Coronavirus Disease 2019 (COVID-19)

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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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
HOW TO STAY INFORMED:

THIS SITUATION IS RAPIDLY EVOLVING

PLEASE CHECK FOR UPDATES ON THE NICD AND NDOH WEBSITES

(www.nicd.ac.za and www.ndoh.gov.za)
Coronavirus Disease 2019 (COVID-19)

WHO 11th February 2020

• OUT
  Novel Corona virus-2019 (NCoV-19)

• IN
  COronaVirus Disease-2019 (COVID-19)

Virus: SARS-CoV-2
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 Jianghan District of Hubei Province
- Number of cases continued to increase rapidly, and evidence of person-to-person transmission mounted
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
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-19).

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.

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

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

**TRANSMISSION**
Coughs or sneezes from infected person or touching contaminated objects.

*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
  - Higher case fatality in critical cases and elderly
  - 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

Phase 4: Verified and sustained human-to-human transmission

Phase 5: Spread of disease between humans is occurring in more than one country of one WHO region.

Phase 6: Community-level outbreaks are in at least one additional country in a different WHO region from phase 5. A global pandemic is under way.
Phases of a pandemic – and appropriate responses

<table>
<thead>
<tr>
<th>Phases</th>
<th>Description</th>
<th>Direct and coordinate rapid pandemic containment activities in collaboration with WHO to limit or delay the spread of infection.</th>
<th>Increase surveillance, Monitor containment operations, Share findings with WHO and the international community.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 4</td>
<td>Human to human transmission of an animal or human-animal influenza reassortant virus able to sustain community-level outbreaks has been verified.</td>
<td></td>
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<tr>
<td>Phase 5</td>
<td>The same identified virus has caused sustained community level outbreaks in two or more countries in one WHO region.</td>
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<tr>
<td>Phase 6</td>
<td>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.</td>
<td></td>
<td>Actively monitor and assess the evolving pandemic and its impacts and mitigation measures.</td>
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</table>
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.
- **PHASE 5**: The same identified virus has caused sustained community level outbreaks in two or more countries in one WHO region.
- **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.

**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.
- 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.
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
Clinical and epidemiological criteria for person under investigation (PUI)

Criteria for Person Under Investigation (PUI)

- Persons with acute respiratory illness with sudden onset of at least one of the following: cough, sore throat, shortness of breath or fever [≥ 38°C (measured) or history of fever (subjective)] irrespective of admission status AND
- In the 14 days prior to onset of symptoms, met at least one of the following epidemiological criteria:
  - Were in close contact\(^1\) with a confirmed\(^2\) or probable\(^3\) case of SARS-CoV-2 infection;
    
    OR

  - Had a history of travel to areas with presumed ongoing community transmission of SARS-CoV-2; i.e., Mainland China, South Korea, Singapore, Japan, Iran, Hong Kong, Italy, Vietnam and Taiwan.
    
    OR

  - Worked in, or attended a health care facility where patients with SARS-CoV-2 infections were being treated.
    
    OR

  - Admitted with severe pneumonia of unknown aetiology

\(^1\) Close contact: A person having had face-to-face contact or was in a closed environment with a COVID-19 case; this includes, amongst others, all persons living in the same household as a COVID-19 case and, people working closely in the same environment as a case. A healthcare worker or other person providing direct care for a COVID-19 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 COVID-19 case, travel companions or persons providing care, and crew members serving in the section of the aircraft where the index case was seated.  

\(^2\) Confirmed case: A person with laboratory confirmation of SARS-CoV-2 infection, irrespective of clinical signs and symptoms. 

\(^3\) Probable case: A PUI for whom testing for SARS-CoV-2 is inconclusive (the result of the test reported by the laboratory) or for whom testing was positive on a pan-coronavirus assay.
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
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

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
• 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 a 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.

<table>
<thead>
<tr>
<th>NICD Identifier</th>
<th>Date Symptom Onset</th>
<th>Details of health official completing this form</th>
<th>Today’s date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Role</td>
<td>Facility name</td>
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<tr>
<td>Email address</td>
<td>Telephone number(s)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Travel (provide details of all: 7 days before onset)</th>
<th>Travelled by</th>
<th>Air/bus line</th>
<th>Flight/bus #</th>
<th>Seat #</th>
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## Details of contacts (With close contact* 7 days prior to symptom onset, or during symptomatic illness.)

