	X	X	X	X	X

#### ACTIONS REQUIRED BY HEALTH CARE WORKERS REGARDING IPC, reporting and data collection AT THIS STAGE

<b>Level of IPC care required by personnel</b>	Avoid crowds, keep 1m from people, frequent hand hygiene, MASKS not required*	Avoid crowds, keep 1m from people, frequent hand hygiene, MASKS not required*	Avoid crowds, keep 1m from people, frequent hand hygiene, MASKS not required*	Avoid crowds, keep 1m from people, frequent hand hygiene, MASKS not required*	Droplet precautions, incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab	Droplet precautions, incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab	Droplet precautions, incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab	Droplet precautions, incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab	Droplet precautions, incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab	Droplet precautions <sup>#</sup> , incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab
<b>Actions required</b>	None	None	Immediately Port Health official gives patient a mask and moves traveller to private room,	None	Call NICD, collect throat swab, send to NICD Arrange transfer to medical facility	Limit staff entry to isolation room	Call ahead and request facility to prepare isolation room for clinical assessment	Take patient straight to isolation room Notify patient as suspected COVID	Adhere to facility IPC protocols for respiratory isolation	Adhere to facility IPC protocols for respiratory isolation
<b>References</b>	WHO guidelines 'Advice on use of masks' (*individual may choose to wear mask)	WHO guidelines 'Advice on use of masks' (*individual may choose to wear mask)	WHO guidelines 'Advice on use of masks' (*individual may choose to wear mask)	WHO guidelines 'Advice on use of masks' (*individual may choose to wear mask)	RSA Coronavirus guidelines on NICD website WHO 'IPC for NCoV'	RSA Coronavirus guidelines on NICD website WHO 'IPC for NCoV'	RSA Coronavirus guidelines on NICD website WHO 'IPC for NCoV'	RSA Coronavirus guidelines on NICD website WHO 'IPC for NCoV'	RSA Coronavirus guidelines on NICD website WHO 'IPC for NCoV'	#If possible, facilities should use airborne precautions



STAGE OF ASSESSMENT OF TRAVELLERS/PERSONS UNDER INVESTIGATION FOLLOWING ARRIVAL AT HEALTH FACILITY						
Symptom status	Arrival and registration	Screening by triage nurse	Screening by triage nurse	In depth assessment by Emergency Doctor	Admission pending COVID result	Confirmed positive test
Unknown	X					
No symptoms, does not meet case definition		X				
Meets case definition			X	X	X	X

**ACTIONS REQUIRED BY HEALTH CARE WORKERS REGARDING IPC, reporting and data collection AT THIS STAGE**

Level of IPC care required by personnel	Avoid crowds, keep 1m from people, frequent hand hygiene, MASKS not required*	Avoid crowds, keep 1m from people, frequent hand hygiene, MASKS not required*	Droplet precautions, incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab	Droplet precautions*, incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab	Droplet precautions, incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab	Droplet precautions#, incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab
Actions required	Screen for travel history and main complaint	Repeat screen for travel history and main complaint	Immediately provide patient with mask, and isolate patient	Collect throat swab, send to NICD	Adhere to facility IPC protocols for respiratory isolation	Adhere to facility IPC protocols for respiratory isolation; consider moving patient to designated facility
References	WHO guidelines 'Advice on use of masks' (*individual may choose to wear mask)	WHO guidelines 'Advice on use of masks' (*individual may choose to wear mask)	RSA Coronavirus guidelines on NICD website WHO 'IPC for NCoV'	RSA Coronavirus guidelines on NICD website WHO 'IPC for NCoV' (*airborne precautions if possible)	RSA Coronavirus guidelines on NICD website WHO 'IPC for NCoV' (*airborne precautions if possible)	RSA Coronavirus guidelines on NICD website WHO 'IPC for NCoV' (*airborne precautions if possible)

# Actions following confirmation of diagnosis

- Implement airborne precautions
- Inform hospital manager and IPC focal point
- Notify the case on the NMC system and inform the provincial CDC co-ordinator
- Collaborate with IPC focal point, and CDC co-ordinator to collate a list of contacts
- Complete Case Report Form DAILY
- Take respiratory specimen every 2-3 days and a day before anticipated discharge to monitor for presence of virus

# Clinical management

\*prepared by Dr Jeremy Nel, Helen Joseph Hospital



Clinical management of suspected /confirmed COVID case is essentially management of a Severe Acute Respiratory Illness (SARI)

There are two issues:



KEEP A BROAD DIFFERENTIAL DIAGNOSIS  
BEFORE DIAGNOSIS CONFIRMED



SUPPORTIVE CARE OF A SEVERE ACUTE  
RESPIRATORY ILLNESS

# Important differential diagnosis

- Conventional bacterial pneumonia
- Atypical bacterial pneumonia
- Other viral pneumonias
- *Pneumocystis* pneumonia

# Bacterial pneumonia

- Severe pneumonias generally require **broad-spectrum antibiotics** empirically.
- Recommended options for community-acquired pneumonia:

