MOH PANDEMIC READINESS AND RESPONSE PLAN FOR INFLUENZA AND OTHER ACUTE RESPIRATORY DISEASES (REVISED APRIL 2014)

SCOPE

1. This document covers the readiness and response plan for novel acute respiratory infections with pandemic potential (e.g. influenza or SARS) and recommends appropriate public health measures and response actions prior to and during a pandemic. This plan can be applied to any acute respiratory pathogen (virus or bacteria) and guidance will be provided by MOH for individual novel pathogens where necessary.

INTRODUCTION

BACKGROUND

2. A pandemic is an epidemic[1] of an infectious disease that has spread through human populations across geographical regions globally. Pandemics occur when the general population has no or little immunity against an emerging or re-emerging pathogen. Over the centuries, infectious diseases with different modes of transmission have resulted in pandemics, including influenza (respiratory spread), cholera (water- and food-borne) and bubonic plague (vector-borne). This document focuses on the national response framework against **acute respiratory infections with pandemic potential**.

3. Influenza has been a major acute respiratory infection of interest as it caused four pandemics since the turn of the 20th century. Previous influenza pandemics have shown no predictable periodicity or pattern and all differed with respect to antigenic subtype, epidemiology and disease severity. They can be more or less severe than preceding seasonal epidemics – while the 1918 H1N1 pandemic was associated with high mortality, the 2009 H1N1 pandemic was relatively mild. Additional details on influenza viruses can be found in Annex A.

4. Other acute respiratory diseases can also have pandemic potential. These include the Severe Acute Respiratory Syndrome-associated Coronavirus (SARS-CoV) and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV), which are of concern due to their clinical severity. Additional details of these coronaviruses can be found in Annex B.

PUBLIC HEALTH THREAT ASSESSMENT

5. Both the ability of respiratory pathogens to spread (**transmissibility**) and the ability to cause serious illness (**virulence**) determine the extent of the outbreak and its resulting public health impact.

6. For example, influenza A viruses undergo reassortment events (i.e. exchange and recombination of genetic material between viruses), generating new strains with unpredictable transmissibility, virulence, and pandemic potential. However, the factors that

[1] An **epidemic** occurs when new cases of a certain disease, in a given human population, and during a given period, substantially exceed what is expected based on recent experience.

drive the emergence of pandemic influenza are not well understood. Reassortment events in swine remain a significant source of pandemic potential influenza viruses. Mammalian-adapted virus strains in other animal species, along with avian influenza virus strains that have shown the potential to infect humans, are also a potential threat. The laboratory syntheses of H5N1 influenza strains that can transmit efficiently among humans show their pandemic potential.

7. Similarly, coronaviruses undergo genetic mutations and recombination at a rate similar to that of influenza viruses. Due to the extensive genetic diversity of these viruses, infections that result from coronaviruses can be difficult to predict and manage. These viruses may cause epidemic diseases of pandemic potential.

8. Currently, the primary risk factor for human infection for avian influenza and novel coronaviruses appears to be direct or indirect exposure to contaminated environmental sources, with some human spread among close contacts. For efficient human-to-human transmission to occur, these pathogens must undergo further genetic changes and adaptation.

9. Given the unpredictability of the respiratory pathogens, pandemics will likely occur again. Modeling studies notwithstanding, predictions of how particular disease strains will evolve remain highly speculative. Continued surveillance and monitoring of the global developments in the evolution of acute respiratory infections as well as pandemic preparedness and planning will serve to prepare us against the emergence of the next pandemic.

CLINICAL FEATURES OF ACUTE RESPIRATORY INFECTIONS

SYMPTOMS

10. Symptoms of different acute respiratory infections may vary depending on the pathogen. General symptoms may include constitutional symptoms such as fever, myalgia (muscle pains), headache, malaise (body discomfort), and respiratory symptoms such as cough, sore throat, and rhinitis (nasal inflammation). Certain populations such as the young, and elderly and those with underlying medical conditions may be at risk of developing a more severe illness including pneumonia.

11. For example in influenza cases, uncomplicated illness is characterised by the abrupt onset of symptoms. Among children with influenza illness, otitis media (middle ear infection), nausea, and vomiting are also commonly reported. Influenza illness typically resolves after a few days for most patients, although cough and malaise can persist for more than 2 weeks. Influenza can exacerbate underlying medical conditions (e.g. pulmonary or cardiac disease), lead to primary viral or secondary bacterial pneumonia, or occur as a co-infection with other pathogens.

12. It is often difficult to identify a specific pathogen based on clinical symptoms alone because there is a wide range of pathogens that cause similar symptoms including, but not limited to, *Mycoplasma pneumoniae*, adenovirus, respiratory syncytial virus, rhinovirus, parainfluenza viruses, and *Legionella* spp. Laboratory tests are required to conclusively identify these pathogens, although in a pandemic where the majority of cases are caused by the pandemic pathogen, it is possible to intervene based on clinical symptoms alone.

LABORATORY FEATURES

13. Diagnostic tests available for respiratory infections include cultures (e.g. viral cultures), serology, polymerase chain reaction (PCR), immunofluorescence assays, and rapid tests. The sensitivity and specificity of any test may vary by the laboratory that performs the test, the type of test used, and the type of specimen tested. Among respiratory specimens for viral isolation or rapid detection of influenza, nasopharyngeal specimens are typically more effective than throat swab specimens. For SARS and MERS-CoV, lower respiratory specimens are preferred as these viruses preferentially affect the lower respiratory tract. As with any diagnostic test, results should be evaluated in the context of other clinical information available to health-care providers.

14. Commercial rapid diagnostic tests are also available for some diseases. For example, rapid tests to detect influenza viruses within 30 minutes are widely available. These rapid tests differ in the types of influenza viruses they detect and whether they can distinguish between influenza types. The specificity and, in particular, the sensitivity of rapid tests are lower than culture or PCR, and vary by test.

SEVERE INFECTIONS AND MORTALITY

15. The proportion of severe infections and mortality from respiratory infections varies widely, depending on risk factors such as comorbid conditions, age and immune status. It is therefore important to understand the virulence patterns of the disease in question. MERS-CoV tends to result in severe infections among older individuals and those with comorbid conditions, while SARS resulted in severe infections across a wide age spectrum. Influenza-related hospitalisation and deaths often result from pneumonia as well as from exacerbations of cardiopulmonary conditions and other chronic diseases. However, in an influenza pandemic, the mortality rates among the different population groups could be vastly different from that in seasonal influenza cases.