<table>
<thead>
<tr>
<th>Surname</th>
<th>First name(s)</th>
<th>Sex (M/F)</th>
<th>Age (Y)</th>
<th>Relation to case</th>
<th>Date of last contact with case</th>
<th>Place of last contact with case</th>
<th>Residential address (for next month)</th>
<th>Phone number(s), separate by semicolon</th>
<th>HCW?? (Y/N)</th>
<th>if Yes, facility name</th>
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</tbody>
</table>

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1 Close contact: A person having had face-to-face contact (<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. 2 Chose from: Aunt, Child, Class mate, Colleague, Cousin, Father, Friend, Grandfather, Grandmother, Healthcare worker taking care of, Mother, Nephew, Niece, Other relative, Uncle. 3 Healthcare worker.


To be emailed to PDF version at: [http://www.nicd.ac.za/diseases-a-z-index/novel-coronavirus-infection/](http://www.nicd.ac.za/diseases-a-z-index/novel-coronavirus-infection/)
## Close Contact Monitoring Tool

**2019-nCoV DAILY SYMPTOM MONITORING TOOL**

Complete for each contact of confirmed case.

If not captured electronically at site, forward to ncov@nicd.ac.za, on completion of last day of monitoring.

### Details of contact of case under investigation/confirmed case

<table>
<thead>
<tr>
<th>NICD Identifier</th>
<th>Date last contact</th>
<th>Place last contact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surname</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Name</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Date of birth</strong></td>
<td>DD/MM/YYYY</td>
<td>Age (Years)</td>
</tr>
<tr>
<td><strong>Contact #</strong></td>
<td></td>
<td>Alternative contact #</td>
</tr>
<tr>
<td><strong>Relation to case</strong></td>
<td></td>
<td>Place of contact</td>
</tr>
<tr>
<td><strong>Healthcare worker</strong></td>
<td></td>
<td>Facility name</td>
</tr>
<tr>
<td><strong>Traced</strong></td>
<td>Y N</td>
<td>Contact type</td>
</tr>
<tr>
<td><strong>Email</strong></td>
<td></td>
<td>Monitoring method*</td>
</tr>
<tr>
<td><strong>Quarantine</strong></td>
<td></td>
<td>Facility where quarantined</td>
</tr>
<tr>
<td><strong>House #</strong></td>
<td></td>
<td>Street</td>
</tr>
<tr>
<td><strong>Town</strong></td>
<td></td>
<td>Municipality</td>
</tr>
<tr>
<td><strong>District</strong></td>
<td></td>
<td>Province</td>
</tr>
<tr>
<td><strong>Name</strong></td>
<td></td>
<td>Contact number(s)</td>
</tr>
</tbody>
</table>

### Details of health official completing form

<table>
<thead>
<tr>
<th>Today's date</th>
<th>Jul 24 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surname</strong></td>
<td>Name</td>
</tr>
<tr>
<td><strong>Role</strong></td>
<td>Facility name</td>
</tr>
<tr>
<td><strong>Email</strong></td>
<td>Telephone number(s)</td>
</tr>
</tbody>
</table>

### 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.

### Symptom Monitoring Table

<table>
<thead>
<tr>
<th>DAY</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date (DD/MM)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Fever (≥38°C)</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
</tr>
<tr>
<td>Chills</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
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<tr>
<td>Cough</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
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</tr>
<tr>
<td>Sore throat</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
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<tr>
<td>Shortness of breath</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
</tr>
<tr>
<td>Myalgia/body pains</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
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<tr>
<td>Diarrhoea</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
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### Symptom Monitoring Table

<table>
<thead>
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<td>Date (DD/MM)</td>
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<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
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<td>Chills</td>
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<td>Cough</td>
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<td>Sore throat</td>
<td>Y N</td>
<td>Y N</td>
<td>Y N</td>
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<tr>
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<td>Y N</td>
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</table>

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 (≤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 if 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

