health
Department:
Health
REPUBLIC OF SOUTH AFRICA

NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

2030 NDP

Covid-19 Outbreak investigation: A practical guide and manual for healthcare facilities

(including care homes for the elderly, infirm or mental health care users)

Part A: Practical guide
Part B: Manual and appendices

Version 1

Foreword

The Covid-19 pandemic has impacted so many aspects of our way of life, but none more so than the way we do healthcare. The health care facility environment has changed immeasurably, and along with this, so has our awareness of the importance of infection prevention and control. Health care workers themselves are doubly affected by the Covid-19 pandemic. Healthcare Workers (HCWs) retain their vulnerability to Covid-19 infection as members of community who live and go about the daily business of housekeeping, child-rearing, and active citizenry. Secondly, HCWs face the spectre of being at risk of acquiring Covid-19 from their patients and simultaneously of passing on Covid-19 infection to their patients.

The awareness of these risks been brought to the fore through witnessing a number of health facility-associated Covid outbreaks within the first months after the pandemic entered South Africa. We learned first-hand the devastating impact of uncontained and undetected Covid-19 infection in health care facilities. We learned that we need to do all that is reasonably possible to keep our facilities free of Covid-19.

This practical guide (Part A), manual (Part B) and appendices are offered to support all health care workers from leadership to hands-on clinicians to prevent, detect, respond to and limit the impact of Covid-19 in health care facility environments.

By health facilities, the document includes hospitals, short stay facilities, community health centres, primary health care facilities, maternal obstetric units, specialised hospitals such as psychiatric and tuberculosis hospitals as well as homes for mental health care users or the aged and infirm.

Most importantly, the manual includes often overlooked, but critically important sections on leadership, communication and an extensive section on provision of psychological support for HCWs during outbreaks. The manual reminds those in leadership the importance of clear, timely and transparent communication. It places emphasis on the need to involve all stakeholders in outbreak response, particularly organised labour.

The writing team who put this document together are to be thanked for contributing their experience and insights from across the spectrum of public and private health care services. Each has drawn from their experience in managing outbreaks, performing laboratory tests, determining transmission chains, identification of the source of the outbreak, providing infection prevention and control advice, managing infected and exposed HCWs, counselling affected persons and reporting on findings.

We trust that this document will be a useful addition to supporting our HCWs to make health care facilities a safe place in which to render services, and in which persons can receive health care and healing.

DR SSS BUTHELEZI
DIRECTOR-GENERAL OF HEALTH
DATE: 2020/07/27

How to use this document

If you have a case or cases of Covid-19 in a health facility

- Quickly read Part A (pages 6-12)
- Convene a facility outbreak response team.
- Print copies of Appendix 1 (Outbreak investigation Checklist, page 47). This will serve as the agenda for the facility outbreak response team meeting.
- Print copies of Appendix 2 (Covid Outbreak Case investigation form) – one for each case of Covid-19.
- Whilst you are waiting for the outbreak response team meeting, arrange for someone to complete the Outbreak Case investigation form (Appendix 2) for each case of Covid.
- Convene the Outbreak Response Team meeting using the 'Outbreak investigation checklist'. Review the completed case investigation forms. Assign actions and tasks as required.
- Later that night, re-read Part A (pages 6-12). If you need more detail, go to the sections in the Manual (Part B).
- If you need additional support, the NICD provincial epidemiologist team in your province for advice.

PROVINCE	NAME	EMAIL	CELPHONE
NATIONAL	Joy Ebonwu	joye@nicd.ac.za	082 400 5588
ECP	Ruvimbo Chingondzo	ruvimboc@nicd.ac.za	060 963 4824
FS	Motshabi Modise	motshabim@nicd.ac.za	082 616 3642
GP	Nomathamsanqa Ndlovu	nomathamsanqan@nicd.ac.za	060 963 4605
KZN	Poncho Bapela	ponchob@nicd.ac.za	071 681 6683
LP	Unarine Makungo	UnarineM@nicd.ac.za	060 963 4760 / 073 213 3004
MP	Janine Bezuidenhout	janineb@nicd.ac.za	060 963 4947 | 082 669 8015
NW	Wellington Maruma	Wellingtonm@nicd.ac.za	072 939 3614
WCP	Hlengani Mathema	hlenganim@nicd.ac.za	082 327 0394

If you wish to prevent Covid-19 outbreaks in your facility

- Go through the table of contents (page 4) to familiarise yourself with the document.
- Read the section on 'Prevention of Covid-19 outbreaks in facilities' (pages 43 -46).
- Conduct an Infection prevention control audit using the audit tool (Appendix 6, pages 53-57), and the South African Covid-19 infection prevention and control guidelines https://www.nicd.ac.za/diseases-a-z-index/covid-19/covid-19-guidelines/infection-prevention-and-control-guidelines/

If you are in a leadership position in your facility and wish to prepare yourself for Covid-19 outbreaks

- Read Part A (pages 6-12).
- Read the chapter on Leadership and communication during outbreaks (pages 17-20).
- Read the chapter on Psychosocial support for HCW and patients during and after an outbreak (pages 36-41).
- Read other parts of the manual as required.

Contents

How to use this document 1

Part A: Quick reference guide to support outbreak investigation and response 4

Part B: Outbreak Investigation Manual and Appendices 11

1. Introduction and background 11
2. Health-care associated Covid-19 outbreaks in health care facilities across the globe. 12
3. Definitions and scope of these guidelines 13
   a. Definitions 13
4. Covid-19 outbreak investigations in health care facilities 14
   a. Aims of Covid-19 outbreak investigations 14
   b. Principles of outbreak investigation 14
5. Leadership and communication during facility outbreaks 16
   a. Leadership structures 16
   b. Leadership style 17
   c. Principles of communication during outbreaks 17
   d. Announcement of the outbreak and communication with media 18
   e. Co-ordination of outbreak investigations 19
   f. Documentation of outbreak investigation processes 19
6. The process flow of an outbreak investigation 19
   a. Process flow diagram 19
   b. Tools to support aspects of investigation and response 20
7. Detection of an outbreak and initial assessments 20
   a. Defining an outbreak 20
   b. Assessment of the index case 21
   c. Determination of the infectious period of the index case. 21
   d. Initial assessment following identification of a Covid-19 case in a health care facility. 23
8. Investigations and actions to support containment of the outbreak 24
   a. Provision of treatment care and support for infected persons 24
   b. Isolation of persons who test positive for Covid-19 24
   c. Defining a case 24
   d. Identification of contacts 25
   e. Management of contacts 26
   f. Identification of second- and third-generation cases 28
   g. An infection prevention and control assessment 28
   h. Additional laboratory investigations to support source determination 29
   i. Environmental decontamination 29
   j. Ward and facility closure 30
9. Analysis of data and formulation of hypotheses to determine the source of the outbreak 31

a. Epidemiological descriptive analysis 31
b. Interpretation of data and generation of hypotheses 33
c. Supplementary studies 35
10. Psychosocial support for HCW and patients during and after an outbreak 36
a. The Covid-19 pandemic as the context for a facility outbreak 36
b. Ethical aspects guiding health care worker behaviour during outbreaks 37
c. Psychological adjustments by HCW prior to an outbreak 37
d. The impact of Covid-19 testing during an outbreak 37
e. Psychosocial reactions to the outbreak 38
f. The impact of isolation and/or quarantine 38
g. Coping mechanisms during outbreaks 39
h. Conflict 40
i. Key components in responding to persons' psychological needs during outbreaks 41
j. Psychological responses post outbreak 42
11. Reporting of the findings from outbreak investigations. 42
12. Closure of the outbreak 43
13. Prevention of Covid-19 outbreaks in health care facilities 44
a. Co-ordination of Covid-19 prevention efforts 44
b. Early detection 45
c. Pre-emptive containment measures 47
14. Occupational Health and Safety measures applied to Covid-19 prevention and outbreak response 47
Appendices 48
Appendix 1: Outbreak investigation check list 48
Appendix 2: Outbreak case investigation form 50
Appendix 3: Contact line list 51
Appendix 4: Contact screening tool 52
Appendix 5. Algorithm for management of HCW who are contacts of Covid-19 cases, or who test positive for Covid-19 53
Appendix 6: IPC checklist for outbreaks 54

Writing team: Kerrigan McCarthy, Lesley Bamford, Rebecca Berhanu, Lucille Blumberg, Angela Dramowski, Anchen Laubscher, Caroline Maslo, Elizabeth Mayne, Shaheen Mehtar, Tash Meredith Jeremy Nel, Nilesh Patel, Olga Perovic, Mande Taubkin, Juno Thomas, Anne von Gottberg.

The infection prevention and control audit checklist was prepared by Shaheen Mehtar, Angela Dramowski, Briette du Toit and Ronel Steinhobel

Part A: Quick reference guide to support outbreak investigation and response

BACKGROUND

These guidelines are applicable to healthcare facilities (clinics, hospitals and care facilities for the aged, infirm or mental health care users). The aim of this guideline is to:

1. Provide a practical step-by-step approach to Covid-19 outbreak investigation
2. Contain facility-associated Covid-19 transmission and
3. Identify and remediate gaps in infection prevention and control (IPC) practice to prevent future outbreaks.

I. DECIDING WHEN TO INITIATE AN OUTBREAK INVESTIGATION

Unexpected cases or clusters of patients or HCWs with Covid-19 infection should prompt an outbreak investigation. An outbreak response is not required for patients in whom Covid-19 was suspected and have been appropriately managed with correct infection prevention and control measures. The following situations should prompt an outbreak investigation:

1. An admitted patient in a health care facility
    a. who was not initially suspected of Covid-19, and/or was not appropriately triaged, develops compatible symptoms, and a laboratory test confirms the presence of SARS-CoV-2.
    b. who is incidentally tested (for example prior to surgery or transfer to another hospital) and who is not suspected of having Covid-19, tests positive for SARS-CoV-2.
2. A HCW in a facility
    a. undergoes routine symptom screening, is found to have compatible symptoms and a swab yields a positive result for SARS-CoV-2.
    b. has a swab collected as part of systematic or random testing of asymptomatic staff, and the swab yields a positive SARS-CoV-2 result in an asymptomatic HCW.

II. INITIAL STEPS FOLLOWING RECOGNITION OF AN OUTBREAK (See Figure 1 below)

1. An outbreak investigation leader should be identified. This person should be sufficiently senior in the health care facility management to take responsibility for the actions required to manage the outbreak **and should receive full delegated authority from the institutional head.**

2. Convene an outbreak investigation team. (See Part B, Section 5a. Leadership structures). Essential roles include:
    a. Head of the facility (CEO/CMO)
    b. IPC specialist
    c. Occupational health specialist if available
    d. Senior matron
    e. A senior clinician or medical specialist
    f. Microbiologist and/or infectious diseases specialist if available
    g. Housekeeping and environmental cleaning
    h. Data manager.

Other individuals or groups that may need to be included are unions and organized labour, human resources, media liaison officer, pharmacist and appropriate allied health care practitioners.

3. The checklist in Appendix 1 can be used to guide initial actions following detection of the outbreak.

4. Early communication to key stakeholders (HCWs, unions, patients, media) following detection of the outbreak should be made by a senior authority in the institution to prevent misinformation and reduce anxiety (See Part B, Section 5.c). An initial communication regarding the outbreak needs to be made within 12-24 hours following recognition of the incident. This initial communication should clearly state:
    - what is known about the outbreak at that time point and what is not known
    - what initial steps have been taken to contain the outbreak
    - how persons can prevent themselves from becoming ill (i.e. strict adherence to IPC measures).

5. Clear and concise record keeping is critical as outbreaks may have legal and economic implications and government authorities may also require reports. The investigation process may also yield findings that offer learning lessons for others (See Part B, Section 5.f)

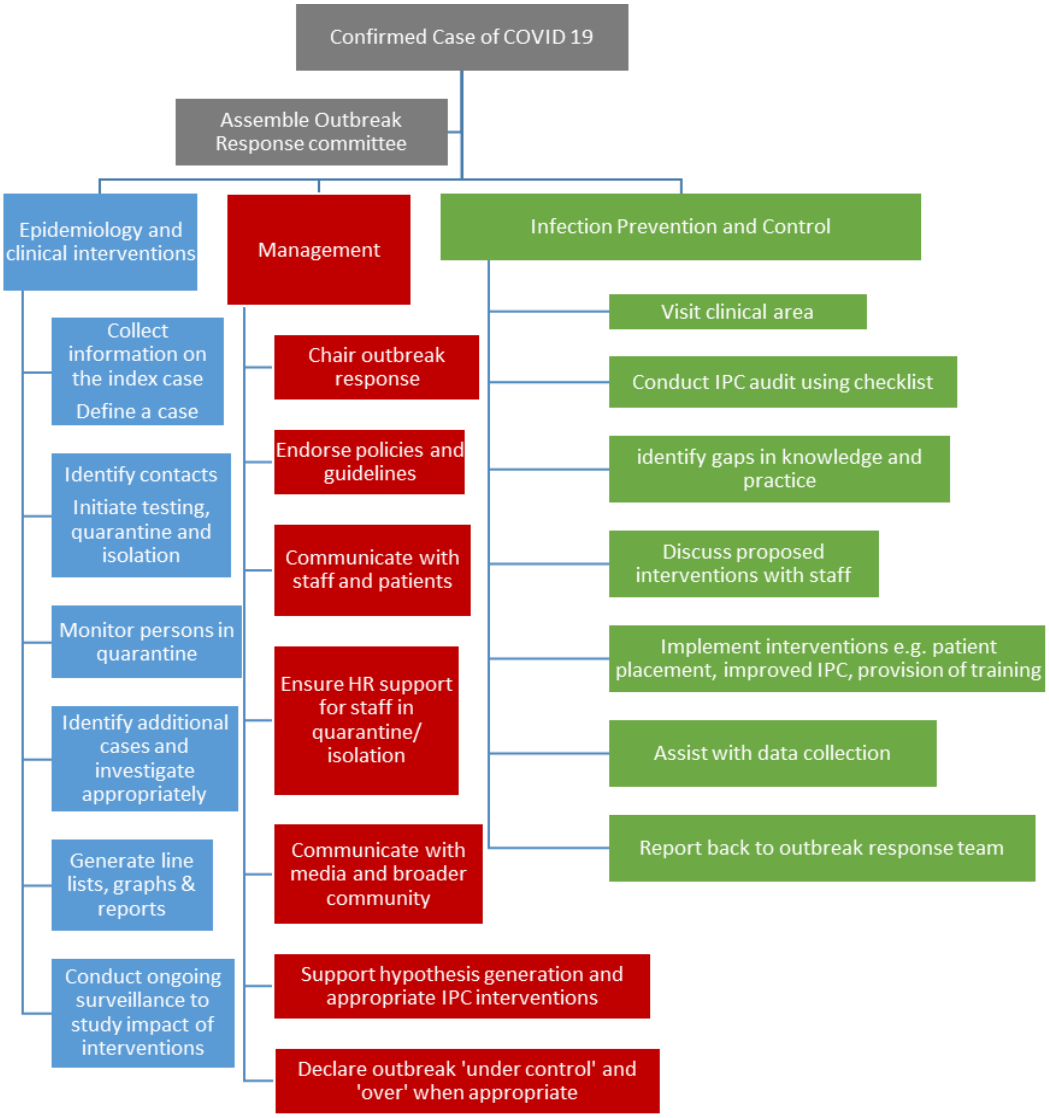


Figure 1: Approach to investigation and management of healthcare-associated Covid-19 infections

III. ASSESSMENT OF THE INDEX CASE(S), THE INFECTIOUS PERIOD AND THE EXPOSURE PERIOD

1. A full description of the index patient should be obtained and presented to the first meeting of the outbreak investigation team. A case investigation form should be completed (see Appendix 2 and Part B, Section 7.b Assessment of the index case).

DEFINE THE INFECTIOUS PERIOD FOR THE CONFIRMED CASE (See Part B, Section 7.c):

- In a symptomatic person, the infectious period commences 48 hours prior to symptom onset and lasts until 10 days after symptom onset
- In an asymptomatic case
    - Where the source of infection is unknown, the infectious period may be regarded as commencing 48 hours before the sample which led to confirmation was taken, to 10 days after the sample was taken.
    - Where the source of infection is known, the infectious period can be estimated based on a minimum incubation period of 2 days following exposure.

DEFINE THE EXPOSURE PERIOD FOR THE FACILITY:

- In a health care facility, the exposure period for a health care facility are the days that infected HCW/s or patient/s was/were present in the facility whilst in the infectious period.

2. Once the infectious period of the index case/s is known, an initial assessment can be made regarding the likelihood of onward transmission of SARS-CoV-2 in the facility:
    - **Unlikely transmission scenario:** where the index case has been in the health facility whilst infectious (i.e. during the infectious period) for </=2 days, or
    - **Likely transmission scenario:** when index cases/s have been in the facility for more than 2 days during the infectious period. (see Part B, Section 8f.)

IV. IDENTIFICATION OF CONTACTS

1. The index case/s should be interviewed to identify all persons whom they have come into contact with during the infectious period (see Part B, Section 8.4 Identification of contacts). These persons may include HCWs, support staff, members of auxiliary services, other patients in the same room/cubicle, patients who shared a toilet or were in the same waiting area and visitors. The movements of cases through the facility should be traced in order to identify contacts.

2. All contacts should be listed on the contact line list (see Appendix 3).

3. All contacts should be interviewed to determine if they are 'close' contacts according to the WHO definition (see text box).

DEFINITION OF A CLOSE CONTACT: (See Part B, Section 8.d)
Close contacts are those who meet the WHO case definition of contacts (> 15 minutes within 1 meter without mask and eye protection and/or PPE failure).
HCW who were in contact with the index case/s and who were wearing appropriate personal protective equipment are regarded as 'low risk' contacts.

4. All HCW who are close contacts should be interviewed. The WHO Health worker exposure risk assessment and management tool should be completed for every HCW who was a high-

risk contact of a Covid-19 case. If the index case is a HCW, attention should be paid to work areas and other shared spaces used by the HCW (tea/break rooms, changing rooms, toilets, computer/work spaces) and other HCWs or facility staff who share transportation with the index case when traveling to work (taxi, shared private vehicle, etc).

V. QUARANTINE, TESTING AND MANAGEMENT OF CONTACTS (See Part B, Section 8)

1. Low-risk contacts (those who do not meet the WHO definition for contacts) who are HCW may continue to work but should monitor for symptoms for 14 days.

2. Close contacts only (i.e. not low-risk contacts) should be tested for Covid-19 as soon as possible after exposure to the case/s is identified. This includes c**ontacts who are symptomatic when interviewed AND contacts who are asymptomatic.** However, when the exposure period for the facility is short (e.g. <2 days), testing may be delayed until day 8 after last exposure in asymptomatic contacts who are HCW may delay in line with the protocol to support an early return to work (see point 7 below). However, when the exposure period is longer (3-7 days), secondary and tertiary transmission may have already taken place, and early testing of all contacts is essential to identify cases and contain the outbreak

3. All close contacts should be immediately quarantined and monitored for symptoms (see Appendix 4) whilst waiting for test results. Quarantine of high-risk contacts will prevent onward transmission of Covid-19 in a facility. Contacts who have been infected with Covid-19 will not transmit infection onwards if they are in quarantine. Contacts should be counselled regarding the meaning of quarantine. It should be ascertained if they are able to self-isolate as part of quarantine. If not, institutional and local health care authorities should consider using a quarantine facility, or a providing alternative accommodation. Guidance for persons who undergo quarantine at home may be found at https://sacoronavirus.co.za/2020/03/15/covid-19-self-quarantine-guidelines/. A self-monitoring tool for contacts may be found in Appendix 3. The human resources manager, occupational health or IPC nurse should support HCWs in quarantine with intermittent telephone calls.

4. All contacts who test positive for SARS-CoV-2 should be isolated for a period of 10 days post the onset of symptoms or 10 days from test date if asymptomatic.