EPIDEMIOLOGY

16. We assume that the epidemiological features of a future acute respiratory infection pandemic will be consistent with previous known human epidemics and pandemics. However, these features should not be interpreted as being definitive of a novel pandemic pathogen. In the event of a pandemic, active and enhanced surveillance will be required in the early stages of the outbreak to determine the true nature of the pandemic pathogen.

17. **Incubation period.** The incubation period will vary depending on the pathogen, and will have to be determined through surveillance. The incubation period for human influenza is typically 2 days, with a range of 1 - 4 days. However, human cases of avian influenza have incubation periods around 2 - 8 days and as long as 14 - 17 days. The incubation period for SARS was up to 10 days, and MERS-CoV up to 14 days. Depending on the pathogen, the incubation period for field investigations and monitoring of contacts will also vary correspondingly.

18. **Transmission.** There are 3 modes of transmission for respiratory pathogens:

    a. Large droplet spread (the main route of transmission for influenza);

b. Transmission through droplet nuclei, i.e. airborne spread (Sneezing, coughing and even talking can produce droplets of wide variety of particle sizes that can facilitate droplet or droplet nuclei infection); and

c. Contact, either direct or indirect, with respiratory secretions.

19. **Infectious period.** The infectious period depends on the pathogen. In the case for influenza, infected persons can be infectious (i.e. spread the disease to others) one day before the onset of symptoms. Conversely, for coronaviruses, infected persons are usually infectious when symptomatic.

20. **Organism survival in different environments.** Survival of respiratory pathogens outside the body varies with multiple factors including temperature and humidity. The few available studies have been on the influenza virus, showing that it generally survives 24-48 hours on hard, non-porous surfaces, 8-12 hours on cloth/paper/tissue, and 5 minutes on hands. Survival is generally enhanced under conditions of low humidity and in the cold.

NATIONAL STRATEGY FOR PANDEMIC RESPONSE

OVERVIEW

21. The national strategy for pandemic response is to establish an effective surveillance system to detect the importation of a novel acute respiratory pathogen with pandemic potential and to mitigate the consequences when the first wave hits. For influenza viruses and other pathogens where vaccines production is possible, vaccination will be provided as soon as a vaccine becomes available, which is likely to be beyond the first wave. To assist planners in preparing for the worst-case scenario, we have provided some planning assumptions for consideration in Annex C. However, the actual epidemic will likely differ and real-time information will guide the response.

22. Our objective is to sustain the nation through the first epidemic wave by minimising mortality and morbidity through the use of measures that are proportional to the assessed public health impact, while ensuring preparedness for vaccination of the entire population when a vaccine becomes available.

23. The recommended national response measures are dependent on the phase of the local epidemic and the assessed public health impact of the epidemic.

a. In the initial **phase when cases are mostly overseas**, efforts will be to detect and **minimise importation** of the disease for as long as possible to allow time to gain a better understanding of the disease and to prevent disease spread. Depending on the extent of transmission and the virulence of the disease, this may necessitate border health control measures such as travel advisories or temperature screening. For diseases with potentially severe public health impact, border health control measures similar to that implemented for SARS will be adopted. Some containment measures may be needed for the individual cases that are imported to Singapore, especially if these cases result in local clusters.

b. **When the disease spreads in the Singapore community**, for a relatively **mild disease** with low to moderate public health impact, efforts to contain the disease may be halted and a move towards **reducing the community impact** of the pandemic may be made

sooner. This will include measures aimed at extending appropriate treatment to community cases and reducing the spread through social distancing.

c. Conversely, a pathogen with greater virulence and causing more **severe public health impact** would necessitate sustained measures to **contain its spread** (e.g. SARS). While we may not be able to fully contain the disease, measures can still be taken to delay or limit spread throughout the community. This will reduce the number of infections at any one point in time and reduce disruption to essential services. When the disease spreads widely across Singapore, **measures to reduce community impact** will set in.

d. A key drive throughout the epidemic will be to **communicate** with and **educate** the public and securing their co-operation with our efforts. The key message to the public will be the importance of each individual's responsibility in preventing disease spread through personal hygiene and being socially responsible in behaviour.

24. In essence, our response aims at achieving the following three broad outcomes:

a. **Reduce morbidity and mortality through providing healthcare and early treatment of infected cases.**
During the local epidemic, outpatient care will be provided by polyclinics and participating primary care clinics[2] including Pandemic Preparedness Clinics (PPCs). Severe cases will be referred to hospitals for further treatment. All healthcare facilities will have to ramp up their surge capacity to cope with the possible increase in cases. For influenza, depending on the epidemic's severity, clinically diagnosed cases may be treated with anti-virals, preferably within 48 hours of the onset of symptoms.

b. **Slow and limit the spread of disease to reduce the surge on the healthcare system.**
During an epidemic, the estimated number of cases requiring medical attention could easily overwhelm our healthcare system. Healthcare workers (HCWs) are vital to combat the disease. They will be protected through infection control measures and personal protection practices. In addition, for severe epidemics of influenza, front-line HCWs working at the restructured hospitals, polyclinics and participating primary care clinics may be given anti-viral prophylaxis to protect them during the peak of the epidemic.

c. **Maintain essential services in Singapore and limit community disruptions.**
It is important to limit the epidemic's impact on essential services. Work units will be able to improve staff availability if there is an established business continuity plan to ensure that proper health control measures for both individuals and communities within the organisation are in place. In severe epidemics, certain segments of essential services will need added protection to maintain operational capacity with undisrupted services. In such situations, these work units may be provided with prophylaxis, if appropriate, e.g. anti-virals for influenza.

NATIONAL COMMAND AND CONTROL STRUCTURE

25. Singapore has in place a crisis management system designed to prepare for and respond to a wide variety of hazards. The Homefront Crisis Management System (HCMS) is the national framework for coordinating whole-of-government planning and response

[2] Primary care clinics broadly encompass community based GP clinics and paediatric clinics (ie non-hospital/medical centre based).

during a homefront crisis that has national significance and impact. The HCMS is led by a **Homefront Crisis Ministerial Commitee (HCMC)** which is chaired by the Minister for Home Affairs to provide strategic and political guidance during a crisis.