<table>
<thead>
<tr>
<th>Specimen type</th>
<th>Collection materials</th>
<th>Storage and transportation</th>
<th>Dangerous goods shipping category</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOR SYMPTOMATIC PATIENTS:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sputum*</td>
<td>Deep cough sputum in sterile leak proof container</td>
<td>Refrigerate and ship at 2-8 °C up to 48 hrs, if &gt;48 hrs freeze at -70°C and ship on dry ice</td>
<td>Biological substance, Category B</td>
<td>The preferred sample but need to ensure the material is from the lower respiratory tract</td>
</tr>
<tr>
<td>Bronchoalveolar lavage*</td>
<td>2-3 ml in sterile leak proof container</td>
<td>Refrigerate and ship at 2-8 °C up to 48 hrs, if &gt;48 hrs freeze at -70°C and ship on dry ice</td>
<td>As above</td>
<td>There may be some dilution of virus but still a worthwhile specimen</td>
</tr>
<tr>
<td>(Endo)tracheal or nasopharyngeal aspirate*</td>
<td>2-3 ml in sterile leak proof container</td>
<td>Refrigerate and ship at 2-8 °C up to 48 hrs, if &gt;48 hrs freeze at -70°C and ship on dry ice</td>
<td>As above</td>
<td></td>
</tr>
<tr>
<td>Nasopharyngeal and oropharyngeal swab</td>
<td>Dacron or nylon flocked swab in Universal Transport Medium (UTM) in a sterile leak proof container</td>
<td>Refrigerate at 2-8 °C up to 5 days, if &gt;5 days freeze at -70°C and ship on dry ice</td>
<td>As above</td>
<td>Nasopharyngeal and oropharyngeal swabs should be placed in the same tube to increase the viral load</td>
</tr>
</tbody>
</table>
| 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:  
  * Acute – first week of illness  
  • Convalescent – 2-3 weeks later |
| 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.
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), goggles/visor (your own spectacles are not sufficient).
8. Tissue for patient to wipe nose after sample collection.
9. Cooler box and cooled ice packs.
10. Ziploc plastic specimen bag.
Collection of naso/oropharyngeal swabs for detection of respiratory viruses

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.
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 PPE in correct sequence

11. Wash hands with soap and water
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
What PPE do I need in the laboratory?

Process as per normal BSL2 (suspected influenza sample)

• Closed specimen tube (transporting / receiving)
  • Lab coat and gloves

• Open specimen tube before inactivation (aliquoting) must be done in a Biosafety cabinet

• Inactivated specimen/extracted nucleic acids (PCR)
  • Lab coat and gloves
How do I package a specimen for Coronavirus testing?

• Send as per category B substance (as per influenza specimen)

• Locally or nationally:
  • Specimen in sealed, leak-proof ziplock bag, placed in sealed cooler box with cooled iceblocks

• Internationally:
  • Triple packaging according to IATA category B guidelines

Do not delay sending specimens, do not wait for special flight or allow staff to say they cannot touch the specimens
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.


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 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
Record keeping


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/](http://www.nicd.ac.za/diseases-a-z-index/novel-coronavirus-infection/)

<table>
<thead>
<tr>
<th>Test names</th>
<th>Pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria</td>
<td>Mycoplasma pneumoniae, Chlamydia pneumoniae, Haemophilus influenzae, Haemophilus influenza type B, Staphylococcus aureus, Klebsiella pneumoniae, Legionella spp., Salmonella, Bordetella pertussis, Moraxella catarrhalis</td>
</tr>
<tr>
<td>Fungi</td>
<td>Pneumocystis jiroveci</td>
</tr>
<tr>
<td>Community-acquired pneumonia</td>
<td>Streptococcus pneumoniae, Staphylococcus aureus, Haemophilus influenzae, Moraxella catarrhalis</td>
</tr>
<tr>
<td>Hospital-acquired pneumonia</td>
<td>Klebsiella pneumoniae, Pseudomonas aeruginosa</td>
</tr>
<tr>
<td>Atypical pneumonia</td>
<td>Mycoplasma pneumoniae, Chlamydia pneumoniae, Legionella spp.</td>
</tr>
<tr>
<td>Neonatal sepsis</td>
<td>Group B streptococcus, Listeria monocytogenes, Staphylococcus aureus, Chlamydia trachomatis, Ureaplasma urealyticum/jarvsi, cytomegalovirus</td>
</tr>
<tr>
<td>Bacterial meningitis</td>
<td>Streptococcus pneumoniae, Neisseria meningitidis, Haemophilus influenzae</td>
</tr>
<tr>
<td>Viral meningitis</td>
<td>Adenovirus, cytomegalovirus, Epstein Barr virus, herpes simplex virus 1, herpes simplex virus 2, varicella zoster virus, enterovirus, parainfluenza, human herpesvirus 6, human herpesvirus 7, parovirus B19, mumps virus</td>
</tr>
</tbody>
</table>
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