5. Close contacts who test negative for SARS-CoV-2 should remain in quarantine for 14 days whilst continuing to monitor symptoms. If symptoms compatible with Covid-19 develop, they should undergo repeat testing.

6. Patients who were in the same room/ward as the index case, or who shared a bathroom, and remain hospitalized should be placed in isolation or in the PUI ward and closely monitored for symptoms and signs of infection for 14 days following last exposure. These patients should be provided with surgical masks. Patients who were close contacts but have been discharged should be contacted and instructed to self-quarantine at home (or in a quarantine facility) and monitor themselves for symptoms for 14 days from exposure.

7. HCW who are close contacts may return to work after a negative Covid-19 test 8 days after exposure, whilst continuing to monitor for symptoms, practicing strict IPC and avoiding contact with vulnerable patients until day 14 post last exposure to the index case. This intervention is advised to minimize critical HCW shortages (see Guide to the management of

staff in healthcare and laboratory settings with Covid-19 illness and exposure V9. 31 March 2020, see Appendix 5).

8. If more than 14 days has elapsed after last exposure to the index case, and the contact is asymptomatic, neither testing nor quarantine are necessary.

VI. SECONDARY CASES AND MANAGEMENT OF LARGE/UNCONTAINED OUTBREAKS (Section 8.g-j)

1. Any contacts who test positive for Covid-19 become 'cases'. An identical process of identification of contacts of the second-generation case/s, including quarantine, management and testing of contacts should be followed.

2. If the index case was identified and contact tracing initiated early, it is likely that second-generation cases may already be in quarantine when they test positive. In this case, there will be no contacts of the second-generation case in the health care facility. Transmission of Covid-19 in the facility will have been stopped.

3. However larger outbreaks with secondary and tertiary waves of transmission may occur:
    a. when the initial source case(s) are missed,
    b. outbreak investigations and quarantine procedures are delayed due to long test turnaround time,
    c. when contacts not identified in the initial contact tracing become positive.

4. If it becomes apparent that widespread transmission has happened in the facility, it may be helpful to identify groups of HCW to test (see Section 8.6). This may include HCW who work in a specific part of the facility, such as in the emergency department, theatre, or ICU, or those that may have had exposure to the apparent 'epicentre' of infection in the facility. Particular attention should be paid to HCW who move between different sections of a hospital or facility (e.g. radiographers, physiotherapists, phlebotomists, cleaning staff, case managers etc.) as they can serve as a transmission 'bridge' between different units.

5. In certain circumstances, it may become necessary to temporarily close a ward or unit in order to gain control of a large Covid-19 outbreak (See Section 8.j). **Theatre, unit or ward closure is an <u>extreme measure</u>** and should only be undertaken in consultation with infectious diseases or IPC specialists. <u>In the event of a ward closure, the affected clinical area is closed to new admissions and patients should **not** be moved to another part of the facility (unless it is an isolation/PUI area) as this defeats the purpose of ward closure.</u> In the interim, contact tracing should be conducted and strengthened IPC measures should be implemented. In the event of theatre closure, terminal cleaning can be done once staff or patients vacate the theatre complex. Once the ward population has decreased to a number that can be managed in a single unit or smaller clinical area (as patients have been discharged home), the contaminated areas can be terminally cleaned and disinfected and opened to new admissions.

VII. ENVIRONMENTAL DECONTAMINATION (See Section 8.9)

All equipment and rooms where the infectious case/s have been within the last 7 days should be identified for appropriate cleaning. The South African Covid-19 Disease Infection Prevention and Control guidelines should be followed. Following thorough cleaning, <u>surfaces are wiped</u>, not sprayed with disinfectants such as 1000 ppm chlorine (hypochlorite) or 70% alcohol, as recommended.

VIII. PSYCHOSOCIAL SUPPORT DURING OUTBREAKS (See Part B, Section 10)

It is essential to support the psychosocial needs of persons during outbreaks. Strategies to strengthen coping mechanisms may be found in Part B, Section 10.

IX. REPORTING THE FINDINGS OF AN OUTBREAK INVESTIGATION, GENERATING HYPOTHESES AND DECLARING AN OUTBREAK CLOSED (See Part B Section 9, 11,12)

1. In situations where facility-based transmission has occurred, the outbreak investigation team should aim to identify possible sources and places of exposure (see Part B Section 9). In the healthcare setting, exposures may occur from staff-to-staff, patient-to-staff and from staff-to-patient. Following Covid-19 exposure events, IPC measures should be strengthened in in the health care facility itself, and other community settings such as:

- the index case's immediate family members and household,
- student residences or workers' hostels at the health care facility,
- public transport and other community exposures (shops, public amenities)
- workplace/s (the workstation area and communal, recreation areas at the workplace)[i].
- shared changing rooms in the workplace.

2. Reporting of findings through daily updates, interim and final reports to all affected persons and stakeholders is critical (See Part B, Section 11). The daily report to the outbreak investigation team should include updates and summaries of findings and activities according to the various components of the outbreak response. Daily reports should be brief, with bullet points summarizing actions in each section including
    - Epidemiology and surveillance – including laboratory results, updates on cases and contacts, and further investigations to identify the source.
    - Infection prevention and control – findings from assessments, interventions to prevent additional cases, training and refresher activities
    - Health workforce management – staffing arrangements to support continuity of service, and update regarding quarantined/isolated persons
    - Communication – media reports, engagement with organised labour and provincial authorities.

   Reports should continue until the end of the outbreak and for a period afterwards, however, their frequency may be reduced from daily to weekly. (Section 11, Table 5 summarises components of the various reports on outbreak investigations and response).

3. An outbreak may be regarded as over when two complete incubation periods have passed without the detection of additional cases (i.e. 28 days) (see Part B, Section 12) assuming that adequate surveillance mechanisms are in place. During the period whilst investigations are proceeding, and no additional cases are identified, it may be safe to report that an outbreak is 'under control'. However, this announcement should be cautiously worded, explaining the interventions that are in place to detect additional cases.

4. At all stages of the Covid-19 pandemic, facilities should be on the alert as cases may arise at any stage through community transmission leading to infected HCW, or through admission of cases where Covid-19 is undetected.

X. PRIMARY PREVENTION OF HEALTHCARE-ASSOCIATED COVID-19 OUTBREAKS, INCLUDING OCCUPATIONAL SAFETY (Part B, Sections 13 and 14)

Each instance of a healthcare-associated Covid-19 facility outbreak should be used as an opportunity to re-evaluate policies and practices, re-train staff and strengthen Covid-19 primary prevention measures. Use Appendix 6 to identify areas that require strengthening with the IPC checklist for investigating a Covid-19 outbreak.

Primary interventions to support prevention and early detection of Covid-19 in healthcare facilities (see Table 6, pg. 46)

Administrative interventions	Engineering interventions	Personal Protective Equipment
Visitors and Patients 1. Limit or restrict HCF visitors and persons escorting patients. 2. Screen all visitors for Covid-19 symptoms 3. Restrict hospital admissions to essential stays 4. De-escalate non-urgent admissions and postpone elective procedures 5. Triage and screen all patients for Covid-19 symptoms before entering the HCF according to guidelines 6. Triage patients with possible Covid-19 symptoms to a separate assessment area 7. Admit PUI and Covid-19 infected patients to dedicated isolation wards 8. Avoid movement and transfers of patients and staff between wards 9. Implement a standardised Covid-19 symptom/exposure checklist for admissions 10. Screen all hospital inpatients daily for Covid-19 signs and symptoms 11. For inpatients, maintain a low threshold to isolate, re-assess and screen for SARS-CoV-2 if developing pyrexia of unknown origin or new respiratory symptoms 12. Consider testing all new ICU admissions for SARS-CoV-2; if laboratory capacity allows, consider testing of all patients on admission.	1. Ensure adequate natural or mechanical ventilation for areas where aerosol-generating procedures are performed often e.g. ICU's 2. Increase the frequency of surface and equipment cleaning and disinfection in the HCF. 3. Increase the availability of alcohol hand rub at the point of care and ensure access to soap, water and handtowels. 4. Provide dedicated areas for cleaning and disinfection of re-usable PPE e.g. visors and goggles 5. Create greater physical separation between beds to reduce droplet contamination of surfaces e.g. convert a 6-bed to a 4-bed cubicle; or use partitions or screens between beds in ICUs 6. Implement strict physical distancing in the workplace i.e. on ward rounds, in tea rooms, the cafeteria, staff meetings 7. Close public cafeteria seating areas. 8. Keep medical notes outside of the patient cubicle; keep paper notes in a plastic file and prescription charts in plastic sleeves that can be wiped over with 70% alcohol 9. Ensure tea rooms are spacious and well-ventilated, and stagger tea times to avoid crowding.	**Visitors, Patients and Staff** **Universal masking** 1. Require all outpatients and visitors to wear a non-medical (cloth) mask while inside the HCF 2. Require all inpatients with or without symptoms of acute respiratory infection to wear a surgical mask. 3. Require all healthcare workers to wear masks at all times whilst in the facility 4. All administrative staff and support staff with limited patient contact, use non-medical (cloth) masks. **PPE policies and training** 1. Ensure all staff are familiar with the HCF's PPE policies 2. Ensure a stable supply of adequate quality PPE 3. Provide ongoing training, PPE buddies and visible reminders of how to don and doff PPE in Covid areas.
Staff 1. As far as possible, avoid movement of staff between Covid and non-Covid sections of the hospital on any particular day. 2. Consider staff off duties for extended periods before returning to non-Covid areas. 3. All staff to undergo repeated training regarding Covid-19 risk reduction 4. Ensure agency staff or locums are familiar with the HCF's Covid-19 policies 5. Encouraged all staff receive influenza vaccination to reduce frequency of flu-like illnesses and absences 6. Perform daily self-monitoring for Covid-19 symptoms using a form, an app or a 7. buddy symptom checking system. 8. Ensure staff are familiar with how to report symptoms to their line manager 9. Support staff to travel to and from work in ways that minimise community exposure to Covid-19		

Part B: Outbreak Investigation Manual and Appendices

1. Introduction and background

The first case of coronavirus disease 2019 (Covid-19) was reported to the World Health Organization (WHO) in December 2019 from Wuhan City, Hubei Province in China. In January 2020, the WHO declared the Covid-19 outbreak a public health emergency of international concern (PHEIC). On the 5th of March 2020, South Africa reported its first case of Covid-19. On the 11th of March 2020, the WHO characterized Covid-19 as a pandemic. On the 15th of March 2020 the President of South Africa declared the pandemic to be a National Disaster and instituted travel bands and closure of schools. On the 23rd of March 2020, the National Command Council enforced a nation-wide lockdown with effect from midnight on Thursday 26 March to assist in preventing the spread of Covid-19.

Soon after the initial detection of imported cases, incidents of hospital-associated infections (HAI) were reported to the National Institute for Communicable Diseases (NICD). An outbreak of Covid-19 at a private sector hospital in eThekwini lead to closure of the facility[1]. Follow-up investigations revealed that 39 patients and 80 staff were linked to the outbreak. Ultimately 15 persons died.
Based on current evidence, the Covid-19 virus is transmitted between people through close contact and droplets[2], however the possibility of airborne transmission remains unclear[3]. Whilst asymptomatic transmission of SARS-CoV-2 has been documented[4], the people most at risk of infection are those in close contact with a Covid-19 patient or who care for Covid-19 patients.
Therefore health care workers (HCW) are at risk for Covid-19 infection[5]. Reasons for Covid-19 infections in HCW include unprotected exposures to infected patients either in the community or in healthcare facilities, inadequate or incorrect use of personal protective equipment (PPE), poor hand hygiene practices, lack of environmental cleaning or work intensity coupled with long duration of exposures[6].

The risk of Covid-19 in health facilities increases as a result of increased burden of disease as well as community transmission. An increased load of Covid-19 infections in health care facilities may lead to healthcare associated (HA) transmission to patients and staff, staff shortages due to consequential quarantine requirements, serious infections and death particularly amongst staff and patients with underlying risk factors, and facility closure.

There are increasing requests made to the NICD to support outbreak investigations and responses in health care facilities. These guidelines are compiled to support facility and district health care staff to conduct their own response activities. They facilitate a practical step-by-step approach to outbreak investigation with the aim of identifying and remediating gaps in infection prevention and control (IPC) practice.

[1] Full report available at https://www.krisp.org.za/manuscripts/StAugustinesHospitalOutbreakInvestigation_FinalReport_15may2020_comp.pdf
[2] WHO Risk assessment and management of exposure of health care workers in the context of COVID-19. Interim guidance. 19 March 2020
[3] Bahl P, Doolan C, de Silva C, Chughtai AA, Bourouiba L, MacIntyre CR. Airborne or droplet precautions for health workers treating COVID-19? [published online ahead of print, 2020 Apr 16]. *J Infect Dis*. 2020;jiaa189. doi:10.1093/infdis/jiaa189
[4] Gandhi M, Yokoe DS, Havlir DV. Asymptomatic Transmission, the Achilles' Heel of Current Strategies to Control Covid-19. *N Engl J Med*. 2020;382(22):2158-2160. doi:10.1056/NEJMe2009758
[5] Bahl P, Doolan C, de Silva C, Chughtai AA, Bourouiba L, MacIntyre CR. Airborne or droplet precautions for health workers treating COVID-19? [published online ahead of print, 2020 Apr 16]. *J Infect Dis*. 2020;jiaa189. doi:10.1093/infdis/jiaa189
[6] Wang J, Zhou M, Liu F. Reasons for healthcare workers becoming infected with novel coronavirus disease 2019 (COVID-19) in China. *J Hosp Infect*. 2020;105(1):100-101. doi:10.1016/j.jhin.2020.03.002

These guidelines should be read together with the South African National Infection Prevention and Control Strategic Framework and Manual[7] which set minimum national standards for the effective prevention and management of HAIs, and the Covid-19 Infection Prevention and Control Guidelines of the National Department of Health[8] so that hazards associated with biological agents are minimized for patients, visitors and health care personnel in health facility.

2. Health-care associated Covid-19 outbreaks in health care facilities across the globe.

In the early stages of the Covid-19 pandemic, reports from China and Europe suggested high rates of healthcare-associated (HA) transmission to patients and HCWs[9,10,11]. In January 2020, 41% of Covid-19 cases in Wuhan were hospital-acquired of which more than two-thirds were HCWs and the remainder were patients admitted for other diagnoses[12]. Improvements in screening, cohorting and enhancements in PPE subsequently reduced nosocomial transmission to HCWs in many settings[13].

Hospital outbreaks typically occur when there are unrecognized Covid-19 cases amongst patients or other HCWs[14,15]. These can result from false-negative SARS-CoV-2 test results early in the course of disease, asymptomatic/presymptomatic transmission[16] and also from unrecognised cases, sometimes as a consequence of atypical presentation[17]. HCWs with Covid-19 can display very mild or minimal symptoms that are not recognized as potential Covid-19 (such as mild coryza or nasal congestion, fatigue, muscle aches etc.) and there is often a lag time of 1-2 days before mildly symptomatic HCWs are referred for testing and quarantine[18]. These brief delays can lead to onward transmission to other HCWs, patients and result in propagated outbreaks.

There is presently no consensus on how best to minimize the risks posed by asymptomatic and presymptomatic transmission in healthcare settings. Proposed strategies include universal masking for all HCWs[19]; daily symptom and temperature checks of all employees[20]; increased physical distancing measures for HCWs in work areas, break rooms and in transportation to/from work[21]; low thresholds for quarantining and testing symptomatic HCWs; weekly testing of asymptomatic HCWs[22]; triage of hospitalized patients in different zones based on Covid-19 risk; universal testing of

[7] Accessible at https://www.nicd.ac.za/wp-content/uploads/2020/04/National-Infection-Prevention-and-Control-Strategic-Framework-March-2020-1.pdf
[8] Accessed at https://www.nicd.ac.za/wp-content/uploads/2020/05/ipc-guidelines-covid-19-version-2-21-may-2020.pdf
[9] Sikkema et al. COVID-19 in healthcare workers in three hospitals in the South of the Netherlands, March 2020. Medrxiv May 1 2020. doi: https://doi.org/10.1101/2020.04.26.20079418
[10] Heinzerling, Amy. "Transmission of COVID-19 to Health Care Personnel During Exposures to a Hospitalized Patient — Solano County, California, February 2020." MMWR. Morbidity and Mortality Weekly Report 69 (2020). https://doi.org/10.15585/mmwr.mm6915e5
[11]Wang et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China. JAMA. February 2020. doi:10.1001/jama.2020.1585
[12] Ibid
[13] Peng et al. Practical experiences and suggestions for the 'eagle-eyed observer': a novel promising role for controlling nosocomial infection in the COVID-19 outbreak. (letter) Journal of hospital epi, March 2020. DOI:https://doi.org/10.1016/j.jhin.2020.02.020
[14] https://www.krisp.org.za/manuscripts/StAugustinesHospitalOutbreakInvestigation_FinalReport_15may2020_comp.pdf
[15] Heinzerling, Amy. "Transmission of COVID-19 to Health Care Personnel During Exposures to a Hospitalized Patient — Solano County, California, February 2020." MMWR. Morbidity and Mortality Weekly Report 69 (2020). https://doi.org/10.15585/mmwr.mm6915e5.
[16] Arons et al. Presymptomatic SARS-CoV-2 Infections and Transmission in a Skilled Nursing Facility. NEJM, April 24, 2020. DOI: 10.1056/NEJMoa2008457.
[17] Tay HS, Harwood R. Atypical presentation of COVID-19 in a frail older person [published online ahead of print, 2020 Apr 21]. *Age Ageing*. 2020;afaa068. doi:10.1093/ageing/afaa068
[18] Chow et al. Symptom Screening at Illness Onset of Health Care Personnel With SARS-CoV-2 Infection in King County, Washington. April 2020, JAMA.
[19] Klompas et al. Universal Masking in Hospitals in the Covid-19 Era. (Opinion). 1 April 2020, NEJM. DOI: 10.1056/NEJMp2006372
[20] Ibid
[21] Ibid
[22] Black et al. COVID-19: the case for health-care worker screening to prevent hospital transmission. Lancet correspondence. April 16, 2020 DOI:https://doi.org/10.1016/S0140-6736(20)30917-X

all hospitalized patients[23]; and increased focus and attention on increasing routine hand hygiene (i.e. availability of sanitizer dispensers, spotters, audits, etc).

Despite the best prevention efforts, outbreaks in health care settings appear inevitable and strong systems to detect and respond to unrecognized Covid-19 cases need to be put in place. Presently, few countries have outlined guidelines for outbreak investigation and response. Approaches that are drawn from guidelines that were drawn up to support outbreak investigation and response to other respiratory viruses (influenza, MERS, SARS-CoV-1)[24] are helpful, as well as the WHO guidelines on the investigation of cases and clusters of Covid-19[25].

3. Definitions and scope of these guidelines

The aim of these guidelines is to support a systematic approach to detection and containment of Covid-19 in health care facilities through provision of a brief reference document and in-depth manual. The intention of these guidelines is to translate and apply the principles of outbreak investigation to the Covid-19 pandemic in South Africa so as to support the investigation and response to HA outbreaks in a practical way.

These guidelines are limited to the detection and response to Covid-19 in health care facilities as defined below. Whilst the general principles of outbreak detection and response that are outlined here may be helpful in other contexts (e.g. workplace settings or institutions such as residences), the SARS-CoV-2 virus poses unique risks in health care facilities that are not present elsewhere. This guideline provides an approach to Covid-19 outbreak in institutions AND deals with issues pertaining specifically to health care facilities.

a. Definitions

A health care facility: The whole, or part, of a public or private health institution, facility, building or place, whether for profit or not, that is operated or designed to provide treatment; diagnostic or therapeutic interventions, nursing, rehabilitative, palliative, convalescent, preventative or other health services such as emergency medical services.