Amoxicillin-clavulanate (Augmentin)  
OR  
2<sup>nd</sup> or 3<sup>rd</sup> generation cephalosporin (e.g. ceftriaxone)  
**PLUS**  
macrolide (e.g. azithromycin)



# Corticosteroids

- **Avoid routine administration**
- Although corticosteroids may be of benefit in severe bacterial pneumonias, they have been associated with prolonged viral shedding and increased mortality in influenza. (PMID: 30798570)
- Concern about possible similar effects in other viral pneumonias (including possibly COVID-2019)
- Should only be used if, after careful consideration, risks outweigh benefits
  - E.g. Suspected adrenal insufficiency, COPD, *Pneumocystis* pneumonia

# Atypical bacterial pneumonias

- Important differential diagnosis of a viral pneumonia. Like a viral pneumonia these may have:
  - Flu-like symptoms: pharyngitis, headache, myalgias, dry cough, rhinorrhoea
  - Bilateral infiltrates – can appear reticulonodular / patchy – don't have to have consolidation
- Empiric treatment options:
  - Macrolide (e.g. azithromycin) OR
  - Quinolone (e.g. levofloxacin, moxifloxacin) OR
  - Doxycycline

# Viral pneumonia

- Influenza, parainfluenza, human metapneumovirus, respiratory syncytial virus, adenovirus, etc.
- **Influenza** is an important differential diagnosis to entertain, since:
  - It is currently influenza season in the Northern hemisphere, where many of the COVID-2019 suspects will have come from.
  - It is potentially treatable.



# Influenza treatment

- Consider empiric **oseltamivir** (Tamiflu) or zanamivir treatment in patients with an influenza-like illness who:
  - Are severely ill
  - Are at high risk for complications (pregnant women, HIV patients, patients with asthma/COPD, etc.)
- Treatment should be started as soon as possible (best chance of benefit within 48 hours of symptom onset)

Oseltamivir 75mg po 12-hourly for 5 days

# *Pneumocystis pneumonia*

- Consider if:
  1. Patient significantly immunocompromised: HIV positive with CD4 < 200, chronic systemic steroid use, chemotherapy, transplant patients, etc.)
  2. Diffuse bilateral infiltrates (often with a mid- to lower-zone predominance)
  3. Hypoxaemia at rest (or in mild cases, with exertion)

Cotrimoxazole (Bactrim)

PLUS

Prednisone if severe disease

( $pO_2 < 70$  mmHg, or alveolar-arterial gradient > 35)

- Consider empiric treatment if the above criteria are met:

# Basic work-up of patients with SARI

- Chest X-ray
  - Blood cultures
  - If productive of sputum: sputum MCS
  - Samples for COVID-2019 testing
- 
- If available (private sector > public sector)
    - Nasopharyngeal and oropharyngeal swabs for respiratory viruses and atypical pathogens
    - Urine *Legionella* antigen
- 
- If PCP suspected:
    - Serum beta-D-glucan
    - Sputum sample / bronchoalveolar lavage (not always possible) for PCP



# Supportive management of SARI

- **Oxygen if required** (titrate to  $SpO_2 \geq 90\%$ , or 92-95% in pregnant patients)
- **Ventilatory support if required**
  - If ARDS develops, consider neuromuscular prone position, and use lung-protective ventilation:
    - Low tidal volumes of 6 mL/kg or less
    - Low plateau airway pressure of 30 cm H<sub>2</sub>O or less
    - Moderate-high PEEP levels to recruit lung
- **Restrictive fluid management** (unless shock or acute kidney injury)
- ... and other standard supportive measures in critically ill patients (consider thromboprophylaxis, neuromuscular blockade, prone position, and lung protective ventilation.)