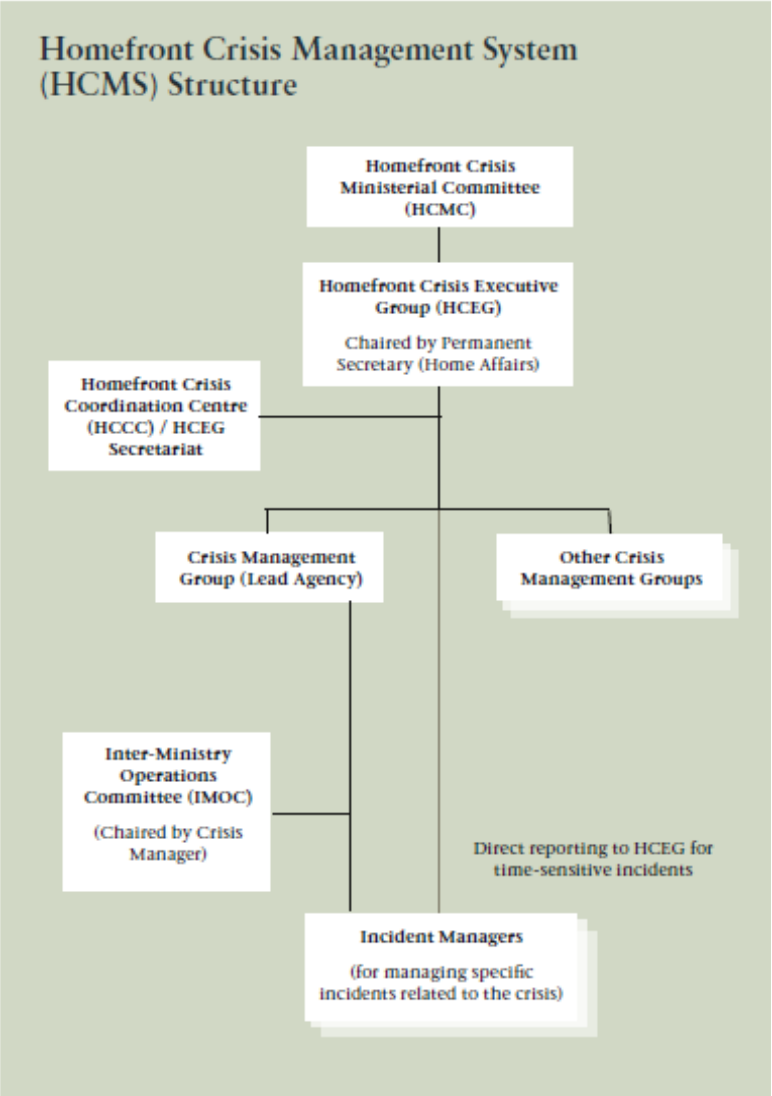
26. Supporting the HCMC is the Homefront Crisis Executive Group (HCEG) chaired by the Permanent Secretary for Home Affairs. The role of the HCEG is to ensure that a comprehensive and integrated multi-agency system is in place to anticipate threat and disaster scenarios, and to prepare contingency plans to avoid, pre-empt, prevent or ultimately deal with any peacetime emergency. The HCEG is supported by various Crisis Management Groups (CMG)s that deal with the operational issues under their charge. MOH chairs the Crisis Management Group (CMG) (Health).

27. **CMG (Health)**

a. **Immediate Response**. In response to a possible novel pathogen case or outbreak, medical surveillance will trigger an immediate response workflow. The CMG (Health) will provide timely situational updates to agencies and to coordinate the initial interagency preparation for **DORSCON (Disease Outbreak Response System Condition)** activation (see the following section). An assessment of the threat and impact to public health will be made, which will include a clinical assessment and the extent of disease spread. Medical directives on case management and infection control measures to undertake in healthcare institutions will be issued by MOH, where necessary. HCMC and/or HCEG may also be activated to coordinate the Whole of Government response to the threat.

b. **Daily Management**. Once the DORSCON is elevated to **Yellow** and beyond, CMG (Health) will be set up and a daily management cycle established to deal with the outbreak. This daily cycle will facilitate the management of daily developments and coordinate the medical and operational responses.

A schematic diagram of the Homefront Crisis Management System (HCMS) structure is given below.



Extracted from National Security Coordination Secretariat website

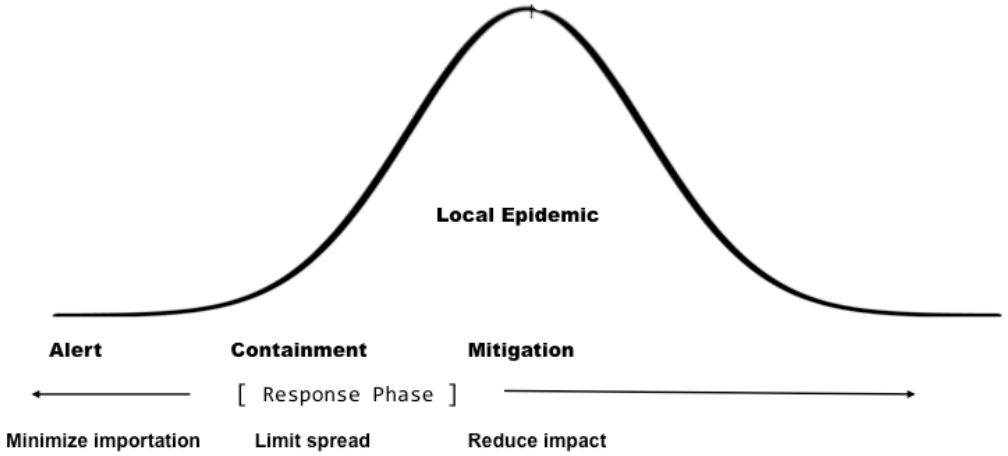
DISEASE OUTBREAK RESPONSE SYSTEM

OVERVIEW

28. The **DORSCON (Disease Outbreak Response System Condition)** is a generic framework that enables the Whole-Of-Government to respond immediately to any outbreak and serves as the nucleus to ramp up for a higher level of response during a pandemic.