A health care worker: Any person who delivers health care and services (directly or indirectly) in a health facility to users. It includes health care professionals and support staff such as cleaners, food service workers, laundry staff, administrative staff, pharmacists, stock controllers, patient facing laboratory and phlebotomy staff, physical and occupational health therapists, and radiographers.

SARS-CoV-2: The virus responsible for Covid-19 infection

Covid-19: Coronavirus disease caused by SARS-CoV-2 virus

A Covid-19 facility outbreak: The detection of single or multiple cases of laboratory-confirmed, symptomatic or asymptomatic Covid-19 in a health facility, in health care workers or in patients where this diagnosis was unsuspected on admission to the health care facility. [Detection of a single case where the infected person was in the facility for <3 days whilst infectious will require a limited response.]

[23] Sutton et al. Universal Screening for SARS-CoV-2 in Women Admitted for Delivery. (Letter)NEJM April 13 2020.

[24] WHO. Protocol to investigate non-seasonal influenza and other emerging acute respiratory diseases. 2018. https://www.who.int/influenza/resources/publications/outbreak_investigation_protocol/en/

[25] WHO. Considerations in the investigation of cases and clusters of COVID-19. 2 April 2020. https://www.who.int/publications-detail/considerations-in-the-investigation-of-cases-and-clusters-of-covid-19

Index case: The first person (health care worker or patient) who tested positive for SARS-CoV-2 except in a patient where the diagnosis was suspected on admission to the health care facility.

A close contact of a Covid-19 case (specific to health care settings)[26]:

- A health care worker contact: any HCW in direct contact with a Covid-19 patient, within 1 meter for 15 minutes or longer, without appropriate PPE (mask and eye protection) and/or experienced failure of PPE.
- A contact who is a patient (or visitor) exposed during hospitalisation: any patient hospitalised in the same room or sharing the same bathroom as a Covid-19 patient, visitors to the patient, or other patient in the same waiting area or outpatient examination room who spent 15 minutes or longer within 1 meter with the index case; or other situations as dictated by a risk assessment;
- A contact who is a patient (or visitor) exposed during an outpatient visit: Anyone in the waiting room or equivalent closed environment at the same time as a person with a confirmed diagnosis of Covid-19; or anyone within 1m of the Covid-19 patient in any part of the hospital for >15 minutes.

4. Covid-19 outbreak investigations in health care facilities

a. Aims of Covid-19 outbreak investigations

- To identify source of outbreak so as to
    - contain and prevent further transmission,
    - identify gaps in and strengthen the IPC measures which facilitate early detection and response to a case of Covid in a health care facility.

b. Principles of outbreak investigation

The principles of outbreak investigation are outlined in the National IPC Manual[27] ((Figure 1). These include the need to:

- establish a multidisciplinary team of essential role players,
- to confirm the presence of an outbreak,
- to verify the diagnosis,
- to define and identify cases,
- to describe the epidemiology of the outbreak in terms of time, person and place,
- to generate and evaluate hypotheses,
- to implement containment and IPC measures,
- to communicate findings,
- to maintain surveillance and vigilance, and
- to document all activities related to the investigation.

[26] WHO. Contact tracing in the context of COVID-19. Interim guidance, 10 May 2020 https://www.who.int/publications-detail/contact-tracing-in-the-context-of-covid-19

[27] Practical Manual for Implementation of the National Infection Prevention and Control Strategic Framework – 2020, National Department of Health. National Guidelines on Epidemic Preparedness and Response. Pretoria. 2009. Accessed at https://www.nicd.ac.za/wp-content/uploads/2020/05/ipc-guidelines-covid-19-version-2-21-may-2020.pdf

Importantly, these principles are not 'steps', as they are not done sequentially. In real-life outbreaks, the principles are applied simultaneously. For example, whilst investigations are being done, health promotion messages are being relayed to stakeholders, interventions to minimise onward transmission of cases are being applied and analysis of the data as it comes in, is being done.

In practice, and when applied to Covid-19, these principles need to be informed by evidence based understandings of disease transmission, by the natural history of disease and proven effectiveness of disease containment and IPC measures. Further, the response to the outbreak needs to be supported by definitive leadership, clear communication, and a compassionate approach to the fear elicited by the outbreak in affected persons.

This guideline document has been developed to provide a user-friendly tool specific to Covid-19 outbreak investigations that take into account our current understanding of the disease transmission dynamics of SARS-CoV-2 in health care facilities. It applies the principles of outbreak investigation to Covid-19 outbreaks in health care facilities.

Figure 1. The ten classic steps of outbreak investigation

5. Leadership and communication during facility outbreaks

Effective leadership is perhaps the most important component of outbreak investigation[28]. Leaders are required to direct and co-ordinate investigations, set a non-retributive, non-judgemental tone, draw on skills of all members of the team, take responsibility for communication of findings and implementation of corrective action. In addition, outbreaks may have ethical, legal and economic implications for individuals and for the institution. Therefore, leadership during outbreak investigations must be effective, responsible and authoritative. Leaders need to be informed, engaged and prepared. They need to have courage to take decisions in a decisive manner, often informed by incomplete information.

A named individual who will take responsibility for leading outbreak investigations should be identified in a facility as part of IPC planning. However, if this is not done prior to the outbreak, this person should be identified as soon as the outbreak is detected. To avoid confusion, only a single leader should be operative, although in prolonged outbreak investigations, leadership may be handed over to another individual.

The named person should be sufficiently senior in the health care facility management structure to take responsibility for the actions required as part of the outbreak investigation. He/she should receive full delegated authority from the institutional head so that he/she may take responsibility for all decisions.

a. Leadership structures

The leader of the outbreak will convene a multidisciplinary team to support outbreak investigations and management. Ideally the members of this team will have been identified as part of IPC preparations.

The essential role players are as follows but others might be co-opted as and when required. Each of the following should be given a clearly defined role for which he/she will be responsible during the outbreak. The leader may include persons listed below depending on the nature and extend of the outbreak.

- Head of the facility (CEO/CMO)
- IPC specialist
- Occupational health specialist if available
- Senior matron
- A senior clinician or medical specialist
- Microbiologist and/or infectious diseases specialist if available
- Housekeeping and environmental cleaning
- Data manager

Other individuals or groups that may need to be included are unions and organized labour, human resources, media liaison officer, pharmacist and appropriate allied health care practitioners. Administrative staff should be present to take minutes, send out minutes and tasks, and ensure all the information submitted is presented to the Outbreak Response Team.

[28] Kahn, LH. Who's in Charge? Leadership during Epidemics, Bioterror Attacks, and Other Public Health Crises. Praeger Security International, Santa Barbara, CA, USA, 2009 ISBN 978-0275994853

b. Leadership style

Outbreak investigations are often conducted under extreme pressure. Depending on the nature of the outbreak, lives and livelihoods may be at stake and the source may be unknown. Investigations need to be done quickly so that interventions may implemented rapidly and the outbreak controlled. Because of this, outbreak specialists often refer to a 'command and control' approach to leadership structures[29], as contrasted with a consultative, consensus-based approach. This terminology reflects the need for rapid and clear decisions, and the importance of directed, short, meetings with less emphasis on discussion and consensus. However, consensus cannot completely be done away with, and leaders will need to be sensitive to the context and personal factors at play.

HCW in facilities are often aware that outbreaks in health care facilities may have ethical, legal and economic implications. HCW may be fearful that these outcomes will affect their work performance or job security, and may be tempted to hide or obfuscate the truth.

Therefore, the leader of an outbreak investigation should state clearly and at the outset of the investigation that the purpose of the investigation is to contain the outbreak, and identify the cause so that further infections and adverse consequences can be avoided. Leaders of the outbreak investigation should set a non-judgemental, non-accusatory tone, and include phrases such as 'we can learn from this', 'let's work to save lives', 'everyone makes mistakes, what's important is that we learn from them'.

c. Principles of communication during outbreaks

Communication during outbreaks is essential to engender support for investigations and to contain fears of patients and staff. WHO advises adherence to the principles listed in Table 1 below[30].

At the outset of the outbreak investigation, it is important to identify key stakeholders who need to be informed regarding the presence of the outbreak, the implications of the outbreak for their service delivery, and the actions that are to be taken during and after the outbreak.
Different stakeholders require different messages. Some information is sensitive, and should not be widely disclosed. The balance between disclosure and transparency should be handled with insight into the values, attitudes and perceptions of stakeholders. Key messages should be identified and communicated. These may include:

- Addressing fear by reassuring health care workers and patients that authorities have responded quickly and are enlisting the help of technical assistants.
- Addressing the threat of loss of livelihood by saying that where possible, the outbreak investigation and staff quarantine will not affect payment of salaries
- Emphasizing behaviours that can prevent disease transmission and keep persons safe. For example, messages can remind HCW that adherence to mask and eye protection use, social distancing, and hand-washing can reduce the risk of transmission.

[30] WHO World Health Organization Outbreak Communication Planning Guide.
https://www.who.int/ihr/elibrary/WHOOutbreakCommsPlanngGuide.pdf?ua=1

Table 1. Key principles to support communication during outbreak investigations adapted from the WHO outbreak communication guidelines[31]

PRINCIPLE	DESCRIPTION
TRUST	Communicate in ways that build, maintain or restore trust between health care workers, patients, and key stakeholders.
ANNOUNCING EARLY	Proactive communication is necessary even if information is complete so that affected persons may be alerted, and the threat of disease may be minimised. Early announcement prevents distribution of inaccurate or false information that would erode trust and increase fear.
TRANSPARENCY	Transparency supports the development of trust. The acknowledgement that information is incomplete can be supplemented by details on what authorities are doing to obtain additional data.
REGULAR COMMUNICATION	Frequent communication at appropriate intervals builds trust. Intervals may be determined by the nature of the outbreak, the speed with which the disease is transmitted and the implications for life and livelihood. For example, statements can be release of statements at specific times of day, or emails distributed daily to specific stakeholders.
LISTENING	Listening is an essential component of outbreak investigation. Authorities need to understand how their messages are being heard and interpreted. Authorities need to understand the 'mood' and disposition of their stakeholders so that communication can adequately address their fears and concerns.
PLANNING	A generic outbreak communication plan should be drawn up as part of IPC preparedness. This plan should be tailored to the context at the outset of an outbreak, and adapted as the needs require. The plan should include identification of stakeholders, appropriate communication media, key messages and desired behaviours.

d. Announcement of the outbreak and communication with media

Early communication following detection of the outbreak should be made to prevent misinformation and reduce anxiety. Rumours abound within institutions, and failure to communicate early may lead to a proliferation of rumours. These will erode trust and generate misinformation which are both difficult to address. Therefore, regardless of how minor the event is, an initial communication regarding the outbreak needs to be made within 12-24 hours following recognition of the case/s, to the entire institution. This initial communication should clearly state

- what is known about the outbreak at that time point and what is not known
- what initial steps have been taken to contain the outbreak
- what investigations are being done to better understand the situation
- how persons can prevent themselves from becoming ill
- what resources are available for psychological support for affected persons

The communication should be released by the most senior authority in the institution, so that it is clear to all that the situation is receiving the necessary response and support. This communication may elicit some fear, but transparency and promptness will engender co-operation, trust and a feeling of security despite the uncertainty and risk of the situation.

Media interest in Covid-19 outbreaks is high, and institutions are often approached by media agencies to comment on outbreaks in their facilities. Media may be 'tipped off' by staff members and occasionally by trade union members. It is not helpful if staff members communicate independently with the media, as a proliferation of messages regarding the state of the outbreak can lead to misinformation and erode trust. It is helpful to remind staff that communication with the

[31] Ibid

media is restricted in line with their employment contracts. Communication with the media should be limited to designated authorities such as the institution head or media liaison officer. If an institution makes a decision to release statements to the media concerning the outbreak, the same principles as described above apply.

e. Co-ordination of outbreak investigations

Initially, daily meetings should take place. All designated members of the team should attend, and provide feedback. The chair may use the outbreak investigation checklist as a guide. A standing agenda should be agreed upon which includes feedback from epidemiological investigations, infection prevention and control, human resources and staffing and communications. The chair should send a short daily summary email communication to all outbreak investigation team members with activities and action points. Daily meetings should be kept short with only findings and action points. Inclusion of communication to key stakeholders at all stages of the outbreak.

f. Documentation of outbreak investigation processes

Clear and concise record keeping is critical as outbreaks may have legal and economic implications and government authorities may also require reports. The investigation process may also yield findings that offer learning lessons for others.

Documentation should ensure that events are clearly documented, that the decisions which were made and who made them are recorded, and that the actions taken by role players are listed and described. Responsibility for documentation should be assigned to a specific person in the outbreak investigation team, such as a project manager or administrator.

Documentation should be factual. It should not include assumptions without an evidence base. A decision register should be maintained, describing who took responsibility for decisions, what was decided and the rationale for the decision.

Documents that are relevant may include minutes from outbreak investigation meetings, decision registers, patient medical reports, results from laboratory investigations, contact tracing reports, epidemiology reports, infection prevention and control assessment, training attendance registers, training descriptions, risk assessments completed and the final outbreak report.

6. The process flow of an outbreak investigation

a. Process flow diagram

The quick reference guide on the opening pages of this manual illustrates the process of outbreak investigations, together with chapter and section references to this guideline, and tools that may be helpful at each stage. A checklist to support these actions is provided in Appendix 1.

b. Tools to support aspects of investigation and response

The following checklists or tools may be helpful support aspects of outbreak investigation and response.

Table 2. Supporting documents for outbreak investigation and response

SUPPORTING DOCUMENTS	PURPOSE	WHERE TO FIND THE DOCUMENT
CLINICAL MANAGEMENT OF SUSPECTED OR CONFIRMED COVID-19	Provides the de-isolation criteria for patients who are Covid-19 positive	https://www.nicd.ac.za/wp-content/uploads/2020/05/Clinical-management-of-suspected-or-confirmed-COVID-19-Version-4.pdf
NICD QUICK REFERENCE GUIDE FOR CLINICAL HEALTH CARE WORKERS	Provides an overview of the latest Covid-19 case definition, risk factors and the collection of swabs	https://www.nicd.ac.za/wp-content/uploads/2020/05/COVID-19-Quick-reference-v14-25.05.2020.pdf
COVID-19 DISEASE: INFECTION PREVENTION AND CONTROL GUIDELINES VERSION 2 (21ST MAY 2020)	Provides guidance regarding implementation of IPC measures in the context of Covid-19.	https://www.nicd.ac.za/wp-content/uploads/2020/05/ipc-guidelines-covid-19-version-2-21-may-2020.pdf
NOTIFIABLE MEDICAL REGULATION CASE REGULATIONS, NOTIFICATIONS FORMS AND CASE DEFINITIONS	Provides Covid-19 case definitions, instructions for notification.	https://www.nicd.ac.za/wp-content/uploads/2020/04/Revised_COVID-19_NMC-Case-Def_5-April-2020.pdf
GUIDE TO THE MANAGEMENT OF STAFF IN HEALTHCARE AND LABORATORY SETTINGS WITH COVID-19 ILLNESS AND EXPOSURE (V9. 31 MARCH 2020)	Provides guidance to employers on how to treat healthcare work exposure, or employees who are Covid-19 positive and the criteria for returning to work	https://www.nicd.ac.za/wp-content/uploads/2020/04/Guidance-for-symptom-monitoring-and-management-of-essential-staff-with-COVID-19-related-illness-final-2.pdf

7. Detection of an outbreak and initial assessments

a. Defining an outbreak

A single case of unsuspected Covid-19 in a health-care facility is defined as an outbreak. Patients in whom Covid-19 was suspected, and who test positive for SARS-CoV-2 do not require an outbreak investigation as long as routine PPE and cleaning protocols for PUI/Covid-19 areas were followed.

Definition of a Covid-19 outbreak in a health-care facility:
In a health care facility, a single case of laboratory-confirmed Covid-19 in a person (HCW or patient) in whom a diagnosis is not suspected, is defined as an outbreak.

An outbreak may be detected in the following ways

1. An admitted patient in a health care facility
    a. who was not initially suspected of Covid-19, and/or was not appropriately triaged, develops compatible symptoms, and a laboratory test confirms the presence of SARS-CoV-2
    b. who is incidentally tested (for example prior to surgery or transfer to another hospital) and who is not suspected of having Covid-19, tests positive for SARS-CoV-2

Appropriately triaged PUIs who test positive for SARS-CoV-2 do not require an outbreak investigation as long as routine PPE and cleaning protocols for PUI/Covid-19 areas were followed.

2. A HCW in a facility

    a. undergoes routine symptom screening, is found to have compatible symptoms and a swab yields a positive result for SARS-CoV-2.
    b. has a swab collected as part of systematic or random testing of asymptomatic staff, and the swab yields a positive SARS-CoV-2 result in an asymptomatic HCW.

When a facility becomes aware of a positive Covid case in an unsuspected context, a complete investigation needs to be done in order to identify the source, contain the infection and prevent subsequent outbreaks. This section outlines the initial investigation of the index patient, the determination of the infectious period and the categorisation of the case/event into a point source or propagated outbreak.

When a facility becomes aware of a positive Covid case, the most senior official in the facility should be informed, and an outbreak investigation team meeting convened. At the first meeting, the findings of the assessment of the index patient should be presented. The outbreak should be categorised as a point source or propagated outbreak. Roles and responsibilities should be assigned regarding outbreak investigations described in Section 8.

b. Assessment of the index case

A full description of the index patient should be obtained and presented to the first meeting of the outbreak investigation team. A case investigation form (Appendix 2) should be completed. The following aspects should be documented in the case of a patient with unsuspected Covid-19.

- Patient demographics
- Admission dates and movement within the hospital
- History of patient's illness, treatment and interventions including auxiliary medical services, phlebotomy, radiology
- Covid-19 test results including previous tests, date of positive tests, reason for this positive test (e.g. screening, routine, clinically suspected)
- Date of earliest symptom onset

In the event that the index case is a HCW the following information should be obtained via interview of the HCW and his/her supervisor:

- Date of earliest symptom onset (if symptomatic)
- Dates that the index case worked in the facility (starting two weeks prior to test date if asymptomatic or two days prior to symptom onset if symptomatic)
- Determine how the HCW could have been exposed to Covid-19: possible patient exposures, PPE failures, ask about symptomatic colleagues or household members. Ask the HCW how they think they were exposed to Covid-19.

c. Determination of the infectious period of the index case.

When investigating the first case/s of Covid-19 in an unsuspected patient in a health facility, it is essential to determine time period when the person/s was/is infectious. This time period is critical as it represents the period at which others are at risk of contracting Covid-19 from the index patient.

According to the WHO, the Covid-19 infectious period is estimated to begin 2 days prior to symptom onset. In asymptomatic cases the infectious period can be estimated if the source of infection is known based on a minimum incubation period of 2 days. However, in an asymptomatic case without a known source, a potential infectious period of 14 days prior to detection should be considered. In a health care facility, the exposure period for a health care facility are the days that an infected HCW or patient was present in the facility while infectious.

Infectious period:
In symptomatic cases: starts 2 days prior to symptom onset and ends 10 days after symptom onset (or 10 days from resolution of symptoms in severe cases)

In asymptomatic cases: the infectious period in asymptomatic cases begins 14 days prior to detection unless the source case is known. If the source case is known, the infectious period can be estimated to begin 2 days after exposure.

Figure 3 illustrates the incubation period[32], the period of infectiousness[33], the serial interval[34], viral shedding and antibody production[35] during Covid-19 infection. These periods are essential to support outbreak investigation and contact tracing, as they will assist with initial categorisation of a point source or propagated outbreak, and define the periods when the risk of transmission to contacts (other patients or HCW) is high. Currently persons with Covid-19 are thought to be infectious starting two days before the onset of symptoms, and up to 8 days after the onset of symptoms[36].