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

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

Victor M Corman¹, Olfert Landt², Marco Kaiser², Richard Molenkamp³, Adam Meijer⁴, Daniel KW Chu⁵, Tobias Bleicker¹, Sebastian Brünink⁶, Julia Schneider⁷, Marie Luisa Schmidt⁸, Daphne GJC Mulders⁹, Bart L Haagmans³, Bas van der Veer⁶, Sharon van den Brink⁷, Lisa Wijsman⁴, Gabriel Goderski⁴, Jean-Louis Romette⁶, Joanna Ellis⁷, Maria Zambon⁷, Malik Peiris⁵, Herman Goossens⁸, Chantal Reusken⁴, Marion PG Koopmans³, Christian Drosten¹
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, ( e.g. 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 meningitides

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

Airborne transmission
- Inhaling droplets nuclei (<5um 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
**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)

**Coronavirus?**

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**Vector transmission**
- Contact with vector
- E.g. malaria, dengue, Zika,

**Control**
- Prevent/eliminate exposure to vector
- Chemoprophylaxis if possible
Principles of infection prevention and control (IPC)

A safe environment can be achieved through elimination of infectious particles in the air and on surfaces.

- **Decrease the number of particles formed by people with COVID**
  - **Administrative controls**

- **Remove the particles from the air and from surfaces**
  - **Environmental controls**

- **Prevent people from inhaling the particles or touching their mucous membranes with contaminated hands**
  - **Personal protective equipment and risk reduction**
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 circulation is functional with appropriate number of air changes per hour)
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-19

Implement contact and droplet precautions

• Put in a well ventilated isolation room
  • Ensure air-conditioning system is well maintained
• Provide patient with a mask
• Implement contact and droplet precautions
• Limit the number of staff who can enter the isolation room
• Limit patient movement – use portable X-rays.

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-19

- When taking a sputum specimen or nasopharyngeal swab use airborne and contact precautions are required
  - E.g. nasopharyngeal swabs, intubation, tracheal aspirate, suction etc
- When nursing a ventilated patient in ICU
  - Use N95 respirator to ensure a tight seal
- Always use gown, gloves
- Use a face-shield or goggles
- Boots or shoe covers are not required

Training in use of IPC

Ensure staff are trained and familiar with

• Triage
• Handwashing
• Screening
• Case definitions
• Use of PPE
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

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.2

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. 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 healthcare facility, supported by trained staff;
- institute the use of screening questionnaires according to the updated case definition (http://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 decontamination 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

- Add airborne precaution for any procedures that may generate aerosols (e.g., washing nasopharyngeal area during preparation of the remains) or possible contamination by fluids from the nose/mouth

- Follow Appendix 12 of RSA guideline
- No specific need for cremation
- No need for designated mortuary
- Environmental Health Practitioners should be informed following the death to assist with procedures
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’
Facility self assessment

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

<table>
<thead>
<tr>
<th>(SOUTH AFRICAFacility) Novel Coronavirus (nCoV) Country Readiness Checklist</th>
<th>Hospital Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Information</td>
<td>Total in Facility</td>
</tr>
<tr>
<td>Number of NICU employed including on duty list</td>
<td>CEO Name</td>
</tr>
<tr>
<td>Number of designated points of entry for patients</td>
<td>CEO Contact details</td>
</tr>
<tr>
<td>Do you have isolation units in the Facility? Yes/No more beds</td>
<td>Cell</td>
</tr>
<tr>
<td>Private wards</td>
<td>Office</td>
</tr>
<tr>
<td>Private ventilation or pressurised</td>
<td>email</td>
</tr>
<tr>
<td>Large cohort area identified Number of beds</td>
<td>Fax</td>
</tr>
<tr>
<td>Isolation area in emergency department identified</td>
<td>Date of Report</td>
</tr>
<tr>
<td>ICU isolation bed number</td>
<td>Facility CEO / Manager Signature</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intervention area</th>
<th>Indicators</th>
<th>Values</th>
<th>Yes/No</th>
<th>Comments</th>
<th>Gaps</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In place a Facility preparedness and response plan for events caused by novel coronavirus?</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do you have a committee established in your Facility to ensure plans are in place</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do you hold meetings of the meetings of this committee</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do you have and have you reviewed plans for implementation of surge capacity procedures and staffing standards of care</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do you believe you have everything in place to identify and isolate patients with COVID-19 and the tools and skills needed to do this effectively</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do you have supplies of PPE for staff in front line areas</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do you have supplies of PPE for staff in front line areas</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Do you have contingency plans in the event demand for PPE or other supplies exceed supply</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Have you designated an area for the isolation of patients who may be at risk for Coronavirus</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Have plans been made to ensure that sick patients are isolated in the Facility</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Have you a screening tool in place at all access points to your Facility</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Have Training on n-CoV been commenced in your Facility</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Patient and PUI* flow and actions required at each step

*PUI=person under investigation
DETENTION 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 n cov@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”

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)
DETENTION 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.
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- 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".