29. The response to any outbreak is determined by the local **disease situation** in Singapore **AND** the **public health impact level**, which is a measure of overall severity based on risk assessment and denoted by four DORSCON levels: Green, Yellow, Orange and Red. This matrix approach provides for the flexibility to adopt responses as building blocks that can be tailored to each unique scenario.

30. There are three **possible disease response phases in Singapore** - Alert, Containment and Mitigation.



a. **ALERT**: The disease is mainly overseas and the response is to detect and minimise importation of disease. This requires border control measures and may require measures to try to **stop the spread from individual cases or resultant clusters if they are imported** into Singapore.

b. **CONTAINMENT:** The disease has arrived in Singapore and the primary response is to **stop or limit the spread of the disease** as much as possible. This requires extensive contact tracing and quarantine measures.

c. **MITIGATION:** The disease is spreading widely through the community, and measures to try to stop its spread are no longer effective. The response is to **reduce the overall impact** of the disease in the community. This requires an overall activation of business continuity plans, surge capacity for healthcare and essential services, and community-based public health measures.

31. The **scale of the response** for each of the phases is dependent on the overall public health impact of the disease, and represented by different DORSCON levels. The **DORSCON** framework comprises four levels: GREEN, YELLOW, ORANGE and RED, based on the likely public health impact on Singapore. **Assessment of the public health impact** will consider multiple factors such as disease characteristics (ability to cause serious disease (virulence) or spread in humans (transmissibility), availability of preventive interventions, travel connectivity of affected areas to Singapore (i.e. likelihood of importation), geographical spread overseas and in Singapore, and recommendations by international health authorities such as the World Health Organisation (WHO). Activation of the DORSCON levels will be based on MOH's recommendations and endorsed by HCEG and HCMC.

DORSCON Level	Public Health Impact
GREEN	Negligible to low
YELLOW	Low to moderate
ORANGE	Moderate to high
RED	High

32. The DORSCON framework contains a **public communications component** to convey the health impact to the public and to advise them on how to respond. Clear guidance to agencies to maintain operational readiness and undertake preparedness planning is also

provided. In order for the DORSCON framework to be relevant for mild and severe epidemics across the different phases, the definitions of the four DORSCON levels have been crafted to correspond to the public health impact of the disease. We have included scenarios that are applicable at each DORSCON level to highlight the possibilities and the need to allow for flexibility and adaptability in the actual response.

DEFINITION OF THE DORSCON LEVELS

33. **GREEN** - Presence of a disease that is assessed to have **negligible to low** public health impact. Possible scenarios include:

Scenario A: Novel disease **is reported overseas with no or limited person to person transmission.**

- Emphasis on **detecting and minimising importation** (i.e. **ALERT phase**), and if cases are imported, implementing measures to stop further spread (i.e. some CONTAINMENT is needed)**.**
- Examples include Avian influenza (H5N1) and Middle East Respiratory Syndrome (MERS) coronavirus.

Scenario B: Local spread of a novel disease that has **similar or lower virulence and transmissibility as seasonal influenza.**

- Disease is mild and self-limiting, even if it can spread easily from person-to-person.
  Emphasis on **reducing the overall impact on the community** (i.e. **MITIGATION phase**)

34. **YELLOW** - Disease is assessed to have **low to moderate** public health impact. Possible scenarios include:

Scenario A: Disease is largely overseas with high virulence and can spread from person to person. However, the disease situation appears to be controlled overseas.

- There is the risk of importation of the disease to Singapore resulting in local sporadic cases/clusters.
- Emphasis on **detecting and minimising importation (i.e. ALERT phase)**, and if cases are imported, implementing measures to stop further spread (i.e. some CONTAINMENT is needed).
- Examples include community clusters of avian influenza in another country, or imported cases or clusters in Singapore.

Scenario B: Disease spreads easily from person to person and causes generally mild illness, but can cause serious illness in vulnerable groups.

- Disease may be local or overseas but is expected to become widespread in Singapore.
- Emphasis on **reducing the overall impact on the community (i.e. MITIGATION phase)**
- Example includes the H1N1 influenza A (2009) epidemic in Singapore

Scenario C: Vaccine available

- Disease shows high virulence and high transmissibility but a vaccine is available. Cases may occur before vaccination program achieves full coverage or due to individual vaccine failures.

- Emphasis on **reducing overall impact on community through vaccination (i.e. MITIGATION phase).**

35. **ORANGE** – The disease is assessed to have **moderate to high** public health impact. Possible scenarios include:

Scenario A: Disease is of high virulence, can spread from person to person, and is spreading overseas.

- The risk of importation to Singapore is high.
- Emphasis on **detecting and minimising importation** (i.e. **ALERT phase**).
- Examples include a SARS-like virus with spread overseas.

Scenario B: Disease is of high virulence, can spread from person to person, and it is in Singapore but is controlled.

- Cases or clusters occur in Singapore.
- Emphasis on aggressively **trying to stop or limit further spread (i.e. CONTAINMENT phase)**.
- Example includes the Singapore SARS experience in 2003.
- The disease may spread more widely across Singapore, and the DORSCON level may remain in ORANGE or escalate to RED depending on the overall impact assessment. In such cases, selective measures to reduce community impact may be instituted in ORANGE.

36. **RED – Mitigation Phase** – The disease is of high virulence, is spreading widely from person to person in Singapore, and the disease is assessed to have **high** public health impact.

- Multiple clusters or widespread community transmission in Singapore
- Emphasis on **reducing the overall impact on the community through social distancing (i.e. MITIGATION phase)**
- Example is if SARS had spread widely in Singapore.

37. Components of pandemic response are outlined in subsequent sections. It should be noted that unless specified, measures for a particular response phase would be applicable to all relevant DORSCON levels. E.g. surveillance recommendations for an Alert Phase would apply regardless of whether we are in DORSCON Green, Yellow or Orange as long as an Alert Phase occurs. A diagram of the DORSCON levels and the phases of the local epidemic are shown below to depict possible scenarios.