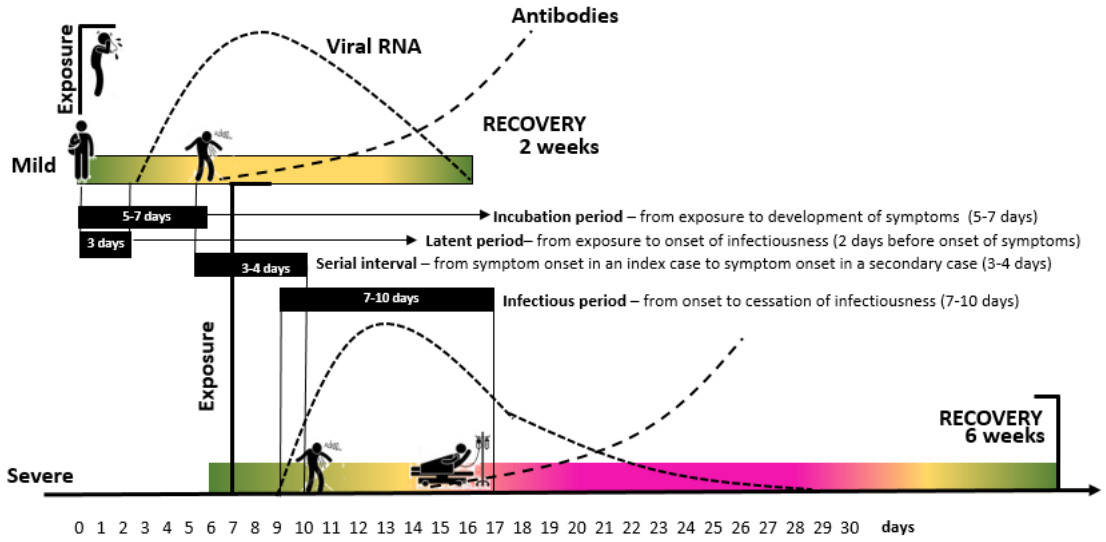


Figure 2. The natural history of Covid-19. Approximate latent, incubation, infectious periods and serial interval for mild (above) and severe (below) cases (coloured bar represents clinical severity are shown. Green=asymptomatic, yellow=mild-moderate symptoms, severe illness=pink). References for these intervals are given in the text.

[32] Lauer SA, Grantz KH, Bi Q, et al. The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application. Ann Intern Med. 2020;172(9):577-582. doi:10.7326/M20-0504

[33] Cheng HY, Jian SW, Liu DP, et al. Contact Tracing Assessment of COVID-19 Transmission Dynamics in Taiwan and Risk at Different Exposure Periods Before and After Symptom Onset [published online ahead of print, 2020 May 1]. JAMA Intern Med. 2020;e202020. doi:10.1001/jamainternmed.2020.2020

[34] ibid

[35] Wölfel R, Corman VM, Guggemos W, et al. Virological assessment of hospitalized patients with COVID-2019. Nature. 2020;581(7809):465-469. doi:10.1038/s41586-020-2196-

[36] Ibid

d. Initial assessment following identification of a Covid-19 case in a health care facility.

Once the infectious period of the index case/s is known, an initial assessment can be made. In general, two broad Covid-19 outbreak scenarios may occur: 1) where the index case has been in the health facility whilst infectious (i.e. during the infectious period) for ≤2 days, or 2) when index cases/s have been in the facility for more than 2 days during the infectious period.

When the index case has been in the facility whilst infectious for ≤2 days, this is likely to lead to a localised 'point source' outbreak. When the index case/s have been in the facility for more than 2 days whilst infectious, this is likely to lead to a propagated outbreak as onward transmission of SARS-CoV-2 has most likely already occurred. Risk factors for propagated outbreaks are outlined in Table 1 and include:

- A patient in whom Covid-19 was unsuspected, and who has been hospitalized for more than 2 days prior to detection;
- An infected HCW who worked while infected/symptomatic for several days;
- An infected HCW without a known exposure (nosocomial or community);
- Two or more Covid-19 cases in a single unit/ward/department.

Table 3. Single and multiple case outbreaks and the challenges posed by each regarding investigation and containment.

INDEX CASE	SCENARIO DESCRIPTION	CHALLENGES POSED BY THIS SCENARIO
SINGLE CASE OUTBREAK		
HOSPITALISED PATIENT	Detected within 2 days of admission to a low Covid risk section of the facility and therefore appropriate IPC measures were not taken.	The early detection of the case implies that primary contacts will not yet be infectious, and therefore the case can be contained.
HEALTH CARE WORKER	The infectious period in the work place is 2 days or less as determined by the onset of symptoms or known date of exposure to a confirmed Covid-19 case	The HCW may or may not have utilise appropriate IPC measures when interacting with colleagues or patients. However, the early detection of the case implies that primary contacts will not yet be infectious, and therefore the case can be contained.
MULTIPLE CASE OUTBREAK		
HOSPITALISED PATIENT	Detected after 3 or more days since admission to a non-PUI ward.	Appropriate IPC measures were not taken. Primary contacts may have transmitted infection to secondary contacts.
HEALTH CARE WORKER	The HCW was present in the facility for 3 or more days whilst infectious (based on onset of symptoms or known date of exposure to confirmed case)	The HCW may or may not have utilised appropriate IPC measures when interacting with colleagues or patients. Primary contacts may have transmitted infection to secondary contacts.
HOSPITALISED PATIENT	A patient who is known to have tested negative whilst admitted or before admission now tests positive for Covid-19	This suggests an unknown nosocomial source of infection. Contacts should be identified and tested for Covid-19. Source identification may not be possible. This scenario indicates a lapse in IPC and Covid-19 prevention measures.
HEALTH CARE WORKER	The infectious period is not known as the HCW remains asymptomatic	This suggests an unknown community or nosocomial source of infection. Contacts should be identified and tested for Covid-19. Source identification may not be possible.

8. Investigations and actions to support containment of the outbreak

Immediately following detection of an outbreak, IPC interventions to prevent ongoing transmission of SARS-CoV-2 in a hospital facility should be implemented. These include provision of appropriate care and support for infected persons, isolation of cases, quarantine of contacts, environmental cleaning and disinfection, re-enforcing of Covid-specific IPC measures and as a last resort, possible ward or facility closure

During investigations and response activities, care should be taken to maintain social distancing and use of appropriate PPE (mask and eye protection) during all meetings with, and interviews of, affected HCWs who were exposed to Covid-19 and who are undergoing risk stratification. To the extent possible, interviews should be conducted telephonically. This will be crucial to minimize exposure of the outbreak investigation team to Covid-19.

a. Provision of treatment care and support for infected persons

Persons who test positive for SARS-CoV-2 should be managed according to South African guidelines for clinical management of Covid-19[37]. Briefly, HCW who are well enough to be managed at home or an isolation centre should not be admitted. Patients in the health care facility who incidentally acquire Covid-19 should be managed for their underlying condition. Should they no longer require admission, they may be discharged home. All cases who are well enough to be managed at home should be monitored telephonically at intervals by their line manager. Warning signs for in-person assessment include ongoing fever, shortness of breath at rest.

b. Isolation of persons who test positive for Covid-19

Isolation of persons who test positive for Covid-19 is an intervention that will prevent onward transmission of Covid-19 in a facility. All persons who test positive for SARS-CoV-2 require isolation.

- Patients in the health care facility who test positive should be isolated in the 'high risk' or 'Covid' section of the facility. HCW who care for them should observe appropriate IPC including strict hand hygiene, environmental cleaning and correct donning and doffing procedures for PPE.
- HCW who test positive for Covid-19 should be isolated at home, or at a quarantine centre if home isolation is not possible unless they are ill enough to require admission. The duration of isolation is 10 days after the date of symptom onset for persons with mild-to-moderate disease, or 10 days after cessation of oxygen dependence[38].

c. Defining a case

Soon after the detection of a Covid-19 case in an unsuspected HCW or patient, and the recognition that an outbreak is present, it is essential to make sure that there are no additional cases. In order to detect additional cases, a 'case' should be clearly defined. A case definition should be based on

[37] Clinical management of suspected or confirmed COVID-19 disease. Version 4. Accessed at https://www.nicd.ac.za/wp-content/uploads/2020/05/Clinical-management-of-suspected-or-confirmed-COVID-19-Version-4.pdf

[38] Guidelines for symptom monitoring and management of workers for SARS-CoV-2 infection (August 2020). Developed by the Occupational Health and Safety Committee-COVID-19 response. Accessed at https://www.nicd.ac.za/diseases-a-z-index/covid-19/covid-19-guidelines/

national recognised case definitions[39] which are tailored to the local context. So for example, following an outbreak of Covid-19 at Hospital X in March 2020, the case definition of Covid-19 could be as follows:

"Any case of laboratory confirmed Covid-19 illness in a health-care worker, visitor or patient at Hospital X from March 2020 onwards".

If necessary, the case definition may make provision for cases where laboratory testing could not be done. This may happen if a person died or if the case was symptomatic a few weeks ago, but is now better. In the latter scenario, PCR testing may be done, but a negative test does not rule out the possibility that this person was infected with SARS-CoV-2 at some point in the past. In this case, the case definition may be expanded to include 'probable' cases. An example of this case definition can be based on the criteria for investigation of a 'suspected' Covid-19 case. These national case definitions may be found on the NICD website in the Notifiable Medical Regulations case definitions documents, or on the Covid-19 'quick reference guide'[40].

WHO definition of a contact of a Covid-19 case (specific to health care settings):
Health Care Workers: any HCW in direct contact with a Covid-19 patient/case where strict adherence to PPE has failed;
Contacts exposed during hospitalisation: any patient hospitalised in the same room or sharing the same bathroom as a Covid-19 patient, visitors to the patient, or other patient in the same room, or other situations as dictated by a risk assessment;
Contacts exposed during outpatient visits: Anyone in the waiting room or equivalent closed environment at the same time as a person with a confirmed diagnosis of Covid-19; or Anyone within 1m of the Covid-19 patient in any part of the hospital for >15 minutes.

d. Identification of contacts

Once the infectious period of the index case/s has been determined, the index case/s should be interviewed to establish all persons that they have come into contact with.

Identification and management of contacts has a dual purpose.

- The quarantine and isolation of contacts will prevent ongoing transmission of Covid-19 in the health care facility.
- Investigation of contacts may identify possible sources of the infection, and allow chains of transmission to become apparent.

The movements of cases through the facility should be traced in order to identify contacts. Interviews of persons, a facility floor-plan and other modalities such as security footage can be used to identify contacts. All persons who had reason to be in contact with cases should be identified and interviewed, including members of auxiliary services, general assistants, chefs, administrators, consultants, cleaning staff, phlebotomists, radiographers, other patients on the ward, or in consulting rooms e.g. radiology waiting areas, scope waiting areas etc. Contacts are also patients who shared a HCW or used a space that the index patient used where adequate disinfection may not have occurred. – e.g. an investigation cubicle or a toilet.

In the event in the index case is a HCW, attention should be paid to work areas and other shared spaces used by the HCW (tea/break rooms, changing rooms, toilets, computer/work spaces);

[39] Notifiable Medical Regulation Case definitions, accessed at https://www.nicd.ac.za/wp-content/uploads/2020/04/Revised_COVID-19_NMC-Case-Def_5-April-2020.pdf
[40] NICD Quick Reference Guide for Clinical Health Care Workers, accessed at https://www.nicd.ac.za/wp-content/uploads/2020/05/COVID-19-Quick-reference-v14-25.05.2020.pdf

patients cared for by the HCW during the infectious period; and other HCWs or facility staff who share transportation with the index case (taxi, shared private vehicle, etc).

All contacts should be listed in the contact line list (Appendix 3). It is helpful to record all contacts, but then to determine who are 'close' vs 'casual' contacts. 'Close' contacts are those who meet the WHO case definition of contacts. Importantly, HCW who were in contact with the index case/s and who were wearing appropriate personal protective equipment are regarded as 'casual' or low-risk contacts.

Risk stratification of HCW contacts

For each HCW who is a close contact, the dates, and nature of the contact with the index case should be determined. This should include the distance from patient, what PPE they were wearing, how long were they within 1m of the case and what they were doing at the time of contact with the patient (e.g. aerosolisation procedures). The WHO Health workers exposure risk assessment and management tool[41] should be completed for every HCW who was a close contact of a Covid-19 case.

Patients who are contacts

For each contact who is another patient in the facility, the dates and nature of contact with the index case including the distance they were from the patient, the time they were in proximity, or used the same facilities sequentially, the presence of shared HCW should be ascertained.

e. Management of contacts

i. Testing of contacts for Covid-19

Contacts who meet the WHO case definition ('close' contacts) should be tested for Covid-19 as soon as possible after exposure to the case/s is identified. This includes contacts who are symptomatic when interviewed AND contacts who are asymptomatic.

IF the period of exposure to the Covid-19 case/s in the facility is short (e.g. <2 days), testing of asymptomatic HCW may be delayed until day 7 (or day 5) after last exposure when in line with the protocol to support an early return to work[42]. However, when the period of exposure to Covid-19 case/s is longer (3-7 days), secondary and tertiary transmission may have already taken place, and all contacts should be tested as soon as possible to identify cases and contain the outbreak.

When a decision has been made to test contacts, or when symptomatic HCW are identified and tested, swabs should be collected according to usual procedures. When swabs are collected, the specimen reference numbers should be recorded. Specimen request forms should be correctly completed, and the specimen should be labelled 'outbreak investigation'. The pathologist of the laboratory that does the testing should be informed, and requested to test AND retain specimens, as subsequent investigations including molecular sequencing of the SARS-CoV-2 may support outbreak investigations.

A negative result in an asymptomatic contact taken within 14 days of last exposure to an index case does not rule out the possibility that a contact may develop COVID-19. Contacts should be monitored for symptoms for 14 days from last exposure. If they develop symptoms they should be tested. However, most persons develop COVID-19 within 5-7 days following exposure. If 5-7 days

[41] Health workers exposure risk assessment and management in the context of COVID-19 virus, accessed at https://apps.who.int/iris/bitstream/handle/10665/331340/WHO-2019-nCov-HCW_risk_assessment-2020.1-eng.pdf

[42] Guidelines for symptom monitoring and management of workers for SARS-CoV-2 infection (August 2020). Accessed on 16 June at https://www.nicd.ac.za/wp-content/uploads/2020/04/Guidance-for-symptom-monitoring-and-management-of-essential-staff-with-COVID-19-related-illness-final-2.pdf

have passed since last exposure, the chances of a person developing COVID decreases. For this reason an early return to work is allowable, given workplace shortages.

If more than 14 days has elapsed after last exposure to the index case, and the contact is asymptomatic, neither testing nor quarantine are necessary.

Any contacts who meet the case definition for the outbreak become 'cases'. Their data should be entered into the case line list, the timeline and the epidemiological curve (see Section 9 below). The contacts of the new case should then be investigated.

ii. Specimen collection and laboratory testing

For all individuals assessed as requiring laboratory testing for SARS-CoV-2, regional or national standard operating procedures for specimen collection should be followed. Nasopharyngeal swabs have a better yield, but oropharyngeal swabs are acceptable. should be placed into universal transport medium (or submit without transport medium if transport to the laboratory will be <2 days). Depending on availability of swabs, transport media and/or PPE - midturbinate nasal, or self-administered nasal swabs or saliva specimens may all be acceptable. Submission of swabs without transport medium or long periods before processing may also decrease viral load and therefore the ability to detect virus. Sputum (if produced – do NOT induce), tracheal aspirates or bronchoalveolar lavage should additionally be collected for severe cases.

As soon as an outbreak is identified, the local laboratory should be alerted. The laboratory should be requested to retain all specimens submitted as part of outbreak investigations. Specimens submitted as part of the outbreak investigation should be clearly identified as such. After immediate processing to establish SARS-CoV-2 detection by PCR, specimens should ideally be stored at -70°C

Testing should be performed using reverse transcriptase real-time PCR, which detects SARS-CoV-2 viral genetic material. South African laboratories use any one of several in-house and commercial PCR assays to test for the presence of SARS-CoV-2 RNA.

Presently, serology tests for Covid-19 are not validated and should not be used. However, once validated serology tests become available, there may be a role for serology testing for contacts and other persons involved in outbreaks. Serology tests may be indicated for persons who were never tested for Covid-19 at the time of illness (and the opportunity for detection by PCR has passed), or had a possible exposure and remained asymptomatic and were not tested, or where there is clinical suspicion they may have been infected but tested negative by PCR. For all these possible scenarios, at least 14 days need to have elapsed since the infection, or 21 days since the exposure.

iii. Quarantine

Because the SARS-CoV-2 virus can be transmitted before the onset of symptoms, the only way to stop onward transmission of the virus is to put all contacts who meet the WHO contact definition in quarantine. The recommended duration of quarantine is 10 days as the incubation period can range from 2 to 11.5 days, with most people developing COVID-19 by day 7-10 after exposure.

South African guidelines regarding the management of essential workers following exposure to Covid-19 disease should be followed[43]. These guidelines allow for an early return to work for HCW following quarantine. Appendix 4 contains an algorithm to support management of HCW.

[43] Ibid

All contacts should be counselled regarding the significance of their exposure. It should be ascertained if they are able to self-isolate as part of quarantine. If not, institutional and local health care authorities should consider using a quarantine facility, or a providing alternative accommodation for the 14-day duration, e.g. a bed and breakfast establishment.

If a person in quarantine tests positive for SARS-CoV2, they should be isolated for a period of 10 days post the onset of symptoms or 10 days from test date if asymptomatic.

Contacts who are admitted to the facility for other reasons – e.g. patients who were in the same ward as the index case, or who shared a bathroom, should be isolated.

If more than 14 days has elapsed after last exposure to the index case, and the contact is asymptomatic, neither testing nor quarantine are necessary.

f. Identification of second- and third-generation cases

Should one or more contacts of an index case test positive for SARS-CoV-2, that contact becomes a 'second-generation case'. An identical process of identification of contacts of the second-generation case/s, including quarantine, management and testing of contacts should be followed. If the index case was identified and contact tracing initiated early, it is likely that second-generation cases may already be in quarantine when they test positive. In this case, there will be no contacts of the second-generation case in the health care facility. Transmission of Covid-19 in the facility will have been stopped.

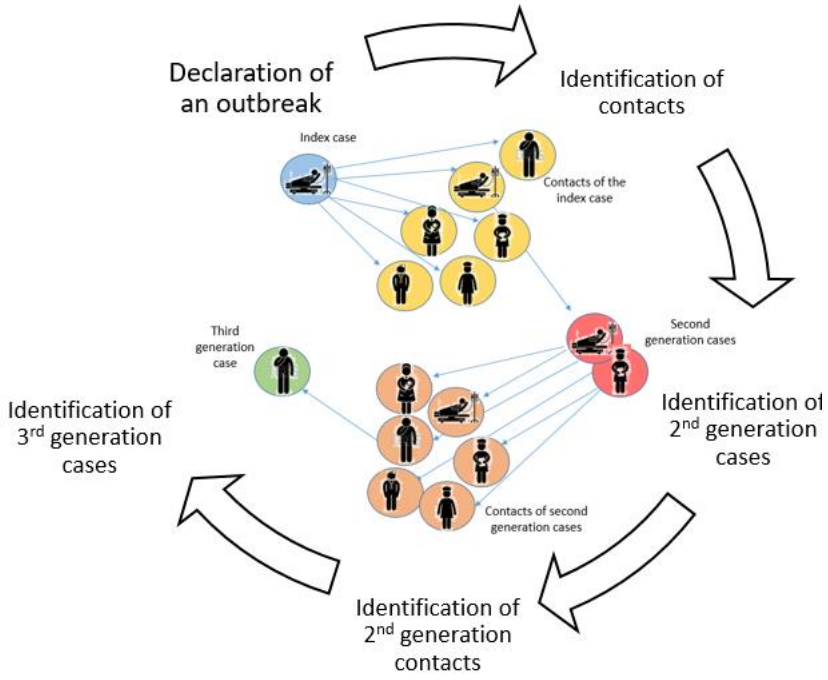


Figure 3. Investigation of cases and contacts as subsequent generations of cases are identified.

g. An infection prevention and control assessment

A Covid-19 outbreak usually arises following a breach in infection prevention and control. Therefore, it is helpful to conduct an assessment of facility IPC practices.