TRANSPORT AND/OR REFERAL 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

- Laboratory testing excludes 2019-nCoV
- 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)

Finalize reporting and do gap analysis for responses to the case.
Perform mitigation of any shortcomings identified during case management.
Initial diagnosis and management of suspected case (PUI), including infection control measures

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

1. Evaluate patient in private room
2. Request patient to wear surgical mask
3. Isolate PUI (ideally an airborne infection isolation room if available)
4. Use appropriate infection control for PUI
   a. Adequate standard precautions for all patients
   b. Add contact and droplet precautions for all patients
   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)

Does the patient meet the case definition?

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 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 healthcare facility where patients with 2019-nCoV infections were being treated.

Other aetiologies been excluded?

No

Request respiratory panel, especially influenza, RSV

Yes

Reassess, if patient fails to improve and no alt diagnosis confirmed

Discuss with NICD (Hotline: 082-883-9920)

Notify to provincial CDC and NMC system

2019-nCoV testing indicated. Follow IPC measures (left)

Collect specimen: Combined nasopharyngeal and oropharyngeal swab in ambulatory patients and sputum (if produced) and/or tracheal aspirate or bronchoalveolar lavage in patients with more severe respiratory disease

Ship specimens and documentation to NICD. Mark: Suspected Novel coronavirus, CRDM
NHLS/NICD, Centre for Respiratory Disease and Meningitis (CRDM), Lower North Wing, SAVP building 1 Meddofontein Rd, Sandringham, Johannesburg, 2131

Positive test result 2019-nCoV

Admit to hospital and isolate

Initiate contact tracing

Monitor for symptom development for 14 days post-exposure

Close* contacts

Casual** contacts

Sequential swabbing

nCoV Negative

nCoV Positive

Admit to hospital and islate

Positive test result 2019-nCoV

Website: www.nicd.ac.za

24h NICD Hotline: 082-883-9920

Document submission: ncoV@nicd.ac.za

* Close contact: A person having had face-to-face contact (≤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

PC measures
- PPE
- Mask
- Gown
- Gloves

Does the patient meet the case definition?

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 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.

Yes
- 2019-nCoV testing indicated. Follow IPC measures (left)

No
- Other aetiologies been excluded?

Yes
- Notify to provincial CDC and NMC system

No
- Discuss with NICD (Hotline: 082-883-9920)

Other aetiologies been excluded?

Yes
- Request respiratory panel, especially influenza, RSV

No
- Reassess, if patient fails to improve and no alt diagnosis confirmed

Symptomatic contact

Complete specimen submission form, patient under investigation form, and contact list. Email to: ncoV@nicd.ac.za

Collect specimen: Combined nasopharyngeal and oropharyngeal swab in ambulatory patients and sputum (if produced) and/or tracheal aspirate or bronchoalveolar lavage in patients with more severe respiratory disease

Ship specimens and documentation to NICD.

Home quarantine

Close contacts

Monitor for symptom development for 14 days post-exposure

Contact details: Provincial CDC coordinators
ECP: Ms Nosiphiwo Mgobo 060 579 9027
Ms Dikeleedi Baleni and 083 757 8217
Initial diagnosis and management of suspected case (PUI), including infection control measures:

- 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.

**Monitoring stopped**

**Asymptomatic contact, 14 days post-exposure**

**Symptomatic contact**

- Complete specimen submission form, patient under investigation form, and contact list. Email to: ncov@nicd.ac.za
- **2019-nCoV testing indicated. Follow IPC measures (left)**
- **Collect specimen: Combined nasopharyngeal and oropharyngeal swab in ambulatory patients and sputum (if produced) and/or tracheal aspirate or bronchoalveolar lavage in patients with more severe respiratory disease**
- **Ship specimens and documentation to NICD.**
  - 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

- **Patient discharged**
  - nCoV Negative
  - Sequential swabbing
- **nCoV Positive**
  - Admit to hospital and isolate

- **nCoV Negative**
  - self-monitoring
    - **Patient discharged**
    - 24h NICD Hotline: 082-883-9920
    - Document submission: ncov@nicd.ac.za
  - **nCoV Positive**
    - Admit to hospital and isolate
    - Positive test result 2019-nCoV
    - Negative test result 2019-nCoV