	Response Phases		
	Alert	**Containment**	**Mitigation**
GREEN	✓ **Prevent importation**, if disease is mainly overseas (High virulence, no or very limited transmissibility)	✓ **Stop the spread** from imported case(s), if any	✓ **Reduce the impact through patient management** (Similar or lower virulence and transmissibility as seasonal influenza)
YELLOW	✓ **Prevent importation**, if disease is mainly overseas (High virulence but low	✓ **Stop the spread** from imported case(s), if any	✓ **Reduce the impact through vaccination or patient management** (Low virulence but high transmissibility)

	transmissibility)		
ORANGE High virulence and transmissibility	✓ **Prevent importation**, if disease is mainly overseas	✓ **Stop or limit the spread from** local cases/clusters	✓ **Selective mitigation measures** may be activated as necessary
RED High virulence and transmissibility			✓ **Reduce the impact through social distancing** to counter widespread transmission

COMPONENTS OF THE PANDEMIC RESPONSE

SURVEILLANCE

38. Surveillance requires internal and external monitoring for disease pathogens and activity. Early identification of novel pathogens through an integrated surveillance system is essential for pandemic detection and vaccine preparation.

39. An integrated national surveillance system is in place that can detect the first few cases or unusual clusters of disease in animals or humans and the timely identification of a novel pathogen. Comprehensive novel pathogen surveillance comprises the following main components: community surveillance, laboratory surveillance, hospital surveillance, disease notification, veterinary surveillance, and external surveillance.

a. **Community Surveillance.** Community-wide surveillance of acute respiratory infections (ARI) has been well established in Singapore. Weekly reports are compiled from the public-sector hospitals and polyclinics.

b. **Laboratory Surveillance.** Surveillance of influenza viruses and other acute respiratory infections is routinely performed by the National Public Health Laboratory on respiratory samples from hospitals and polyclinics.

c. **Hospital Surveillance.** Hospitals continue to support the post-SARS epidemic surveillance system. Patients fulfilling the surveillance criteria are reported to MOH.

d. **Disease Notification.** For novel agents, gazetting the disease under the Infectious Diseases Act may be necessary to mandate notification by doctors and laboratories.

e. **Veterinary Surveillance.** The Agri-Food and Veterinary Authority (AVA) carries out surveillance on poultry and other animals, based on the assumption that poultry and animal infection and deaths may precede human infection.

f. **External surveillance.** MOH performs continuous monitoring of infectious disease situations in the region and globally, via various sources, to identify external health risks and threats. Where incidents of concern emerge in a given country, clarification is directly sought through international contacts.

40. In the absence of novel diseases, the strategy is to maintain situational awareness through general surveillance and to monitor for new disease threats. Surveillance enables MOH to monitor the local and global disease situation and ensure an integrated surveillance system that is well prepared to detect the first case or unusual clusters in animals or humans. Routine **laboratory and veterinary surveillance** will strengthen information on emerging infections.

ALERT

41. Where a novel disease is present, **internal surveillance** will be enhanced by closely monitoring the local situation, stepping up surveillance of high-risk groups and enhancing

laboratory capabilities. MOH will also liaise with the WHO and affected country(s) for information on the disease and situation for effective **external surveillance**.

42. Depending on the risk assessment, surveillance may be further enhanced to include **hospital surveillance**, whereby healthcare institutions will report atypical pneumonias, review case definitions, report unusual health events, monitor hospital staff illness and report clusters of concern of acute respiratory illness. Hospital surveillance will also be important in scenarios where there is a risk of hospital clusters occurring as a result of inadvertent transmission within hospitals.

CONTAINMENT AND MITIGATION

43. **Wider community surveillance:** Besides maintaining internal, external and hospital surveillance described earlier, wider community surveillance will also be necessary when the disease becomes entrenched in Singapore. The aim is to monitor the disease situation at the national level for optimal allocation of resources for case management. Polyclinics will step up reporting for ARI / influenza-like illness (ILI) attendances from weekly to daily. As there is community transmission, acute respiratory illness clusters among healthcare staff and/or patients in healthcare facilities including nursing homes and step-down care facilities will be monitored closely and reported to MOH.

MANAGEMENT OF SUSPECT CASES

ALERT AND CONTAINMENT

44. **Referral of cases**: If screening of suspect cases is done centrally, clinics and step down care facilities will refer cases to TTSH Emergency Department for assessment and admission via 995, if necessary. Children under 16 years of age will be sent to KKH for assessment. MOH will inform the medical community if a dedicated ambulance service for transportation of potentially infectious cases to TTSH/ CDC is to be activated. Other hospitals can continue to manage suspect cases that present at their emergency departments without the need to transfer them to TTSH. Transfer to TTSH or another hospital is recommended only if clinically indicated, e.g. patient requires care in ICU isolation that is not available in certain hospitals. Paediatric and Obstetric services will be set up at TTSH/ CDC by KKH when necessary – These services will be activated by MOH.

45. **Triaging**: Hospitals will implement triaging of febrile patients at emergency departments so that suspect cases can be identified early. Such cases will be evaluated in designated rooms.

MITIGATION

46. **Outpatient management:** Polyclinics and Pandemic Preparedness Clinics (PPCs) will be activated to provide outpatient management. Influenza cases will be treated with anti-virals where clinically indicated. Vaccination will be offered if and when it becomes available.

47. **Referral:** Severe cases seen in primary care settings will be referred to restructured hospitals (RHs) for treatment. Both RHs and private hospitals will need to manage large numbers of pandemic as well as non-pandemic patients. Hospitals, polyclinics and PPCs will

segregate pandemic and non-pandemic cases to minimise transmission through close contact.

48. **Triaging**: Triage for pandemic patients at polyclinics/ primary care clinics, hospital specialist outpatient clinics, and hospital emergency departments should be implemented.

INFECTION CONTROL IN HEALTHCARE SETTINGS

49. Pandemic disease-infected HCWs, patients and visitors can spread infection within and outside healthcare facilities. Transmission risks are primarily from unprotected exposures to unrecognized cases in inpatient and outpatient settings. It can occur through respiratory droplets and close contact with infected patients, and through exposure during aerosol-generating procedures. The risk depends substantially on the type of activity and type of patient contact.

50. Strict adherence to appropriate infection control practices, including the use of appropriate PPE (personal protection equipment), good hand and respiratory hygiene, and environmental hygiene helps prevent transmission. Infection control requirements will differ according to the risk of infection among various clinical areas, and the epidemic phase. For example, emergency departments that deal with high-risk cases will require heightened infection control measures in contrast to healthcare workers in the primary care setting generally.