The health care facility checklist can be used to conduct an IPC assessment following an outbreak of Covid-19 (Appendix 6). The checklist is divided into six thematic areas (administrative controls,

engineering controls, IPC (PPE and hand hygiene), environmental cleaning, laundry and health care waste and transfer of dead bodies). Each question for each section is scored to give scores for each area and an overall score out of 100, to assist with problem identification and prioritisation. It has been written in simple language so that the auditors/investigators can understand what to look for even if they are not IPC trained.

An outbreak of Covid-19 is an opportunity to re-inforce Covid-19 IPC measures. Facilities should use the South African IPC guidelines for Covid[44] to design their facility IPC strategy, policy and practice. Gaps in IPC practice can be identified and closed. Specific interventions to strengthen IPC may be required. Refresher training on IPC procedures may be offered

h. Additional laboratory investigations to support source determination

i. Molecular epidemiological analysis

Whole-genome sequencing (WGS) of SARS-CoV-2 outbreak specimens may be useful to support or refute hypotheses regarding disease transmission pathways in hospital-associated outbreaks[45]. WGS is available at specialist laboratories including the NICD. However, it may not be helpful in all outbreaks. As a general principle, outbreak specimens should be stored after processing at -70°C until decisions can be made about further investigations using WGS. The NICD may be consulted to support decisions on additional outbreak investigations.

ii. Testing of the environment for Covid-19

Testing of the environment for SARS-CoV-2 is not a helpful in outbreak investigations, and should not be done. The virus is often found contaminating the environment (beds, chairs, bathrooms) of infected persons. However, the finding of RNA in the environment does not support or refute hypotheses regarding transmission.

i. Environmental decontamination

All equipment and rooms where the cases have been within the last 7 days should be identified, in order that these may be appropriately cleaned. The South African Covid-19 Disease Infection Prevention and Control guidelines[46] should be followed. Human coronaviruses can remain infectious for several hours on porous surfaces and several days on hard surfaces.[47] Therefore, frequent cleaning the environment is paramount and is covered in detail in the 'Practical manual for the implementation of the national strategic plan for infection prevention and control strategic framework' (2020) [48].

In an outbreak scenario, intensified environmental cleaning and disinfection is critical to reduce the potential for further staff and patient infections through indirect contact with virus-contaminated surfaces and equipment. Routine cleaning with detergent and water will remove dirt and reduce

[44] COVID-19: Disease Infection Prevention and Control guidelines. Developed by the Infection Prevention and Control Committee – COVID-19 response. Accessed at https://www.nicd.ac.za/diseases-a-z-index/covid-19/covid-19-guidelines/

[45] Xiaorong Wang, et al. Nosocomial Outbreak of 2019 Novel Coronavirus Pneumonia in Wuhan, China European Respiratory Journal 2020; DOI: 10.1183/13993003.00544-2020

[46] Ibid

[47] Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. Journal of Hospital Infection. 2020;104(3):246-51 https://doi.org/10.1016/j.jhin.2020.01.022 (accessed March 22, 2020).

[48]Practical manual for the implementation of the national strategic plan for infection prevention and control strategic framework (2020) https://www.nicd.ac.za/wp-content/uploads/2020/04/Practical-Manual-for-implementation-of-the-National-IPC-Strategic-Framework-March-2020-1.pdf

levels of contamination for most pathogens, including SARS-CoV-2. The coronavirus' viral envelope is easily disrupted by detergent and most commonly used hospital disinfectants, killing the virus.
For Covid-19, the major differences to routine cleaning of healthcare facilities are: increased frequency of cleaning and use of disinfectants. Following thorough cleaning, surfaces are wiped, not sprayed with disinfectants such as 1000 ppm chlorine (hypochlorite) or 70% alcohol, as recommended.[49] Universal disinfectant wipes which combine cleaning and disinfection are impregnated with peracetic acid and or hydrogen peroxide and may be used but these are expensive.

Each area of the healthcare facility must be cleaned and disinfected at least twice daily, with a proper schedule, checklist and programme. In high-risk areas (Covid-19 triage, isolation ward and ICU settings), the environment must be cleaned and disinfected at least 3-4 times per day and checked by the supervisor each time using visual inspection and fluorescent markers. To facilitate easy cleaning, all surfaces should be kept clutter free. Cleaning should focus on the most contaminated areas:

- high-touch surfaces - phones, keyboards, gate buzzers, door handles, light switches, taps
- the patient zone - bed rails, bedside cabinet, trolleys, monitors, infusion pumps
- heavily contaminated areas - toilets, intensive care rooms, Covid-19 testing cubicles.

j. Ward and facility closure

Following the recognition of an outbreak of Covid-19 in a hospital facility, it may be appropriate to temporarily close a ward, a facility unit, or a section of the facility.

Closure of a ward means that the clinical area is closed off for new admissions. Patients who are in the ward are discharged home and **not to any other part of the health care facility**. Once the ward population has decreased to a number that can be managed in a single unit or smaller clinical area, the patients may be moved to this isolation ward, whilst awaiting discharge home. The infected ward is terminally cleaned and disinfected. Only after this, should the ward be opened to new admissions. None of the decanted patients are to be re-admitted to this ward. This is essential otherwise further spread will occur.

Careful consideration should be made to determine if the aims of outbreak containment can be achieved without ward or unit closure. A number of facilities in South Africa have been forced to close following extensive uncontained Covid-19 outbreaks[50]. Temporary closure of the Emergency Departments in Daegu, South Korea, occurred frequently followed unsuspected cases of Covid-19[51]. However, following each closure, revised triage processes and algorithms for case management were implemented, and the numbers of closures that were required decreased.

Ward closure represents a disruption to service delivery and moving of patients incurs risks. Ward or unit closure is not warranted if

- a single unidentified Covid-19 patient has been in a ward for <48 hours.
- a single HCW with Covid-19 has worked for two days or less while infectious is identified.

In these cases, contacts (including patients and staff) need to be identified and managed appropriately. Environmental cleaning and disinfection of the area can be done whilst ward activities continue.

[49] World Health Organization. Water, sanitation, hygiene, and waste management for the COVID-19 virus. 23 April 2020.
[50] https://www.medicalbrief.co.za/archives/covid-19-among-staff-and-patients-forces-closure-of-third-private-hospital/
[51] Chung HS, Lee DE, Kim JK, et al. Revised Triage and Surveillance Protocols for Temporary Emergency Department Closures in Tertiary Hospitals as a Response to COVID-19 Crisis in Daegu Metropolitan City. J Korean Med Sci. 2020;35(19):e189. Published 2020 May 18. doi:10.3346/jkms.2020.35.e189

Temporary ward closure may facilitate environmental cleaning, quarantine and testing of exposed HCWs, and allow staff to review and strengthen IPC and patient management procedures. Factors to consider prior to closing a ward or unit are listed in the table below.

Table 4. Factors to consider before a decision is made regarding closure of a ward or unit. Ward or unit closure may be considered if two or more questions are answered 'no'.

	FACTOR UNDER CONSIDERATION	YES	NO
1	Are there multiple Covid-19 cases in patients or amongst HCW in the ward/unit?		
2	Were there two or more undetected and infectious Covid-19 cases in the ward or unit simultaneously?		
3	Are there sufficient staff trained in IPC who are able to work in the ward?		
4	Are there sufficient clinical staff to support ward/unit activities?		
5	Is there sufficient administrative and general assistance to support ward activities?		
6	Do audit findings indicate that IPC practices including hand hygiene, environmental cleaning and use of personal protective equipment are satisfactory in all respects?		

Closure of an entire facility **is an extreme measure** that should be carefully considered and discussed with infectious diseases specialists or a department of health representative prior to implementation[52].

9. Analysis of data and formulation of hypotheses to determine the source of the outbreak

Epidemiological analysis is useful to support outbreak investigation. Persons who are trained in epidemiology are helpful members of outbreak investigation teams. Physicians who are trained in infectious diseases, persons who have completed field epidemiology training programmes, or infection prevention and control nurses who have been trained in outbreak investigation may conduct epidemiological analyses.

If appropriate persons cannot be found, the NICD may be contacted to support epidemiological investigations. The Outbreak Response Unit, or a member of a NICD Centre, or the NICD provincial epidemiologist may be assigned to assist.

a. Epidemiological descriptive analysis

As the data from the investigations of Covid-19 outbreak become available, findings should be put together using linelist, epidemiological curves and timelines.

A line list of cases should be used to collate data on each Covid-19 patient. The linelist can be kept in MS Excel or other spreadsheet programme, or in an application designed to record patient-level data. E.g. WHO Go.data. The spreadsheet should contain the data elements that are found on the Case Investigation form (Appendix 2) at a minimum. The spreadsheet can also include additional data on follow-up of patients, including outcome, subsequent specimens and test results.

A line list of contacts should be maintained, with the data fields found in the Contact Line list (Appendix 3). Fields should be added to reflect the outcome of cases after 14 days, and test results if specimens were taken.

[52] Lee H, Heo JW, Kim SW, Lee J, Choi JH. A Lesson from Temporary Closing of a Single University-affiliated Hospital owing to In-Hospital Transmission of Coronavirus Disease 2019. *J Korean Med Sci.* 2020;35(13):e145. Published 2020 Apr 6. doi:10.3346/jkms.2020.35.e145

An epidemiological curve should be constructed from the data in the line list, to display the number of cases identified on the date of symptom onset or specimen collection. An example is given in Figure 5. Epidemiological curves can be annotated with significant dates – for example the date of implementation of enhanced IPC measures, or improvements in staff: patient ratio, or the non-availability of water in the health care facility.

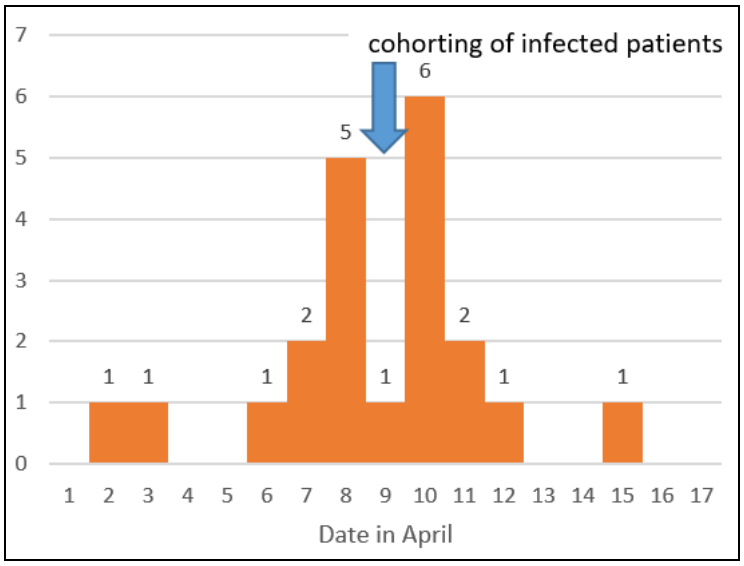


Figure 4. A hypothetical epidemiological curve showing the number of cases diagnosed by date of symptom onset at Hospital X in April.

A timeline of patients' locations in various wards, along with dates of positive tests and infectious periods should be created as per the example in Figure 6.

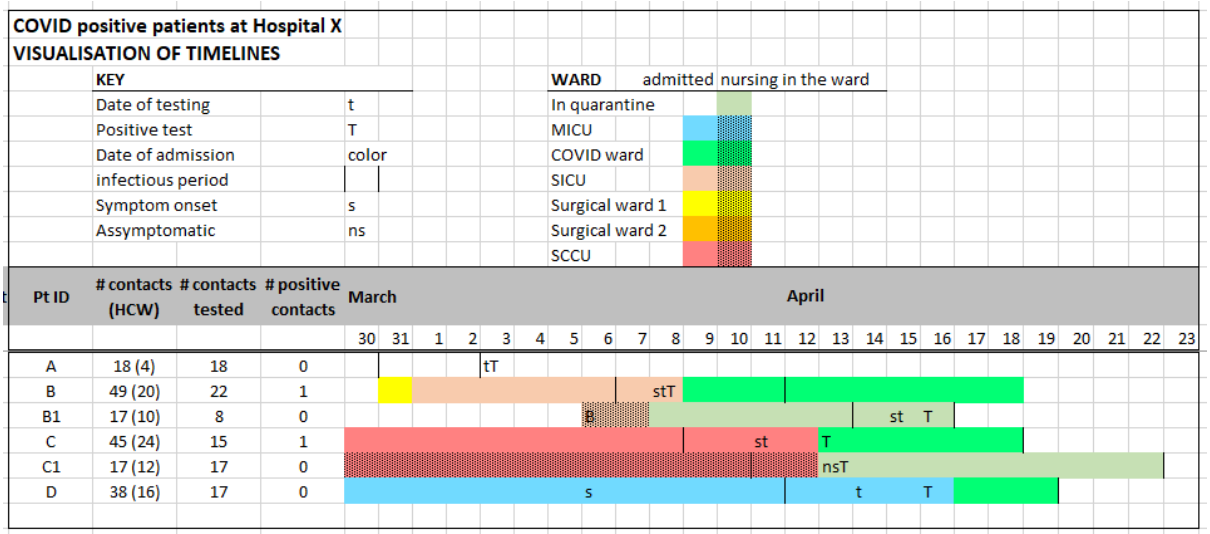


Figure 5. An example of a graphic visualisation of cases at hospital X illustrating cases, date of testing (t) and return of a positive result (T), their location in the different hospital wards (coloured line) by date.

Finally, a transmission diagram may be generated, to indicate the pathways through which Covid-19 travelled through the facility.

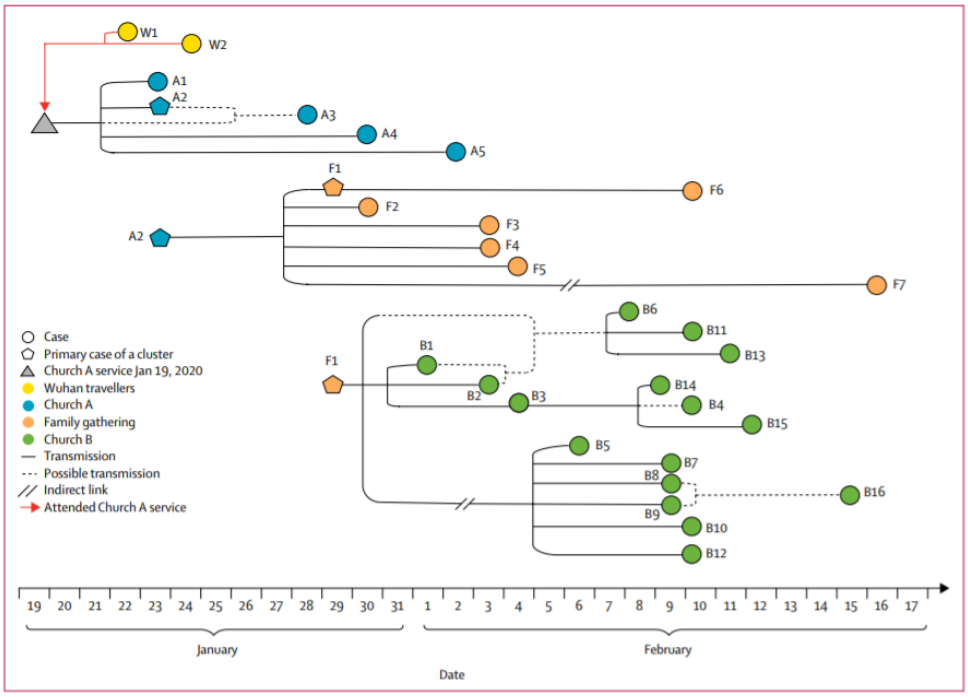


Figure 6. An example of a transmission diagram indicating the patients (circles), transmission pathways (solid lines) reproduced from Yong SEF et al, et al. Connecting clusters of COVID-19: an epidemiological and serological investigation [published online ahead of print, 2020 Apr 21]. Lancet Infect Dis. 2020;S1473-3099(20)30273-5. doi:10.1016/S1473-3099(20)30273-5

The display of data in the above ways can allow a visual sense of how the outbreak evolved. Each of these displays can be interpreted. The interpretation of the data should be done whilst considering the findings of the IPC audit tool.

b. Interpretation of data and generation of hypotheses

i. Interpretation of data

Once data has been collated and displayed visually, these data should be interpreted.

Epidemiological curves can give insight into the possible sources of cases. The shape of the epidemiological curve can be interpreted by realising that each case must have been exposed to an infected case 5-7 days prior to their symptom onset. This can give a clue as to the source of the outbreak. For example, in Figure 5 above, it may be that the index cases on 2nd and 3rd April gave rise to the cases that occurred within 7 days after their symptom onset. It is likely that the last case on 15th April was not infected by the index case, and is therefore likely to be a second generation case.

Timelines can show when patients shared the same wards, and how they moved from ward to ward during their infectious periods. This can support the creation of transmission diagrams.

Transmission diagrams can identify the routes and places of transmission, and focus attention on specific places and practices which may have facilitated transmission.

IPC audit findings (Appendix 6) can give insight into possible practices, omissions or unsafe practices that could have allowed propagation of infection.
The interpretations generated from these analyses can support formulation of hypotheses, which in turn allow for meaningful implementation of interventions to prevent future cases.

ii. Generation of hypotheses regarding the source of infection or reason for propagation

The generation of hypotheses regarding the source of Covid-19 is a process that begins from the first moment following detection of a case, and continues as more information becomes available.

Hypotheses are based on the evidence available at the time. As more evidence becomes available from investigations, and responses, certain hypotheses are ruled out and additional hypotheses are made. As hypotheses are made, more questions arise. Information can then be gathered to support or rule out the hypotheses. Sometimes hypotheses cannot be ruled out. However, hypotheses that cannot be ruled out may give insight into gaps in IPC procedures. These gaps can be closed so that in future, transmission of Covid-19 cannot happen in this way. Figure 8 illustrates the relationship between hypothesis generation, responses to contain infection and investigations that occur in response to detection of a Covid-19 case in a health care facility.

In generating hypotheses, the outbreak investigation team should consider all the possible sources and places of exposure in the 7-14 days prior to the index case's Covid-19 symptom onset or positive test. These may include possible exposures in the health care facility itself, or other community settings such as:

- the index case's immediate family members and household,
- student nurse residences or workers' hostels at the health care facility,
- public transport and other community exposures (shops, public amenities)
- workplace/s (the workstation area and communal, recreation areas at the workplace).
- changing rooms in the workplace

In the healthcare setting, exposures may occur from staff-to-patient, staff-to-staff and, patient-to-staff. Areas where aerosol-generating procedures are frequently performed e.g. ICUs may pose a higher risk for health care worker Covid-19 infection, especially if poorly ventilated, infrequently cleaned and when HCWs fail to perform thorough hand hygiene and proper PPE doffing sequences.

Staff to staff transmission may occur in rest areas such as tea rooms where masks are removed, social distancing is not observed or is not possible, due to crowded spaces and poor ventilation. Social contact, such as sharing phones and pictures from social media is common amongst colleagues. Shared transport to and from work may also be an opportunity for transmission. Identification of the source case in HCF may be very difficult, as a large proportion of Covid-19 infections may be asymptomatic, and multiple exposure events may occur simultaneously in the household, community and workplace.

In the community context, but also in 'civilian' parts of the health care institution, such as coffee shops and tea rooms, certain areas, such as places and spaces with crowding, no physical distancing, poor ventilation and exposure to multiple people (not wearing face covers) for extended periods of time (>15 minutes), pose a higher risk for viral transmission. Both duration and dose of viral exposure are important in considering the likely place of infection. Bear in mind that the person that infected the index case may have been asymptomatic, pre-symptomatic, mildly asymptomatic or may have had atypical symptoms, and thus the index case is often unlikely to known how/where their infection was acquired. Also, the index case may have self-inoculated by touching their own nose/mouth/conjunctival mucous membranes after touching virus-contaminated surfaces.