# Co-ordinating a public health response

# Actions to support a public health response

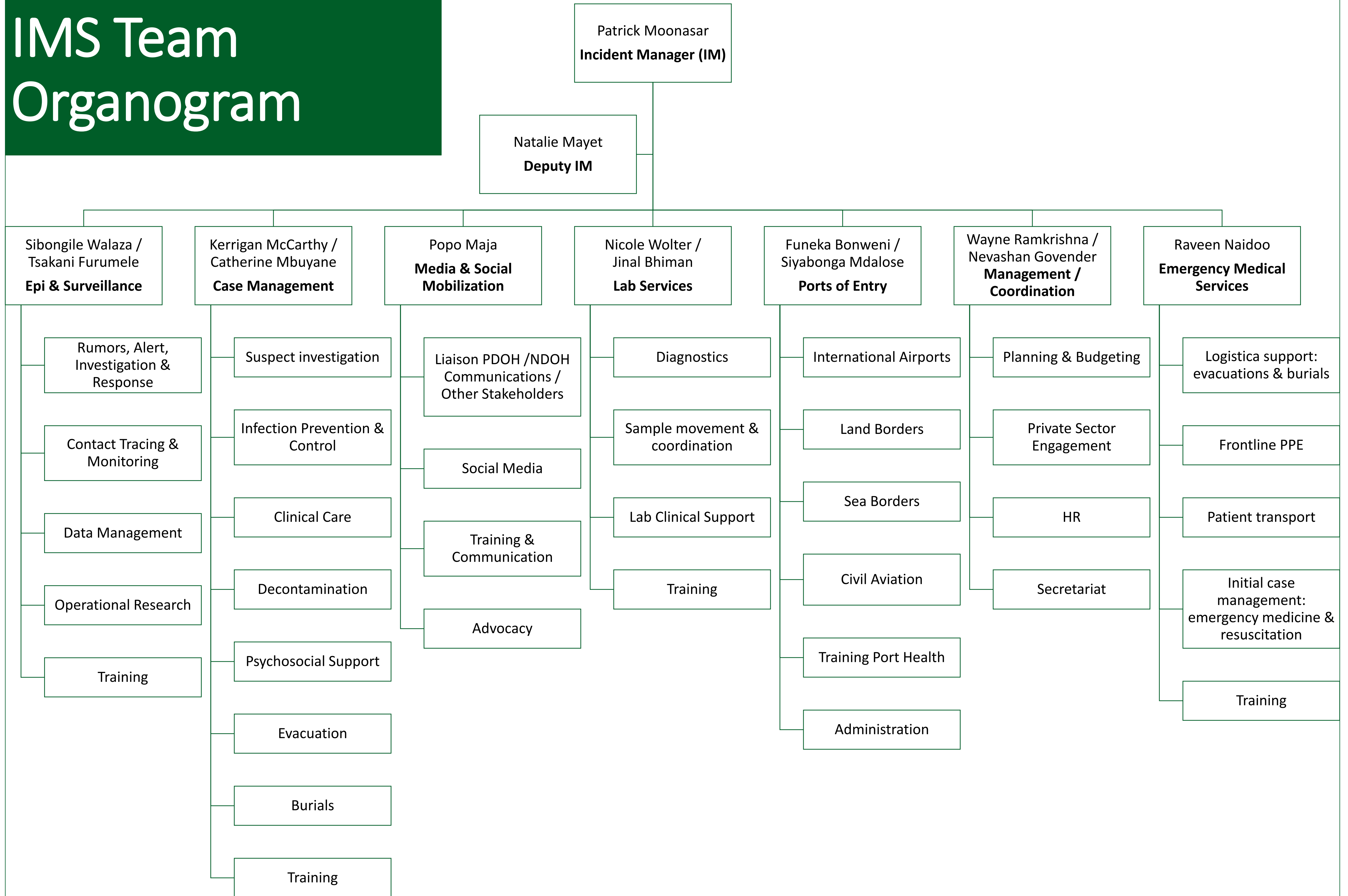
- Activate provincial and district outbreak response teams
  - Ensure representation from all stakeholders especially CDC, hospitals, PHC, NHLS lab rep, NICD provincial epidemiologist and NMC nurse trainer, environmental health, EPI, EMS, port health, procurement and finance
  - Provide an overview of COVID status globally and in RSA
  - Give an overview of RSA COVID guidelines
  - Go through 'patient flow diagrams'
  - Emphasise importance of
    - Screening using case definitions (incl
    - Facility readiness – all facilities incl PHC can use 'Facility readiness checklist'
    - Communication re suspected cases to NICD, and rapid transport of specimen for confirmation
  - Identify gaps and develop an action plan. Set date for next meeting



# Resources for training

- 2-page summary document for facilities
- Specimen request form, and case investigation form (both MUST be completed when a specimen is submitted)
- Training slide set from NICD
- Training videos from NICD
- Facility readiness checklist
- NDoH / NICD COVID guidelines
- WHO IPC for COVID 2-page document
- NDoH communications

# IMS Team Organogram



Patrick Moonasar  
**Incident Manager (IM)**

Natalie Mayet  
**Deputy IM**

Sibongile Walaza /  
Tsakani Furumele  
**Epi & Surveillance**

Kerrigan McCarthy /  
Catherine Mbuyane  
**Case Management**

Popo Maja  
**Media & Social  
Mobilization**

Nicole Wolter /  
Jinal Bhiman  
**Lab Services**

Funeka Bonweni /  
Siyabonga Mdalose  
**Ports of Entry**

Wayne Ramkrishna /  
Nevashan Govender  
**Management /  
Coordination**

Raveen Naidoo  
**Emergency Medical  
Services**

Rumors, Alert,  
Investigation &  
Response

Contact Tracing &  
Monitoring

Data Management

Operational Research

Training

Suspect investigation

Infection Prevention &  
Control

Clinical Care

Decontamination

Psychosocial Support

Evacuation

Burials

Training

Liaison PDOH /NDOH  
Communications /  
Other Stakeholders

Social Media

Training &  
Communication

Advocacy

Diagnostics

Sample movement &  
coordination

Lab Clinical Support

Training

International Airports

Land Borders

Sea Borders

Civil Aviation

Training Port Health

Administration

Planning & Budgeting

Private Sector  
Engagement

HR

Secretariat

Logistica support:  
evacuations & burials

Frontline PPE

Patient transport

Initial case  
management:  
emergency medicine &  
resuscitation

Training