ALERT AND CONTAINMENT

51. Appropriate PPE[3] are recommended for HCWs when attending to all suspect and confirmed cases. In all other clinical areas, appropriate PPE is recommended based on the patient contact type, activity / procedure, and disease virulence / transmissibility.

52. The use of N95 masks is considered where there is anticipation of aerosolised generating procedures in the presence of exposure to high-risk pathogens.

MITIGATION

53. In all clinical areas, appropriate PPE is recommended based on the patient contact type, activity / procedure, and disease virulence / transmissibility.

VISITOR CONTROL AND TEMPERATURE SCREENING IN HOSPITALS

54. Visitor registration will be implemented at all hospitals as a best practice during peacetime. Routine temperature screening for hospital visitors is not necessary. Hospitals will periodically review the need to restrict hospital visitors and maintain a log of visitor contact details.

55. During a pandemic, more stringent visitor restriction in affected hospitals (including stopping of all visits) will be considered if necessary. Similarly, temperature screening and screening for acute respiratory symptoms will be carried out for visitors to selected or all clinical areas if necessary. In situations where there is widespread community transmission

[3] PPE may include masks, gloves, gowns, and eye protection.

and social distancing strategies are employed, a "No visitor" rule will be implemented in all hospitals.

ISOLATION AND DISCHARGE CRITERIA OF SUSPECT AND CONFIRMED CASES

56. All suspect and confirmed cases will be isolated, as far as operationally feasible. When the number of cases exceeds isolation capacity, cases will be cohorted.

57. Cases will be discharged when well or if deemed non-infectious. Quarantine orders can be served to discharged patients, if necessary to prevent further spread.

HANDLING OF DECEASED PERSONS

58. Guidelines on the handling of the deceased during pandemics are generally independent of DORSCON levels and are instead based on risk assessment of exposure and its consequences, characteristics of the infective agent, and the availability of appropriately trained personnel and adequately equipped facilities to handle the deceased.

59. There is a possibility of the disease spreading when persons handling the body come into contact with body fluids. Such persons include healthcare professionals, health attendants and porters and staff of funeral parlors. Precautions to be taken when handling all bodies of suspect and confirmed cases include:

- Wearing of gloves;
- Wearing of surgical masks (N95 masks may be recommended for certain infections, e.g. SARS, or in high-risk situations);
- Carrying out proper hand-washing after handling the body;
- Wearing of disposable gowns, if the risk of splashes is present;
- Minimising the number of persons handling the body; and
- Disposing used items and potentially contaminated articles in properly labelled biohazard bags.

MOH may issue additional guidelines for specific infectious diseases (e.g. SARS). For example, double-bagging may be required and there may be restrictions on embalming and holding of wakes.

60. Ritual washing of the deceased may be permitted depending on the nature of the organism (e.g. transmissibility, infectiveness, virulence and susceptibility to decontamination). The risk of exposure during ritual washing will be assessed by MOH and guidance will be provided during an actual pandemic.

61. Similarly, whether embalming will be permitted depends on the risk assessment of exposure to the infective agent during the activity. MOH may also restrict the embalmers who can carry out this task based on embalming facilities having the necessary biosafety safeguards and risk management systems in place. Embalming may be prohibited if the risk and consequences of exposure are severe. MOH will issue additional guidance on embalming during a pandemic.

BORDER CONTROL MEASURES

62. Measures implemented at the border checkpoints are our first line of defence against possible importation of pandemic case(s). To facilitate timely and effective responses for ramping up such defense measures, MOH will coordinate with the concerned key border control agencies (Civil Aviation Authority of Singapore, Immigration and Checkpoint Authority & Maritime Port Authority), following the activation of the Border Health Control Work Group by HCEG. The border control measures include inbound and outbound temperature screening, issue of Health Advisories and Health Advisory Notices (HANs), installing Health Advisory Posters and filling in of Health Declaration Cards (HDCs), and will be implemented based on the epidemic phase and DORSCON level.

63. The control measures will be based on the local epidemic phases but flexible in accordance with the changing circumstances. However, any timely initial assessment of an emerging disease would be based on incomplete and limited information; hence the measures taken would err on the side of caution with more intense efforts until such time when the disease profile becomes clearer.

64. Temperature screening may be activated at selected or all border checkpoints. Thermal scanners will be used to pick up potentially fever cases and persons will be screened by the medical personnel and managed accordingly. Depending on the situation, a dedicated ambulance service will ferry suspect cases to hospital for follow-up.

TEMPERATURE SCREENING IN INSTITUTIONS / BUILDINGS

65. **ALERT**: Temperature screening is not required.

66. **CONTAINMENT and MITIGATION**: Depending on the risks in the respective environments, temperature screening will be recommended to institutions in the community, including schools, government agencies and businesses.

CONTACT TRACING AND QUARANTINE

67. Contact tracing is the process of identification of people who have possibly been infected after exposure to cases with infectious diseases for the purpose of containing the spread of the disease. Following contact tracing, phone surveillance or quarantine may be necessary for persons (contacts) who are well, depending on the risk assessment.

68. Quarantine refers to the segregation of well persons who may have been exposed to an infectious agent, and may be infected but are not yet ill. The Infectious Diseases Act (IDA) gives MOH the authority to issue quarantine orders.

69. **ALERT and CONTAINMENT:** Contact tracing will be carried out to allow for active case detection and monitoring of close contacts, including phone surveillance if necessary.

70. Quarantine of close contacts will be carried out for effective containment of cases to limit the spread to the community. The duration of the quarantine will be determined based on the incubation period of the disease. Quarantine usually occurs in the home. However, if a person under quarantine is unable to be quarantined at his/her home, dedicated quarantine facilities will be made available. Contact tracing and quarantine will be sustained for as long as operationally feasible and if it continues to have an impact on reducing transmission.

71. **MITIGATION:** Contact tracing, phone surveillance and quarantine would be stopped, as such measures would no longer be effective.

SOCIAL DISTANCING

72. Social distancing aims to reduce the number of person-to-person contacts in order to slow the spread of infection. This reduces the surge on the medical care system. Social distancing is thus an important public health measure to reduce transmission until an effective vaccine is available.