Generation of a transmission diagram/s may assist the outbreak team to develop hypotheses of the outbreak source which lead to the observed transmission pathways. Review IPC and Covid-19 prevention measures at the facility and each possible place where transmission could have occurred using the IPC checklist (Appendix 6). Conduct interviews of HCWs and observations of clinical practice and staff interaction on the wards. Make proposals, generate further questions and obtain additional investigations.

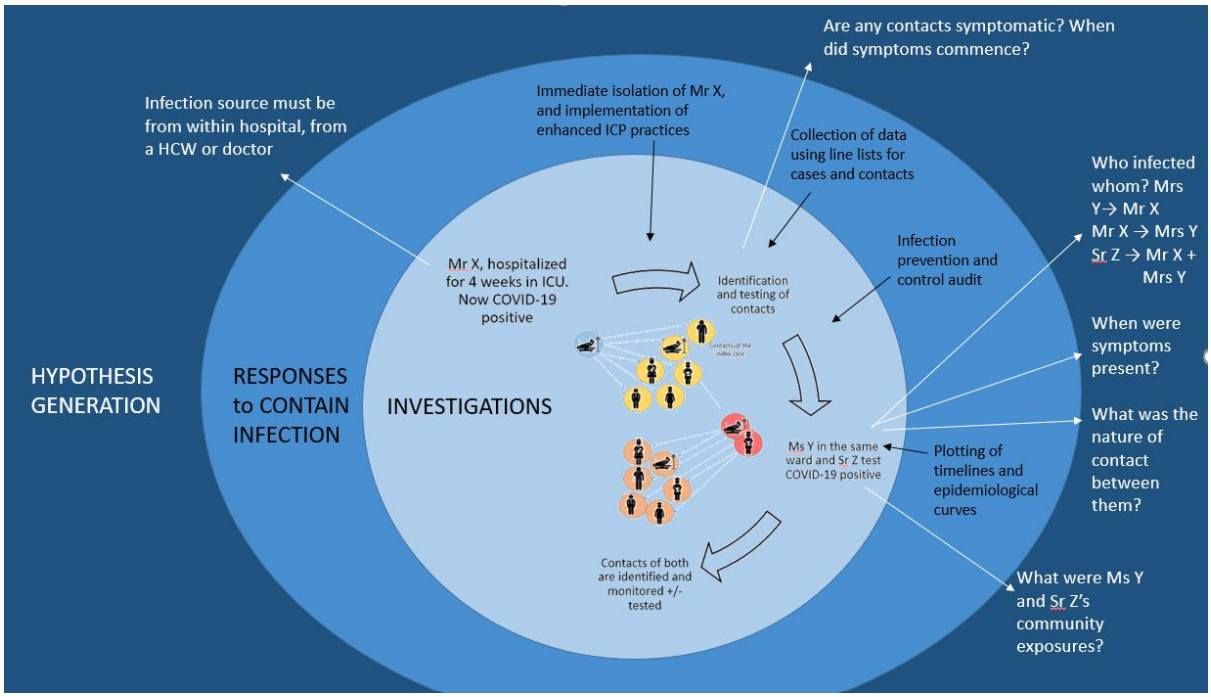


Figure 7. Diagram to illustrate the relationship between investigations following detection of a case of Covid-19, responses to contain the infection, and the generation of hypotheses based on increasing evidence gathered during investigations and responses.

c. Supplementary studies

Occasionally sufficient data is collected to support further analytical studies which may identify risk factors for Covid-19 disease. These data usually take the form of a case-control study, where exposures to identified risk factors are collected on persons diagnosed with Covid-19, and on persons who are found to be free from Covid-19. These exposures may include undergoing certain procedures, such as having radiological investigations, having physiotherapy in a specific consulting room, having blood drawn by a particular phlebotomist or being in a certain ward at a certain time.

Supplementary studies don't happen 'by accident' during outbreaks, as in order to conduct meaningful statistical analyses, sufficient good quality data needs to be collected. Often in the panic and rush to respond to an outbreak, data collection is not standardised, and insufficient thought is given regarding which data elements to collect. However, the use of pre-prepared data collection tools such as case investigation forms which are easily modified in the outbreak context can simplify and standardise data collection.

Where the source of an outbreak is unclear, case-control studies may identify particular exposures over others that are more likely to be the source of the infection. One of the disadvantages of supplementary studies is that they require insight and expertise of persons skilled in epidemiological statistical analysis, and secondly that the data collection and analysis takes time. Therefore, the results of these analyses are not often available to support implementation of interventions.

10. Psychosocial support for HCW and patients during and after an outbreak[53]

a. The Covid-19 pandemic as the context for a facility outbreak

The context of any outbreak, including pre-existing circumstances and conditions contribute towards how people will react when an outbreak occurs.

The Covid-19 pandemic has resulted in a state of constant uncertainty as people face the unknown and try to find ways to cope. The pandemic is a frightening experience which brings about a variety of mental, emotional and social dilemmas. But being a HCW during this unique and unprecedented time means additional difficulties and demands. Our own South African context adds unique challenges. We are a mixed income country with limited resources, and a substantial population living in poverty. An individual's interpretation and experience of the pandemic will depend on their gender, age, culture, religion, socioeconomic group, level of education, living conditions, access to resources, number of dependents, relationship dynamics, past psychiatric diagnoses, profession and where they work, level of insight, and degree of medical knowledge. Each person has their own idiosyncrasies, responsibilities and circumstances which influence their mental, emotional and social well-being as well as their ability to cope during this time.

On top of these contextual factors, there are many stressors that contribute to a person's psychosocial reaction. These include fixation on the constant and overwhelming amount of information being circulated about Covid-19 (true, fake, detailed, shocking etc), the uncertainty of what will happen next and to what extent, fear of being infected, financial implications, isolation and lack of social interaction, boredom, homebound citizens experiencing lack of routine and "cabin fever" (being confined to a space for a long period of time), inability to engage in leisure activities that assist individuals to cope with stressors, relationship dynamics (loving and supportive or marred with conflict), general conflict, lack of support structures, concern for family members, crime (looting and home invasions), past or present psychiatric and medical conditions.

Living alone or with a roommate, partner or family, creates its own type of stress. Those who live alone will have to manage this trauma (pandemic) on their own. Those who live with other people will have some level of support and comfort but at times they may feel trapped or unable to escape and this could intensify already fractured relationships or new issues may arise.

When faced with a trauma or life changing event, people tend to become reflective about their lives. They may contemplate their mortality as well as analyze their life, who they are as a person, relationships, past achievements and future aspirations. This can be overwhelming and further add to existing levels of distress. As a HCW there are additional stressors: stressful and ever changing working environment, potential contact with infected patients, caring for patients who are infected, responsibility of leading a MDT in treating these patients, also caring for patients who are not infected, making difficult decisions (admitting non infected patients, admitting infected patients, best treatment plan to follow, whether to actively treat an infected patient or start palliative care, etc.), limited access to and sustainability of resources, ethical dilemmas, adherence to protocols and procedures, limiting physical contact with their family members and possible need for self-isolation.

[53] This section is supported by content from 1) Lives on the line? Ethics and practicalities of duty of care in pandemics and disasters. European Respiratory Journal. Volume 34 Number 2; 303-309. A.K. Simonds*; 2) D.K. Sokol*; Mitigating the psychological effects of COVID-19 on health care workers. P.E. Wu, R Styra and W.L Gold. Published at www.cmaj.ca April 15, 2020; and 3) IASC Inter-Agency Standing Committee. Interim Briefing Notice: Addressing mental health and psychosocial aspects of COVID-19 outbreak. Version 1.5, February 2020.

b. Ethical aspects guiding health care worker behaviour during outbreaks

Outbreaks bring about medical, ethical and organizational ethical and moral dilemmas. HCW hold many roles – for example carer, colleague, employee, family member, friend and citizen. The obligations as HCW may conflict with personal obligations. HCW are then faced with the question which of these roles is most important to me - taking care of others or taking care of myself? To act responsibly a HCW must do both. Thus they need to consider ways to enact these responsibilities, and that the choices come with opportunity costs, or consequences.

Guidelines for HCW dictate a code of conduct, ethics, rules and regulations which govern their behaviour. These include:

- A duty to care for patients.
- A duty to act in the best interest of family / loved ones and oneself.
- A duty to be informed about prevention, treatment, management and other relevant information related to infection (Covid-19).
- Responsibility to support the hospital, colleagues, other professionals, and society.
- Responsibility to abide by standard operating procedures
- An obligation to honour one's employment contract.
- An obligation to minimize risk to patients, other staff members, family, society and oneself.

Some HCW may be unwilling to care for Covid-19 (or PUI) patients during an outbreak. Reasons for this may include: the perceived risk of infection of themselves or their family members, personal health comorbidities, lack of expertise, limited knowledge about the disease and treatment thereof, inadequate understanding of the protective measures in place to minimize the risk of infection as well as social, cultural and religious beliefs. There are many consequences to this. Those HCW who are caring for patients will need to absorb more responsibilities, do more shifts, and carry additional workloads. These HCW may become exhausted, ill or burnout rendering them unable to assist in caring for these patients. It may lead to the loss of trust between HCWs. It may result in conflict between staff members, doctors and the management team. There is also the risk of the employer executing disciplinary measures.

c. Psychological adjustments by HCW prior to an outbreak

Before an outbreak occurs in a facility, HCWs have already experienced changes in their work environment for example, the implementation of procedures and policies in preparation for caring for patients during the Covid-19 pandemic. During this time staff may struggle to adjust and find a new normal. Some may feel as though they were being pushed or bullied into a situation that does not appear to be within their field of specialty / expertise or even necessary at the time. Others may have expressed their concerns and unhappiness while others became combative and resistant. This experience may have resulted in them being in a constant state of psychological fight or flight. On the other hand, if preparations and training for Covid-19 have been done well, many HCW will be somewhat prepared for the experience of an outbreak.

d. The impact of Covid-19 testing during an outbreak

Testing for Covid-19 in HCW or other patients who are contacts will result in a stress reaction no matter how prepared the individual may be. The experience it over very quickly but the mental and emotional aspect will last for some time.
While waiting for the results an individual may experience some of the following emotions:

- confusion (how did this happen?)
- realisation (I saw it coming),

- questioning the universe (why me?),
- anxiety, worry, fear, irritability, loneliness (walking this road alone),
- stress symptoms (physiological and psychological),
- fluctuations in mood, sadness, frustration, impatience,
- feeling directionless and powerless is a response to a situation is out of a person's control.
- Feelings of anger and resentment
- Looking for someone to blame for being in this situation such as the person who potentially infected them, their employer for putting them in this situation (HCW), themselves or God.

During this time, some people prefer to be alone with their thoughts while others need to talk about it constantly. People may find themselves spending hours considering the various aspects that led to this point, going through various 'what if' scenarios, considering or planning what will happen after the results are out.

No matter what the results reveal, there is the possibility of developing acute stress disorder, anxiety, depression, or engaging in negative coping mechanisms to manage the after-effects of this experience such as substance abuse. Some individuals may even contemplate self-harming behaviours or suicide. Outbreak investigators, and facility managers should not downplay the mental and emotional impact of going through the testing process.

e. Psychosocial reactions to the outbreak

The stress of an outbreak elicits intense responses. These may include fear, worry, anger, frustration, uncertainty, lack of focus our attention to detail, irritability, short term memory loss, indecisiveness, feelings of helplessness and hopelessness, negativity, feeling lonely / isolated, being overwhelmed, low mood, anxiety, panic attacks, blunted affect (no fluctuation in mood), loss of interest in pleasurable activities, aggressive outbursts, disturbances in sleep patterns and appetite, headaches, muscle tension, mental and physical exhaustion, upset tummy, being tearful and more.

HCW who experience outbreaks are at risk of experiencing acute stress, burnout (a state of mental, emotion and physical exhaustion due to excessive and prolonged stress), compassion fatigue (becoming indifferent to experience of others due to being mentally and emotionally fatigued by caring for others), and symptoms of Post-Traumatic Stress Disorder (PTSD).

A degree of stigmatization may be experienced by patients as well as HCW once they return to their normal environment and duties. This results in people avoiding or treating the individual as if they are infected both at work and in their community. Because of this people may under report their symptoms.

The symptoms above are variably displayed in persons. For some, these symptoms may have already been present before the pandemic occurred. The mental and emotional impact of experiencing the Covid-19 trauma will vary with time. It may be mild or intense as the individuals are faced with and begin to tackle various situations. Some of these reactions (and situations) may be more difficult to manage but some will be easier.

f. The impact of isolation and/or quarantine

Although quarantine is generally only for a relatively short period of time it still can have significant impact on a person's mental wellbeing. This is because persons are socially and physically distanced from others. While in quarantine individuals may experience almost all of the mental and emotional symptoms listed when waiting for the test results. They may also experience loneliness due to isolation from others, boredom and symptoms of PTSD. Persons may have a sense of guilt and

concern for others. Self-reflection and contemplating mortality are common. These emotions and mental processes may already begin before testing is done and last until the results have been confirmed. Sometimes these symptoms may only appear part way through isolation or days, weeks or even months after the quarantine period is over.

When caring for persons affected by outbreaks, it is important to be aware of and support a person through the practical implications of quarantine/isolation which may be a source of additional stress if an individual is unable to make the necessary arrangements. These include

- being worried about having enough basic supplies for themselves and family members
- child care if they are a single parent, or a carer for a family member
- not being able to do duties (home and work)
- the possible financial implications – are they in a situation of no work no pay, if employed is this covered by WCA, etc.

g. Coping mechanisms during outbreaks

People cope differently with stress. There are many factors that determine a person's ability to cope when faced with a stressful situation. During an outbreak and being in quarantine the factors that may affect an individual's ability to cope include:

- Whether the isolation elective or mandatory
- How long the isolation is set to last (a prolonged period means increases the risk of psychological impact)
- Where are they isolating – at home, hospital, offsite employee arrangements
- How persons usually cope with stressful situations
- What types of coping mechanisms they have in place and how effective they are
- The extent of an accessible and effective support systems
- The current mental health status and pre-existing mental health conditions
- A person's level of resilience
- A survivor or victim mentality in the person
- A persons' unique personality and character traits

Different traits such as optimism, need for control, social intelligence, grit, perfectionism, insight, courage, compassion may help or act against a person's ability to manage the situation. Extroverts tend to need more social interactions and may be severely impacted by the loneliness of isolation. Introverts generally prefer more solitude and thus may initially find it easier to cope. However, they too need some degree of social interaction.

The feeling of not having control over the situation causes a lot of distress. It is important for individuals to consider what is beyond their control (the virus, isolation, etc.) and what is within their control. The latter includes how they react to what is happening and the meaning, behaviour and thought process they dwell on. These in turn effect their mental, emotional, social and physical wellbeing during this time of crisis.

Coping mechanisms may be constructive (enhance or improve functioning) are destructive (potentially make the situation worse). Some coping mechanisms may assist but only if used in moderation for example alcohol used in excess, tranquilising medication or the use of social media. People already have some coping mechanisms they implement when faced with stressful situations, however they may not recognize them. Despite being in quarantine/isolation, these usual strategies will still be effective. Helpful coping mechanisms may include:

- Interacting socially via telephone and video calls, messages, social media

- Keeping busy with activities that are stimulating and consuming such as games, puzzles, reading, TV, crafts
- Staying informed but not overwhelmed
- Writing in a journal or a blog to document one's private thoughts and feelings during this experience
- Remembering the meaning of the isolation - to protect others
- Talking to someone who can provide support, or to the staff caring for the person, or to a professional
- Staying in the present moment and not projecting awful things into the future or overanalysing the past
- Keeping perspective with the broader context of life, and realising that experience is a small part of a longer narrative.
- Meditating or using breathing and / or relaxation techniques
- Listening to music as this has the ability to change brainwaves and mood
- Taking care of basic needs such as a healthy diet, rest and if possible exercise
- Having positive expectations about one's ability to adapt to the situation
- Staying positive and focus on the task at hand
- Focusing on one task at a time and be aware of what, how and why you are doing this task (i.e. mindfulness)

Particularly during quarantine and isolation, but also during other times, persons should still remain socially connected. This means taking the initiative to reach out to family and friends via telephone calls and social media platforms. This should not be in order to share the latest frightening information about Covid-19 but rather to have more social and 'normal' conversations and to reconnect.

It is vital that we limit the amount of time we spend listening to, reading about and watching content related to Covid-19 as this may reinforce the sense of helplessness and hopelessness and intensifies the feelings of fear and panic. Furthermore, news may be fake, incorrect or taken out of context in order to serve other socio-political agendas.

h. Conflict

During an outbreak, persons are likely to be in a state of chronic stress. This renders them more irritable, short tempered, aggressive and opinionated. These behaviour patterns are likely to cause friction at home and at work which may escalate to uncontrollable or even volatile / violent situations. It is helpful to raise the awareness of this very human tendency in people, so that people can self-monitor and respond appropriately. Conflict may be successfully negotiated if people have capacity to:

- assess their level of distress
- identify trigger points
- decide if the disagreement warrants engagement
- listen to the other person's point of view
- process all the information before taking action
- weigh up all options
- possibly discuss with uninvolved party
- attempt to negotiate in order to reach a resolution that is comfortable for both parties

At times it may become necessary to involve an external party to assist with resolving the disagreement. During an outbreak fear can be a major contributing factor to people becoming

irrational and making impulsive decisions. Advice and guidance from authoritative pillars or colleagues, friends, family may be helpful in times.

i. Key components in responding to persons' psychological needs during outbreaks

During outbreaks it is the responsibility of those directing the outbreak response to address the psychological needs of persons affected. Mental health care, and social considerations of being involved in an outbreak can be integrated into all response activities. A helpful way to do this is to acknowledge the psychological challenges that are experienced in uncertain times, including the changes in working environment, continual new information, stricter application of IPC measures, the difficulties and physical strain working in PPE, the impact of chronic stress and fear and of being constantly aware and vigilant, the presence of stigmatization and isolation.

Those who hold leadership roles can assist by relaying positive messages, emphasizing strengths and opportunities created by the outbreak, creating structures in which affected people can respond, act and communicate, giving clear rationales for what is happening, establishing open lines of communication, promoting self-care strategies and normalizing the variety of experiences that persons feel. This includes letting people know that the stress reactions they feel are an expected response to being in an outbreak

Communication has a key role to play in supporting the psychological responses to the outbreak. Silence from authorities, misunderstandings and lack of information can be a major cause of fear and unwillingness to work. However, communication needs to be bi-directional. It is essential that authorities create a space to listen to HCW's concerns, and to their suggestions regarding Covid-19 responses Some HCW and patients may be very vocal about their concerns and grievances. It is important to remember that these responses may be elicited by fear and a feeling of being out of control. If these concerns are not heard, they find their way into complaining and gossiping with colleagues, which in turn, spreads negativity and a general feeling of unhappiness. On the other hand, there will be some who will keep their concerns to themselves and will lash out later. There will also be those who are fearful of expressing themselves as they are concerned about how they will be perceived (weak or incapable) and the consequences thereof (not seen as coping or able to do duties effectively). It is therefore important that those managing the outbreak encourage persons to express themselves regularly in a space that it non-judgmental and safe.

Any strategy needs to emphasise the responsibility of people working in the hospital to ensure that they are informed, that they take advantage of the training being offered and discuss their concerns with the correct personnel. HCW need to conform to policies and procedures that are put in place to assist them to stay safe, abide by them and attend training. All of these will assist HCW to be prepared and help calm their fears a little.

A strategy needs to emphasise and reward community values such as determination, delayed gratification and team work. During the outbreak, many persons may be asked to step outside their comfort zone to work in areas where they need to learn new skills. In order to do this HCW need to work together as a team, be brave, listen to one another, work together, learn from others who are skilled in these areas, lead and teach others, and most importantly be kind, understanding and caring towards each other.