- **nCoV Negative**
  - Symptomatic contacts
    - Home quarantine
    - Close contacts
    - Casual contacts
    - Monitor for symptom development for 14 days post-exposure
    - Initiate contact tracing

- **Symptomatic contact**
  - Daily, telephonic-monitoring
  - Self-monitoring
    - Patient discharged

- **Other aetiologies been excluded?**
  - Discuss with NICD (Hotline: 082-883-9920)
<table>
<thead>
<tr>
<th>Symptom status</th>
<th>Arrival and disembarkation</th>
<th>Screening by Port Health</th>
<th>Screening by Port Health</th>
<th>Seen at Immigration and customs</th>
<th>In depth assessment at Port Health</th>
<th>Meets case definition, awaiting transfer by EMS</th>
<th>Transported by EMS to health facility</th>
<th>In Emergency Medicine Department (casualty)</th>
<th>Admission pending COVID result</th>
<th>Confirmed positive test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unknown</td>
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<td>No symptoms, does not meet case definition</td>
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<tr>
<td>Thermoscan positive</td>
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<td>Meets case definition</td>
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**ACTIONS REQUIRED BY HEALTH CARE WORKERS REGARDING IPC, reporting and data collection AT THIS STAGE**

<table>
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<tr>
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<tr>
<td>- If possible, facilities should use airborne precautions</td>
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*individual may choose to wear mask*
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<tr>
<th>Symptom status</th>
<th>Arrival and registration</th>
<th>Screening by triage nurse</th>
<th>Screening by triage nurse</th>
<th>In depth assessment by Emergency Doctor</th>
<th>Admission pending COVID result</th>
<th>Confirmed positive test</th>
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<td>Screen for travel history and main complaint</td>
<td>WHO guidelines ‘Advice on use of masks’ (*individual may choose to wear mask)</td>
</tr>
<tr>
<td>Avoid crowds, keep 1m from people, frequent hand hygiene, MASKS not required*</td>
<td>Repeat screen for travel history and main complaint</td>
<td>WHO guidelines ‘Advice on use of masks’ (*individual may choose to wear mask)</td>
</tr>
<tr>
<td>Droplet precautions, incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab</td>
<td>Immediately provide patient with mask, and isolate patient</td>
<td>RSA Coronavirus guidelines on NICD website WHO ‘IPC for NCoV’ (*airborne precautions if possible)</td>
</tr>
<tr>
<td>Droplet precautions*, incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab</td>
<td>Collect throat swab, send to NICD</td>
<td>RSA Coronavirus guidelines on NICD website WHO ‘IPC for NCoV’ (*airborne precautions if possible)</td>
</tr>
<tr>
<td>Droplet precautions*, incl surgical masks, gloves, disposable gowns, eye visor/goggles if collecting throat swab</td>
<td>Adhere to facility IPC protocols for respiratory isolation; consider moving patient to designated facility</td>
<td>RSA Coronavirus guidelines on NICD website WHO ‘IPC for NCoV’ (*airborne precautions if possible)</td>
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*individual may choose to wear mask

(*airborne precautions if possible)
Actions following confirmation of diagnosis

• Implement appropriate precautions
  • Contact and droplet for ward-based patients
  • Contact and airborne for aerosol generating procedures
• 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\textsuperscript{nd} or 3\textsuperscript{rd} generation cephalosporin (e.g. ceftriaxone)
  
  **PLUS**

  macrolide (e.g. azithromycin)

2017 SA Community-acquired Pneumonia Guidelines
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**

For more information, see 2019 NICD Influenza Guidelines
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)

- Consider empiric treatment if the above criteria are met:
  
  **Cotrimoxazole (Bactrim)**
  
  PLUS
  
  **Prednisone** if severe disease
  
  (pO₂ < 70 mmHg, or alveolar-arterial gradient > 35)
Basic work-up of patients with SARI

- Chest X-ray
- Blood cultures
- If productive of sputum: sputum MCS
- Samples for COVID-2019 testing

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- If available (private sector > public sector)
  - Nasopharyngeal and oropharyngeal swabs for respiratory viruses and atypical pathogens
  - Urine *Legionella* antigen

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- 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 $\text{SpO}_2 \geq 90\%$, 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 $\text{H}_2\text{O}$ 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
Reduce your risk of coronavirus infection:

- Clean hands with soap and water or alcohol-based hand rub
- Cover nose and mouth when coughing and sneezing with tissue or flexed elbow
- Avoid close contact with anyone with cold or flu-like symptoms
- Thoroughly cook meat and eggs
- Avoid unprotected contact with live wild or farm animals