73. Social distancing measures, such as cancellation of mass events, can be activated in **DORSCON Red**, to stem ongoing community transmission. Public health messaging will emphasize the need to avoid mass gathering. Business continuity plans should kick in to scale down operations and maintain essential services during such periods. Under certain circumstances, selective social distancing measures may be required in **Containment (DORSCON Orange) or even during the Mitigation phase of a milder pandemic (DORSCON Yellow)**, or to reduce spread in specific contexts.

74. School closure carries a high public signature and should be considered in the following scenarios where there is a need to safeguard wider community health:

- **DORSCON Orange:** Selective school closures may be implemented to break the chain of transmission of cases or clusters that are detected in schools.
- **DORSCON Red:** School closures will be implemented if necessary as part of the wider social distancing strategy to mitigate the outbreak.

MEDICAL TREATMENT

75. Medicines may be effective in the early treatment of some acute respiratory diseases with pandemic potential. For influenza, anti-virals are effective for both the prevention (prophylaxis) and early treatment if administered within 48 hours following the onset of illness. Their use can reduce the duration of symptoms and the likelihood of complications requiring hospitalisation. For example, the currently stockpiled anti-viral drug to be used for prophylaxis and treatment in the event of an influenza pandemic is either Oseltamivir or Zanamivir.

PANDEMIC VACCINE

76. In a pandemic, it is very likely that vaccines, if technologically feasible, will only be available after 4-6 months. In the initial stages, these will be in short supply. However, vaccination is the key strategy in response to an influenza pandemic.

77. Initially, when vaccines are in short supply, vaccination will be provided to priority groups, such as those at higher risk of disease-related complications and personnel providing essential services (e.g. healthcare workers). As vaccines become more readily available, vaccination will be expanded to the rest of the population.

COMMUNICATIONS

78. Members of the public will be guided by the DORSCON alert levels for the appropriate actions to be taken. As the severity and spread of the disease increase, the

public will be advised to take greater measures to keep themselves safe. The public are advised to refer to the MOH website for the latest situational update and appropriate measures at each DORSCON alert level as follows:

Colour	Green	Yellow	Orange	Red
Nature of disease	Disease is mild **OR** Disease is severe but does not spread easily from person to person (e.g. MERS, H7N9)	Disease is severe and spreads easily from person to person but is occurring outside Singapore. **OR** Disease is spreading in Singapore but is typically mild i.e. only slightly more severe than seasonal influenza. Could be severe in vulnerable groups. (e.g. H1N1 pandemic).	Disease is severe AND spreads easily from person to person, but disease has not spread widely in Singapore and is being contained (e.g. SARS experience in Singapore).	Disease is severe AND is spreading widely.
Impact on daily life	No disruption	Minimal disruption e.g. border screening measures, higher work and school absenteeism	Moderate disruption e.g. quarantine, temperature screening, visitor restrictions at hospitals.	Major disruption e.g. school closures, work from home orders, significant number of deaths.
Advice to public	Be socially responsible: if you are sick, stay home	Be socially responsible: if you are sick, stay home	Be socially responsible: if you are sick, stay home	Be socially responsible: if you are sick, stay home
	Maintain good personal hygiene	Maintain good personal hygiene	Maintain good personal hygiene	Maintain good personal hygiene
		Look out for health advisories	Look out for health advisories	Look out for health advisories
			Comply with control measures	Comply with control measures
				Practice social distancing: avoid crowded areas

INFECTION CONTROL IN NON-HEALTHCARE SETTINGS

79. *Guidelines for infection Control in Non-healthcare workplaces* can be found in **Annex D.** Where applicable, MOH will also issue supplementary guidance on infection control and PPE usage to non-healthcare workplaces during a pandemic.

CONCLUSION

80. This document outlines the general principles for responding to a pandemic of a novel or re-emerging respiratory disease under the DORSCON framework. While the timing of a pandemic cannot be predicted, this plan provides an overview of the components for response that will be considered. Given the possible variations in severity of a pandemic, the need for flexibility in the response plan to address different scenarios has been emphasized. There is a need to continue engaging and working with the public to raise the level of preparedness at the individual, community and national levels. Through our collective efforts, we will be ready to implement a robust and sustainable national response to a pandemic threat, should the situation calls for it.

LIST OF ADDITIONAL RESOURCES FOR PANDEMIC PLANNING

Local resources

- Ministry of Health (http://www.moh.gov.sg)
- Ministry of Home Affairs (http://www.mha.gov.sg)
- National Security Coordination Secretariat (http://www.nscs.gov.sg)
- SPRING Singapore (http://www.spring.gov.sg/Resources/Documents/Guidebook_Flu_Pandemics_Business_Continuity_Guide_Eng.pdf)

International resources

- World Health Organisation (http://www.who.int/influenza/preparedness/pandemic/)
- US Centers for Disease Control and Prevention (CDC) (http:// www.cdc.gov/flu/pandemic-resources)

ANNEX A

Influenza viruses

The minimum requirement for pandemic influenza has historically been associated with a major change or shift in the viral surface protein genes in influenza A viruses. Previous influenza pandemics are thought to have originated as swine reassortants, in which one or both human-adapted viral surface proteins were replaced by proteins from avian influenza virus strains. Current evidence of direct human infection with wholly avian influenza viruses suggest that reassortant events can take place directly in humans, without swine as intermediaries.

Avian Influenza

All subtypes of influenza viruses circulate in wild birds and occasionally result in zoonotic infection of humans. At the time of writing, known avian influenza viruses have not adapted well to humans, and the risk of sustained human-to-human transmission and community spread remains low. Nevertheless, the virus continues to persist in birds and often poultry and continues to evolve genetically by mutation, resulting in the possibility that the virus might eventually adapt to humans.

Human infection with H5N1 was first documented in a 1997 outbreak in Hong Kong, with 18 human cases including six deaths. Most human H5N1 infections can be linked to contact with infected poultry or association with exposure to a contaminated environment, but isolated instances of inefficient human-to-human transmission may have occurred.

Human infections with subgroups of H7 influenza viruses (H7N2, H7N3, and H7N7) had been reported in the Netherlands, Italy, Canada, United States of America, Mexico and the United Kingdom. Most infections occurred in association with poultry outbreaks and mainly resulted in conjunctivitis and mild upper respiratory symptoms, with the exception of one death in the Netherlands. Human infections with a new avian influenza A (H7N9) virus were reported in early 2013 in China. Most patients had severe respiratory illness and case fatality was more than 20%. Many reported contact with poultry or poultry-related environments.