It may be helpful to provide telephone hotlines, employee wellness services, psychological services or counselling social workers. All these may be made available through video or telephonic consults, including support groups such as 'care for the care-giver' sessions.

Pre-emptive identification of individuals who are not coping may prevent adverse individual and organisational consequences. Warning signs include frequent absenteeism, passive aggression, non-co-operation, negative responses to authority, excessive conflict, poor handling of conflict or withdrawal.

If outbreaks are managed well and participatory approaches are used, the experience can create a cohesive environment. Unwanted, destructive outcomes can be minimised. HCW can be empowered by being encouraged to share their experience with others and to use the lessons learned to prevent further outbreaks. Teaching others is a powerful tool in managing the effects of an outbreak.

j. Psychological responses post outbreak

The psychological responses that may occur amongst HCW after the outbreak is over should not be under-estimated. Persons who were in a state of crisis management, who just managed to hold things together, will now have time to reflect on what happened and how they feel. Symptoms of anxiety, depression and PTSD may surface during this time. When these conditions affect HCW, they may be unable to perform their duties effectively. The impact will be felt by HCW, their colleagues and also their families. This wave could last for up to a year after the pandemic is declared over.

It is important to be cognizant of the psychological risks post-outbreak. HCW, patients and support systems to be aware that this period also carries risks. As before and during the outbreak, reliable and accurate information on Covid-19, ongoing training and psychological support resources should be provided.

11. Reporting of the findings from outbreak investigations.

Reporting of findings through daily updates, interim and final reports to all affected persons and stakeholders is critical.

The initial announcement of the outbreak is discussed in Section 5d.

Daily reports on the outbreak should be shared with the institution and with the outbreak investigation team. Content should be tailored to the audience bearing in mind the need for transparency to ensure trust but also respectful of the confidentiality of affected persons. No names should be used in these daily reports. The daily report to the outbreak investigation team should include updates and summaries of findings and activities according to the various components of the outbreak response. Table 5 summarises components of the various reports on outbreak investigations and response. Daily reports should be brief, with bullet points summarizing actions in each section. Reports should continue until the end of the outbreak and for a period afterwards, however, their frequency may be reduced from daily to weekly.

An interim report on the outbreak may be made once the outbreak is under control, but not all findings from investigations are available. Findings may be described in more detail, with paragraphs rather than bullet points.

Table 5. A guide for content of daily, interim and final reports

SECTION	A GUIDE TO CONTENT.
EPIDEMIOLOGY AND SURVEILLANCE	Update and interpretations of • Line lists • Epidemiological curves • Transmission diagrams Further investigations required to identify source
LABORATORY TESTING AND RESULTS	Laboratory results from cases and contacts
INFECTION PREVENTION AND CONTROL	Findings from IPC assessments New processes and procedures to prevent transmission of additional cases Training and refresher activities
HEALTH WORKFORCE MANAGEMENT	Update regarding persons in quarantine or in isolation Staffing arrangements to support continuity of service
COMMUNICATION	Media reports Engagement with organised labour Engagement with local and provincial authorities

During an outbreak, there is always fear and self-blame amongst the HCW. The IPC teams should reinforce messages in a no-blame environment to inspire confidence in the HCW. All cadres of staff must be aware of the policies through on the job or formal short training courses. Communication and key IPC messages to staff should be repeated and reinforced constantly to ensure awareness and teamwork to achieve a safe work environment through daily visits to the clinical areas by the IPC teams. Another essential role of the IPC team is to dispel misinformation by using evidence-based guidelines from reputable sources such as the WHO. Daily evaluation of the containment measures should be documented using a checklist or similar and reported to the IPC Committee every day. Modifications to practice should be considered depending on the local situation, as long as these are within the evidence-based guidelines.

Once the outbreak is under control, surveillance must continue for three times the incubation period after the outbreak is over, which in the case of Covid-19 will be 42 days. If surveillance is stopped too early, a second wave of infections might be missed. Equally, another pathogen causing similar symptoms might also be missed and the perception will be that the outbreak continues. In order not to miss secondary cases, vigilance of new cases or modification in case presentation must be borne in mind.

These general principles should be followed, reported on and the information used to advise national and local policy making bodies.

12. Closure of the outbreak

An outbreak may be regarded as over when two complete incubation periods have passed without the detection of additional cases (i.e. 28 days), assuming that adequate surveillance mechanisms are in place. During the period whilst investigations are proceeding, and no additional cases are identified, it may be safe to report that an outbreak is 'under control'. However, this announcement should be cautiously worded, explaining the interventions that are in place to detect additional cases.

Whilst an outbreak is under control, surveillance mechanisms should be in place in order to detect additional cases. These are discussed in the section on 'Prevention of Covid-19 outbreaks in health care facilities'.

At all stages of the Covid-19 pandemic, facilities should be on the alert as cases may arise at any stage through community transmission leading to infected HCW, or through admission of cases where Covid-19 is undetected.

13. Prevention of Covid-19 outbreaks in health care facilities

Guidance presented here is based on the National IPC Strategic Plan[54] and the Implementation Manual[55] accompanying this document. The strategic framework is based on the eight WHO Core Components[56] of IPC. A checklist for facility preparedness for Covid-19 developed by the European Regional Organisation office of the WHO may be useful[57].

a. Co-ordination of Covid-19 prevention efforts

i. Infection prevention and control leadership at different levels

Leaders should provide both political, human resources and financial support for IPC during outbreaks. Accountability should be increased via monitoring and feedback to achieve staff behavioural change and ensure safe patient care. Successful multi modal strategies (MMS) include the involvement of champions or role models at national, provincial, district and health facility level[58]

At a national level IPC is coordinated and implemented by the National Department of Health. This According to the WHO Core Components of IPC, the national committee should support outbreak response, investigation and implementation of appropriate preventative strategies depending on the type of outbreak and healthcare facility. However, in the Covid-19 outbreak, Incident Management Team of the National Department of Health has taken responsibility for co-ordinating health-related aspects of outbreak response.

At facility level the outbreak response team can either be an extension of the IPC Committee or comprise a broader team with senior management.

ii. IPC audits and observations

Once the routes of transmission have been established in the outbreak investigation, corrective and/or strengthened IPC measures should be put in place and monitored closely. IPC measures require constant reinforcement by means of written documentation, training and mentoring in the clinical areas. Repeated audits and/or daily visits to the clinical areas are essential to establish that practices and protocols are followed by everyone, clinical and non-clinical staff. These visits also identify gaps in knowledge, practice and attitude which can be corrected and the policies clarified. The understanding by the clinical teams of why certain measures are put in place have to be constantly supported by discussion and demonstration of proper practices.

iii. IPC training

Training in general IPC principles (standard and transmission-based precautions), as well as Covid-19 specific prevention measures is needed. Reinforcement of hand hygiene training, environmental cleaning principles and safe use of PPE is essential. Training is needed for all categories of health

[54] National Infection Prevention and Control Strategic Framework (2020), National Department of Health, Republic of South Africa.
[55] Practical Manual for the Implementation of National IPC Strategic Framework (2020), National Department of Health, Republic of South Africa.
[56] Storr J, Twyman A, Zingg W, Damani N, Kilpatrick C, Reilly J, Price L, Egger M, Grayson ML, Kelley E, Allegranzi B; WHO Guidelines Development Group. Core components for effective infection prevention and control programmes: new WHO evidence-based recommendations. Antimicrob Resist Infect Control. 2017;6:6. doi: 10.1186/s13756-016-0149-9.
[57] http://www.euro.who.int/__data/assets/pdf_file/0010/430210/Hospital-Readiness-Checklist.pdf?ua=1
[58] Guidelines on Core Components of infection prevention and control at the national and acute healthcare facility level. WHO 2016. Available from https://www.who.int/infection-prevention/publications/core-components/en/

care staff, and should ideally be repeated or refreshed as frequently as possible with on the job training. In most instances, face-to-face training is preferred to allow staff to ask questions. However, video training or the use of visual training materials and short messages to staff may also be valuable. Wherever possible, training should be tailored to the specific information required by each staff category based on their infection risk /activity profile e.g. nurses, security personnel, cleaning staff etc.

b. Early detection

i. Screening and testing of staff

Daily screening of HCW for symptoms compatible with Covid-19 on entry to work is an essential minimum intervention to detect persons who may be infected[59]. Persons who have symptoms, no matter how minor, should undergo Covid-19 PCR-based testing and should stay away from work until symptoms resolve or the test result is negative for SARS-CoV-2. Practically, it is helpful to ensure that HCW enter the facility through a single entrance so that screening may be supervise and standardised. The following symptoms should be included in the screening register: fever, cough, sore throat, headache, anosmia, dysgeusia, myalgia, fatigue, shortness of breath.

In areas where community levels of Covid-19 are high, some hospitals conduct routine periodic PCR Covid-19 testing on asymptomatic HCW[60,61]. The rationale for this approach includes the fact that 1) a high proportion of persons who test positive for Covid-19 are asymptomatic or pre-symptomatic; 2) pre-symptomatic or asymptomatic transmission is possible; 3) persons are most infectious early on in the course of disease when symptoms may be absent or mild; 4) the consequences of undetected Covid-19 infection in HCW are severe, including transmission to other patients and HCW; 5) whilst risks of acquisition of Covid-19 may be minimised through facility IPC measures, HCW are at risk of Covid-19 from community transmission.

There are no guidelines to assist in implementation of routine testing of HCW for Covid-19. When deciding to implement routine testing of HCW, the following factors should be considered

- Laboratory turn-around time. If TAT is longer than 72hours, the value of testing is minimal as a person who tests positive may not be withdrawn from service whilst testing is done.
- Laboratory capacity for additional testing
- The burden of community transmission. HCW in areas of high community transmission carry a proportionate risk of contracting Covid-19 in community
- The section of the hospital in which the HCW works. Consideration should be given to testing HCW who have a greater the likelihood of exposure to persons with unanticipated Covid-19, for example those working in ICUs or emergency departments.
- Whether or not an outbreak in the facility has just occurred. Testing of HCW may be indicated as part of surveillance.

ii. Screening and testing of patients and visitors

Screening and triage of patients who enter healthcare facilities is an essential intervention to prevent Covid-19 outbreaks in facilities.

[59] WHO Infection Prevention and Control Guidelines for Long-Term care facilities in the context of COVID-19. Accessed at https://apps.who.int/iris/bitstream/handle/10665/331508/WHO-2019-nCoV-IPC_long_term_care-2020.1-eng.pdf

[60] Black JRM, Bailey C, Przewrocka J, Dijkstra KK, Swanton C. COVID-19: the case for health-care worker screening to prevent hospital transmission [published correction appears in Lancet. 2020 Apr 17;:]. Lancet. 2020;395(10234):1418-1420.

[61] Hunter E, Price DA, Murphy E, et al. First experience of COVID-19 screening of health-care workers in England. Lancet. 2020;395(10234):e77-e78. doi:10.1016/S0140-6736(20)30970-3

Emergency departments in hospitals should be set up in such a way as to identify persons at risk of Covid-19. In this way, the HCW who attend to these patients may be appropriately protected. A number of references provide guidance regarding re-design of Emergency Departments to support Covid-19 triage and testing of patients[62,63]. Obstetrics units may consider testing all women admitted to the unit[64]. Consideration may be given to screening elective admissions for Covid-19. The decision to test depends largely on the prevalence of Covid-19 transmission in the community.

Several approaches may be taken regarding visitors to patients in health care facilities. Visitors may by disallowed completely, restricted in terms of time and distance to patients, screened for symptoms on entry, or in extreme cases, tested for Covid-19 prior to visiting.

Table 6. A summary of primary interventions to support prevention and early detection of Covid-19 in healthcare facilities

Administrative interventions	Engineering interventions	Personal Protective Equipment
Visitors and Patients 1. Limit or restrict HCF visitors and persons escorting patients. 2. Screen all visitors for Covid-19 symptoms 3. Restrict hospital admissions to essential stays 4. De-escalate non-urgent admissions and postpone elective procedures 5. Triage and screen all patients for Covid-19 symptoms before entering the HCF according to guidelines 6. Triage patients with possible Covid-19 symptoms to a separate assessment area 7. Admit PUI and Covid-19 infected patients to dedicated isolation wards 8. Avoid movement and transfers of patients and staff between wards 9. Implement a standardised Covid-19 symptom/exposure checklist for admissions 10. Screen all hospital inpatients daily for Covid-19 signs and symptoms 11. For inpatients, maintain a low threshold to isolate, re-assess and screen for SARS-CoV-2 if developing pyrexia of unknown origin or new respiratory symptoms 12. Consider testing all new ICU admissions for SARS-CoV-2; if laboratory capacity allows, consider testing of all patients on admission.	1. Ensure adequate natural or mechanical ventilation for areas where aerosol-generating procedures are performed often e.g. ICU's 2. Increase the frequency of surface and equipment cleaning and disinfection in the HCF. 3. Increase the availability of alcohol hand rub at the point of care and ensure access to soap, water and handtowels. 4. Provide dedicated areas for cleaning and disinfection of re-usable PPE e.g. visors and goggles 5. Create greater physical separation between beds to reduce droplet contamination of surfaces e.g. convert a 6-bed to a 4-bed cubicle; or use partitions or screens between beds in ICUs 6. Implement strict physical distancing in the workplace i.e. on ward rounds, in tea rooms, the cafeteria, staff meetings 7. Close public cafeteria seating areas. 8. Keep medical notes outside of the patient cubicle; keep paper notes in a plastic file and prescription charts in plastic sleeves that can be wiped over with 70% alcohol 9. Ensure tea rooms are spacious and well-ventilated, and stagger tea times to avoid crowding.	**Visitors, Patients and Staff** **Universal masking** 1. Require all outpatients and visitors to wear a non-medical (cloth) mask while inside the HCF 2. Require all inpatients with or without symptoms of acute respiratory infection to wear a surgical mask. 3. Require all healthcare workers to wear masks at all times whilst in the facility 4. All administrative staff and support staff with limited patient contact, use non-medical (cloth) masks. **PPE policies and training** 1. Ensure all staff are familiar with the HCF's PPE policies 2. Ensure a stable supply of adequate quality PPE 3. Provide ongoing training, PPE buddies and visible reminders of how to don and doff PPE in Covid areas.
Staff 1. As far as possible, avoid movement of staff between Covid and non-Covid sections of the hospital on any particular day. 2. Consider staff off duties for extended periods before returning to non-Covid areas 3. All staff to undergo repeated training regarding Covid-19 risk reduction 4. Ensure agency staff or locums are familiar with the HCF's Covid-19 policies 5. Encouraged all staff receive influenza vaccination to reduce frequency of flu-like illnesses and absences 6. Perform daily self-monitoring for Covid-19 symptoms using a form, an app or a 7. buddy symptom checking system. 8. Ensure staff are familiar with how to report symptoms to their line manager 9. Support staff to travel to and from work in ways that minimise community exposure to Covid-19		

[62] Whiteside et al. Redesigning emergency department operations amidst a viral pandemic. Am J Emergency Medicine. Accessible at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7156950/pdf/main.pdf

[63] Chung HS, Lee DE, Kim JK, et al. Revised Triage and Surveillance Protocols for Temporary Emergency Department Closures in Tertiary Hospitals as a Response to COVID-19 Crisis in Daegu Metropolitan City. J Korean Med Sci. 2020;35(19):e189.

[64] Sutton D, Fuchs K, D'Alton M, Goffman D. Universal Screening for SARS-CoV-2 in Women Admitted for Delivery. N Engl J Med. 2020;382(22):2163-2164. doi:10.1056/NEJMc2009316

c. Pre-emptive containment measures

Given that the highest period of Covid-19 transmissibility occurs before and immediately after symptom onset, it is unlikely that identifying and excluding symptomatic patients and healthcare workers will prevent HCF outbreaks. For this reason, 'universal' prevention measures such as physical distancing, mask-wearing and hand hygiene (among others) are critical interventions for primary prevention of Covid-19 outbreaks in HCF.

14. Occupational Health and Safety measures applied to Covid-19 prevention and outbreak response.

The Occupational Safety and Health Act requires employers to comply with safety and healthy workplace. Every workplace must ensure that they done risk assessment of exposure to Covid-19 A detailed outline of interventions in support of this act may be found in the following references:

- Occupational Health and Safety Act of 1993; OSH ACT 85 of 1993
- Guidance on Preparing Workplaces for Covid-19; OSHA 3990-03-2020
- WHO –Getting your workplace ready for Covid-19
- National Institute for Occupational Health | Newsletter | Issue 4 | Volume 1 | COVID-19
- Steps Healthcare Facilities Can Take Now to Prepare for COVID-19 | CDC Policy in the place

Appendices

Appendix 1: Outbreak investigation check list

No.	Item	Done	Not done
	Within <2 hours		
1	Report to hospital management telephonically and by email immediately		
2	Complete case investigation form for the index case/s		
3	Activate Covid-19 Outbreak investigation team and set a time for a meeting within the next 6 hours.		
	2-6 hours		
4	Meet as a Covid-19 Outbreak investigation team		
5	Identify contacts of the index case identified and complete the contact line-list		
6	Assess all contacts assessed for symptoms		
7	Test symptomatic contacts (including HCW and patients) by PCR on throat swabs and arrange isolation		
8	Counsel high risk HCW, test them for Covid-19 (if indicated) and arrange quarantine		
9	Provide low risk, asymptomatic HCW with self-monitoring tool.		
10	Provide patients who are contacts with surgical masks		
11	Send out an official notification of the outbreak to staff and stakeholders, including what is known, what is being done, and a reminder to adhere to IPC practices.		
	6-24 hours		
12	Directly exposed (close contact) patients moved to identified Covid-19 isolation ward, if applicable		
13	Terminal cleaning of all affected areas (i.e. units, wards, departments) is conducted as per protocol		
14	Daily monitoring of contacts and positive Covid-19 cases		
15	Meeting of Outbreak Management Team to review new information, actions and initial IPC responses.		
16	Arrange for IPC audit		
17	Send out daily summary report to Outbreak Management team and key stakeholders.		
18	Notify district authorities of the outbreak and what actions are being taken		
1-2 days			
19	Conduct IPC audit		
20	Obtain laboratory results from all swabs collected.		
21	Inform HCW and patients of their results.		
22	Complete Case investigation forms for all HCW and patients who test positive		
23	Meeting of Outbreak Management Team to review new information, actions and initial IPC responses.		
24	Make an initial decision re the need to close wards/departments		
25	Provide psychosocial support for affected staff and patients		
26	Send out daily summary report to Outbreak Management team and key stakeholders.		
	2-3 days		
27	Obtain new laboratory results from all swabs collected.		
28	Inform HCW and patients of their results.		
29	Complete Case investigation forms for all HCW and patients who test positive		

30	Generate line lists, epidemiological curves, timelines for positive cases		
31	Meeting of Outbreak Management Team to review new information, actions and IPC audit findings.		
32	Generate and discuss hypotheses re the source of the outbreak and modes of transmission		
33	Discuss proposed interventions to prevent onward transmission, and consider ways to prevent future outbreaks in the light of experience gained.		
34	Review the decision to close wards/departments		
35	Send out daily summary report to Outbreak Management team and key stakeholders.		
	3-7 days		
36	Meet daily as the Outbreak Management Team to review new information, actions and IPC audit findings.		
37	Implement and monitor interventions to prevent onward transmission		
38	Collect new laboratory results		
39	Update line lists, epidemiology curves and timelines		
40	Send out daily summary report to Outbreak Management team and key stakeholders.		

Appendix 2: Outbreak case investigation form

Covid-19 Institutional Outbreak – Case investigation form

Section A: Facility and respondent details

Name of facility:_____
Address of facility: _____
Facility district/province: _____

Name of person completing form:_____
Role of person completing form:_____
Date of form completion:_____
Time of form completion:_____

Section B: Details of Covid-19 case

First Name: _____
Last name: _____
Date of birth:_____

RSA ID number/passport: _____
Age (years and months): _____
Sex at birth: Male □ Y / N □ Female: □ Y / N □

Role of person in the institution:
HCW □ Y / N □ if Y, what kind of HCW? _____
Doctor □ Y / N □ Nurse □ Y / N □
Other □ Y / N □ State:_____

Patient □ Y / N □
If patient, date of admission: _____

Section C: Course of Covid-19 infection

Date of Covid-19 test: _____
Laboratory where tested: _____
Reason for testing: Clinically ill : □ Y / N □
Was the person symptomatic at testing? □ Y / N □
Classification of case (at time of form completion)

Covid-19 test result: _____
Laboratory reference number: _____
Routine screening □ Y / N □ Contact of case: □ Y / N □
If symptomatic, date of symptom onset:
Asymptomatic □ Y / N □ Mild - moderate □ Y / N □
Severe □ Y / N □

If severe, indicate clinical events and diagnoses to date:
Oxygen □ Y / N □ ICU admission □ Y / N □
Pneumonia □ Y / N □ ARDS □ Y / N □
Is patient still on oxygen? □ Y / N □

Ventilation □ Y / N □ ECMO □ Y / N □
CVA □ Y / N □ Other □ Y / N □ state_____
Date of earliest symptom onset

Based on the above, what is the approximate infectious period?*

From: _____
To: _____

Section D: Movements in the institution during the infectious period

Parts of the institution the case admitted/worked in during the infectious period?	Dates in that part of institution	Reason for being in that part of the institution?	Wearing appropriate PPE at the time?
1. _____	_____	_____	□ Y / N □
2. _____	_____	_____	□ Y / N □
3. _____	_____	_____	□ Y / N □
4. _____	_____	_____	□ Y / N □
5. _____	_____	_____	□ Y / N □
6. _____	_____	_____	□ Y / N □
7. _____	_____	_____	□ Y / N □
8. _____	_____	_____	□ Y / N □
9. _____	_____	_____	□ Y / N □

Section E: Actions following diagnosis of Covid?

Was case put in isolation? □ Y / N □ if yes, where? Home □ Y / N □ Hospital? □ Y / N □ Other □ Y / N □
Outcome at time of completion of form:
In isolation □ Y / N □ Admitted □ Y / N □

Died □ Y / N □ If died, date_____

NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

COVID-19 CONTACT LINE LIST

Complete a contact line list for every person under investigation and every confirmed Coronavirus disease 2019 (COVID-19) case

health
Department: Health
REPUBLIC OF SOUTH AFRICA

Details of person under investigation/confirmed COVID-19 case			
NICD Identifier		Date Symptom Onset	DD/MM/YYYY
Surname		Name	
Contact number		Alternative number	
Travel (provide details of all: 7 days before onset)		Travelled by	Bus ☐ Plane ☐
Air/bus line		Flight/bus #	Seat #

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

Details of contacts (*With close contact[1] from the date of symptom onset, or during symptomatic illness.*)

	Surname	First name(s)	Sex (M/F)	Age (Y)	Relation to case[2]	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?[3] (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				

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

NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division in the National Health Laboratory Service

health
Department: Health
REPUBLIC OF SOUTH AFRICA

COVID-19 DAILY SYMPTOM MONITORING TOOL

Complete for contact of a confirmed Coronavirus disease 2019 (COVID-19) case

Details of contact of confirmed case (details of case completed just before instructions)

NICD Identifier _____ Date of contact DD/MM/YYYY Place last contact _____

Surname _____ Name _____

Date of birth DD/MM/YYYY Age (Y) _____ Sex M☐ F☐

Healthcare worker Y☐ N☐ If yes, facility name _____

Contact number(s) _____ Email _____

Physical address

House number _____ Street _____ Suburb _____ Town _____

District _____ Province _____ Client traced Y☐ N☐

Details of health official completing this form

Surname _____ Name _____

Role _____ Facility name _____

Email address _____ Telephone number _____

Date completing form DD/MM/YYYY

Next of kin details

Next of Kin name and surname _____ Next of Kin contact number _____

Details of confirmed COVID-19 case

Contact type[1] Close☐ Casual☐ Relation to case[2] _____

NICD identifier _____ Surname _____ DOB DD/MM/YYYY

Instructions for completion: Instructions for completion: Mark "Y" if symptom present and "N" if not. If any symptoms are present collect, contact 082 883 9920 immediately and make immediate arrangements for the collection of a combined nasopharyngeal and oropharyngeal swab. Refer to COVID-19 Quick Guide on the NICD website for additional details. Days post exposure to case.

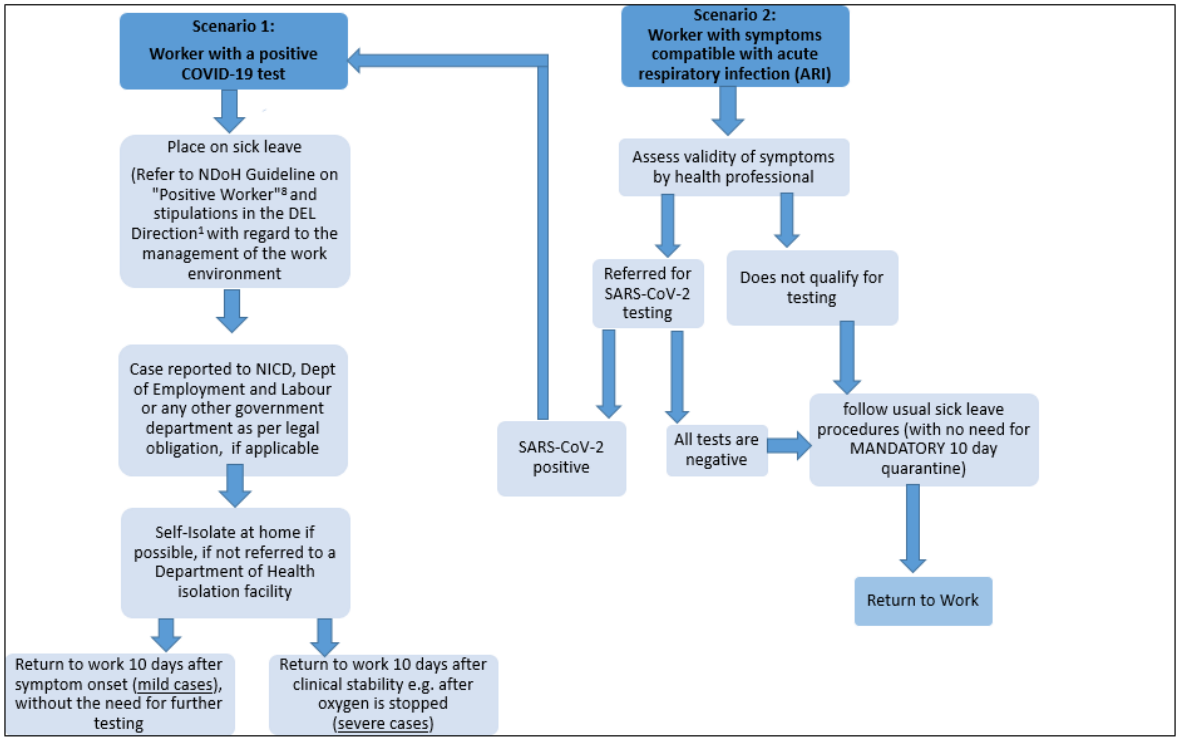
DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Date (DD/MM)														
Measured body temp														
Fever (self-reported)	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N
Chills	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N
Cough	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N
Sore throat	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N
Shortness of breath	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N	☐Y☐N

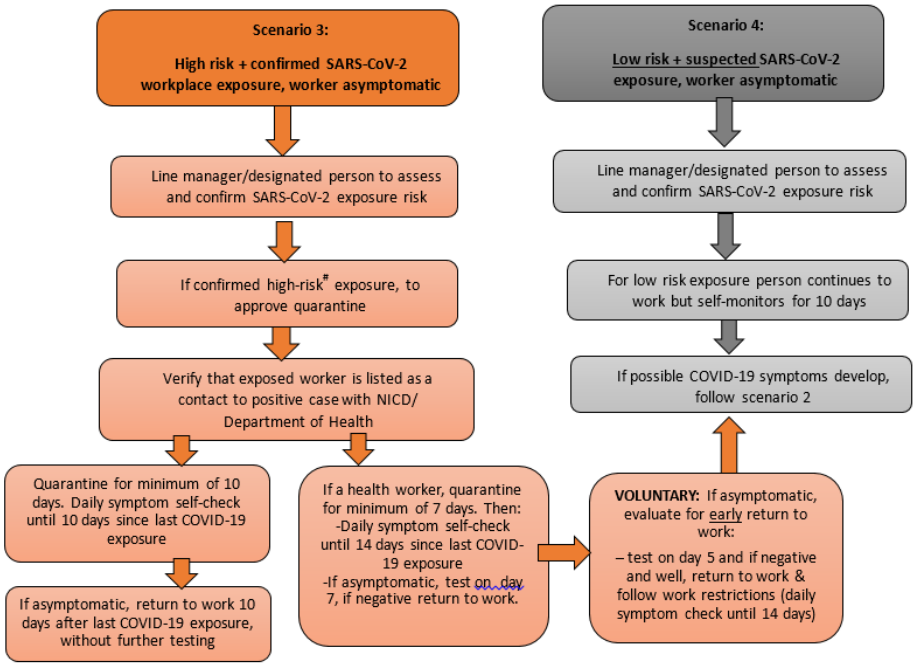
[1] Close contact: A person having had face-to-face contact (≤2 metres) or was in a closed environment with a COVID-19 case; this includes, amongst others, all persons living in the same household as a COVID-19 case and, people working closely in the same environment as a case. A healthcare worker or 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. Casual contact: Anyone not meeting the definition for a close contact but with possible exposure. [2] Chose from: Spouse, Aunt, Child, Class mate, Colleague, Cousin, Father, Friend, Grandfather, Grandmother, Healthcare worker taking care of, Mother, Nephew, Niece, Other relative, Uncle.

Version 7, 5 May 2020

Appendix 5. Algorithm for management of HCW who are contacts of Covid-19 cases, or who test positive for Covid-19

The algorithm below is reproduced from the document '*Guidelines for symptom monitoring and management of workers for SARS-CoV-2 infection (August 2020)*' which was drawn up by the Occupational Health and Safety Committee-COVI-19 response. Accessed at https://www.nicd.ac.za/diseases-a-z-index/covid-19/covid-19-guidelines/





Appendix 6: IPC checklist for outbreaks

This IPC checklist is aligned with the 1) National IPC Strategic Manual (2020) and 2) Covid-19 IPC Guidelines V2 (2020) which provides the most recent evidence for Covid-19 IPC practices. It is for those who are investigating Covid-19 outbreaks in healthcare facilities.

How to complete the IPC checklist (audit form)

- Complete the General Information section ensuring your name is clearly printed as "Name of Auditor".
- Complete checklist as YES = 1; NO = 0. Maximum score is expressed as a percentage
- Complete each section. For Section 1 (General information) ask for this information before hand to facilitate the visit.
- Try to complete each question. A blank will be taken as a negative finding and will affect the overall % score.
- Use the space for comments to write in your ideas and interpretation.
- Following completion of the checklist, prepare a summary highlighting sections (domains) below where the score obtained is <75%. Provide a summary of the key findings to the hospital management with a priority list of interventions under each domain (section).
- Should any individual domain (section) score <50%, repeat the audit of that domain one week following the feedback to management, to ensure that the necessary actions have been taken and protocols implemented.

General Information	**Name of auditor:**	
Name of Healthcare facility	**Date of visit**	
District/ Province:	***Total beds (#)***	***Total Covid-19 (dedicated)(#)***
Bed allocation in HCF (total)		
ICU beds		
Clinical staff (patient: staff ratio)		
• Nurses		
• Doctors		
• Physiotherapist		
• Pharmacy		
• Other		
Non clinical staff working in clinical areas		
• Porters		
• Cleaners		
• Security		
• Administrative staff		
• Other		
No of HCW infected with Covid-19 to date		
There is an Occupational Health Dept. or designated person on site		

Topic	Yes	No	comment
ADMINISTRATIVE CONTROLS			
Structure			
There is an outbreak response team (OBT)			
There is a written outbreak management plan (*ask to see*)			
Covid-19 IPC Guidelines are available (*ask to see*)			
IPC practitioner(s) is part of the OBT			
IPC practitioner is full time, dedicated to IPC			
IPC practitioner has had at least 6 months training in IPC			
Daily meetings of the OBT including an IPC report (*see minutes*)			
Regular reports to Province or District *(see report*)			
Procurement structures for IPC equipment (PPE), are in place			
Restricted access control to the facility is in place			
Total answered 'Yes': x/10 x 100=	***10***		
IPC Provision in clinical areas			
Alcohol based hand rub (3 litres/wd/ day; or 6 litres/ ICU/ day)			
Running water; liquid soap; paper towels (All stations)			
Adequate number of medical masks (2-3/ HCW/ shift)			
N95 respirators for AGP (1/HCW; extended use)			
Goggles/ visors (1/ HCW- extended use)			
Plastic aprons (2-3/ HCW/ shift; single use only)			
Gowns (2-3/ HCW/ shift; for aerosol generating procedures, single shift use only)			
Supply of Gloves (16-20/ HCW/ shift, single use only			
Signage for Droplet/ Contact precautions (Covid-19)			
IPC information leaflet for patients, visitors and staff			
Total answered 'Yes': x/10 x 100=	**10**		
ENGINEERING CONTROLS			
Triage/ Covid-19 screening area for all patients entering the HCF			
Separate assessment area for patient under investigation (PUI)			
Dedicated/ separate admission wards for suspected or confirmed Covid-19			
Adequate number of toilets/ ward (1: 10 ratio)			
Natural ventilation at 60l/sec per patient			
Mechanical ventilation in wards; > 6 ACH/ hour			
Bed spacing: >1.5 m between bed edges			
Bed (privacy) curtains around each bed			
Ventilators have inspiratory and expiratory valves; microbial filters on expiratory valves			
Closed patient suctioning systems			
ICU beds: 3m between beds			
ICU ventilation: at 160 l/sec/ patient or 12 ACH			
Total answered 'Yes': x/12 x 100=	**12**		

Staff areas	yes	no	comment
PPE area in the clinical zones			
Signage for area where PPE is put on and taken off			
Poster displaying how to put on and take off PPE			
A demarcated area for putting on and a separate area for removing PPE			
Hand wash basin at point of putting on and removing PPE			
Staff rest areas			
Staff tea room has signage to remind staff to remove PPE and ensure physical distancing			
The number of staff using the staff tea room is limited to ensure >1.5 metres physical distance			
The staff break times are staggered to reduce crowding			
The tea/ rest room is well ventilated			
There is hand hygiene facilities in the rest room			
There is adequate floor space (tea room) for social distancing			
There is a bin for discarding PPE, before entering the room			
A schedule and checklist for cleaning and disinfecting high touch surfaces is implemented			
Adequate number of functioning toilets for staff			
Total answered 'Yes': x/13 x 100=	**13**		
Operating theatre and maternity wards			
There is a clear SOP for identifying PUI and Covid-infected patients before arrival in the operating theatre			
Positive pressure ventilation provides increased airflows (24 ACH) during operation (negative pressure not required)			
Operating staff wear regular PPE for direct Covid-19 exposure (gloves, mask, gown, goggles) unless undertaking an aerosol generating procedures (AGP) (see guidelines)			
Number of attending persons are reduced during operation and only necessary staff present during AGP			
Cleaning and disinfection of the operating theatre after each patient has been operated upon is implemented			
Maternity patients: for normal deliveries staff wear a surgical mask, gloves, apron/gown and goggles/visor.			
For caesarean section where mother is intubated, wear PPE for AGP (N95 respirators, gown, goggles, gloves).			
Covid-19 positive mothers to wear a surgical mask when breast feeding her infant.			
Kangaroo mothers to wear a cloth mask and maintain a 2metre physical distance from others in the kangaroo ward.			
Surgical instruments (medical devices) are reprocessed in the usual manner			
Total answered 'Yes': x/10 x 100=	**10**		

INFECTION PREVENTION AND CONTROL (For Covid-19)			
Hand hygiene (in accordance with 5 Moments of HH, WHO)	Yes	No	Comment
HH performed before wearing PPE			
HH performed between each step of removing PPE			
Gloves removed after each patient use (single patient use)			
Alcohol based hand rub is available at each bedside of patients and at each ward entrance			
Soap and water, paper towels available at each HW basin			
Short nails, no acrylic or artificial nails			
Staff do not move between patients without first performing HH			
If staff touch surfaces, they carry out HH before touching patients			
Moved from an aseptic field to a contaminated field and performed hand hygiene between different fields or body sites			
Always performed hand hygiene after touching the mask			
Hand hygiene posters are visibly displayed in the clinical area			
Total answered 'Yes': x/11 x 100=	**11**		
PPE			
Correct procedure followed when donning PPE- aprons, masks, goggles/ visor, gloves			
Correct procedure followed when doffing PPE-gloves, aprons, goggles and mask			
Medical mask worn correctly when providing clinical care			
Gown/ apron worn as recommended when providing general clinical care			
N95 respirator worn for AGP only			
Extended use of N95 respirator by the same HCW and stored correctly after use			
N95 respirators have been face fit tested for each HCW			
Goggles or visor worn for all contact with Covid-19 confirmed cases and PUI			
Gloves removed after each patient contact and hand hygiene performed			
Gloves removed before writing in the clinical notes			
Alcohol was not applied to the gloves between patients			
Did not move between patients with the same apron (unless providing "blocks" of care in a Covid-19 multi-bed cubicle)			
Total answered 'Yes': x/12 x 100=	**12**		
Environmental cleaning (EC)			
Cleaning staff is trained in EC protocols for Covid-19			
Cleaning staff are trained in diluting disinfectants (especially chlorine) to the correct strength and concentration			
Cleaning and disinfection protocols are clearly understood and applied (*ask to see protocol*)			
Frequency of cleaning in each area is clearly understood (*ask to see protocol*)			
Systematic cleaning of areas from clean to dirty are followed			
Validation processes are in place (visual and fluorescent markers). (*ask to see supervisor records/ IPC team reports*)			
High touch areas have been cleaned and disinfected according to			

protocol.			
All necessary PPE is available to the cleaning staff			
Double bucket janitor trolley, mops, cleaning cloths and disinfectant to wipe surfaces after cleaning, is available			
Toilet and ablution blocks are cleaned frequently according to protocol			
Terminal cleaning is performed when each patient has been discharged.			
No disinfectant spraying or fogging is being used routinely –(all disinfectants are applied by wiping NOT spraying)			
Total answered 'Yes': x/12 x 100=	**12**		
Laundry; health care waste; transfer of bodies			
Laundry and Healthcare waste management	Yes	No	Comment
All linen from the Covid-19 dedicated clinical areas is bagged and labelled as infectious			
Linen is not sluiced prior to sending for washing			
Washing of laundry is done at high temperatures			
All PPE from Covid-19 clinical areas is discarded as infectious waste			
Healthcare risk waste is labelled as "infectious", and also "Covid-19" if protocol requires			
Total answered 'Yes': x/5 x 100=	**5**		
Transfer of dead bodies			
Persons who died of suspected or confirmed Covid-19 may be transported in a cotton shroud if there is no leakage expected			
Persons who died of suspected or confirmed Covid-19 is transported from the ward to the mortuary in a single body bag			
Those involved in moving the body will wear a pair of gloves and plastic apron			
Those involved in preparing the body in the mortuary will wear gloves, apron, mask and goggles in case of splashing			
In the preparation of the body for removal from the ward, no disinfectant spraying takes place			
Total answered 'Yes': x/5 x 100=	**5**		

Section	Total score	HCF score	Percentage
Administrative Control	20		
Engineering controls	35		
IPC (PPE & HH)	23		
Environmental cleaning	12		
Laundry & HC Waste	5		
Transfer of dead bodies	5		
Total score	100		