Other variant influenza strains

In addition to the direct threat of avian influenza, the 2009 H1N1 pandemic highlighted the emergence of novel influenza strains through reassortment in swine. The strain that emerged in the 2009 pandemic was an avian-human-swine triple reassortment influenza A(H1N1) of classic swine lineage.

In 2010, an influenza A(H3N2) swine-origin triple assortment virus containing the matrix (M) gene from the A(H1N1)pdm09 virus was first identified in pigs in the U.S. Cases of human infection were detected in July 2011. The majority of the infections were associated with exposure to pigs at agricultural fairs, although limited human-to-human transmission had occurred. 16% of cases reported indirect contact with pigs suggesting environmental contamination as a transmission source.

Clinical Presentation

Uncomplicated influenza illness is characterized by the abrupt onset of constitutional and respiratory signs and symptoms (e.g. fever, myalgia, headache, malaise, non-productive cough, sore throat, and rhinitis). Among children, otitis media, nausea, and vomiting are also commonly reported with influenza illness. Influenza illness typically resolves after a limited number of days for the majority of persons, although cough and malaise can persist for more than 2 weeks. Influenza can exacerbate underlying medical conditions (e.g. pulmonary or cardiac disease), lead to primary viral or secondary bacterial pneumonia, or occur as a co-infection with other pathogens. Young children with influenza infection can have initial symptoms mimicking bacterial sepsis with high fevers, and some children hospitalized with influenza can have febrile seizures. Influenza infection has also been associated with encephalopathy, transverse myelitis, Reye syndrome, myositis, myocarditis, and pericarditis.

Infected persons with minimal symptoms may still shed the virus and be infectious. Primary infection in young children is usually symptomatic although up to 50% may be asymptomatic. Adults can remain infectious for 3 to 5 days, while young children can be infectious for up to 3 weeks. Individuals who are severely immuno-compromised may continue to spread the infection for more than 3 weeks.

Pre-existing antibodies against related influenza strains may be present if the pandemic strain is related to previous seasonal influenza strains (e.g. during the H1N1pdm2009). Such pre-existing antibodies may be partially protective, i.e. a higher infective inoculum is required with a lower likelihood of clinical illness.

Influenza Severity

In general, adults aged over 65 years, children younger than five years and persons with certain chronic medical conditions are at higher risk of influenza-associated hospitalization. Local data suggest that the estimated annual excess rate of hospitalization in Singapore due to pneumonia and influenza annually was 78.6 per 100,000 population for children aged 6 to 23 months, and 72.4 per 100,000 population for those aged 24 to 59 months[4]. Older adults typically account for $\geq$90% of influenza-associated deaths annually[5]. Estimated influenza-associated excess mortality rate in Singapore per 100,000 persons were 0.8 among persons aged 20-64 years and 46.9 among persons aged 65 years and older.[6]

[4] Unpublished data for 1996 to 2005 from MOH

[5] Thompson WW, Shay DK, Weintraub E, Brammer L, Cox N, Anderson LJ, et al. Mortality associated with influenza and respiratory syncytial virus in the United States. JAMA. 2003;289:179–86.

[6] Chow A, Ma S, Ling AE, Chew SK. Influenza-associated deaths in tropical Singapore. Emerg Infect Dis. 2006 Jan;12(1):114-21.

ANNEX B

Coronaviruses

Coronaviruses are RNA viruses that can cause respiratory tract or enteric infections in a variety of animals, including humans, livestock and pets. Coronaviruses primarily infect the upper respiratory and gastrointestinal tract of mammals and birds, and five different currently known strains infect humans. Most coronavirus infections in humans result in mild, self-limiting illness.

One commonly known human coronavirus, Severe Acute Respiratory Syndrome-associated Coronavirus (SARS-CoV) that causes SARS has a unique pathogenesis because it causes both upper and lower respiratory tract infections and can also cause gastroenteritis. The SARS outbreak in 2003 affected over 8,000 people across three continents with a case fatality ratio of about 10%, indicating the potential of an animal coronavirus to cross species and transmit from person to person causing severe illness.

For most cases, SARS began with a high fever (>38.0). Other symptoms included headache, a general feeling of discomfort and body aches, while some had mild respiratory symptoms e.g. cough. About 10 to 20 percent of patients had diarrhea although most patients developed pneumonia. SARS was fatal in about 10% of cases.

Similarly, the Middle East Respiratory Syndrome Coronavirus (MERS-CoV), which was first reported in Saudi Arabia in 2012, is a viral respiratory illness. Most people who were confirmed with MERS-CoV infection developed severe acute respiratory illness. They had symptoms of fever, cough and shortness of breath.

ANNEX C

Planning Assumptions

The following planning assumptions are provided to guide planners in developing their preparedness and response plans:

a. The first local human case is more likely to be imported from affected countries rather than developing from within Singapore through direct animal to human transmission.

b. The warning period will be relatively short should a novel pathogen emerge that is capable of efficient human transmission.

c. It may take several days to confirm that this is a new pandemic strain.

d. The disease could be present in Singapore through imported human cases within days to weeks after it emerges in another part of the world. It is unlikely that we will be able to prevent import of the disease. We could attempt to contain the spread of the disease in the community. If containment is not possible, the spread can be delayed.

e. The length of each local epidemic is assumed to be six weeks. The pandemic pathogen may continue to circulate at lower levels after the pandemic.

f. A second pandemic wave of another six weeks is possible, and may be more or less severe than the first wave.

g. There will not be any vaccine initially. The development of vaccine will take at least 4 to 6 months. When vaccines are eventually developed, the supply would be limited initially.

h. Pandemic preparedness and response measures will be guided by the severity of the pandemic.

ANNEX D

Guidelines for Infection Control in Non-Healthcare Workplaces (revised April 2014)

1. This document provides guidance on prevention and control practices that can be implemented in the workplace to limit the spread of severe respiratory infections which are transmitted via close contact and large respiratory droplets. These guidelines can be incorporated into the existing business continuity plans of companies for ease of operations in a public health emergency. However, please bear in mind that no two outbreaks are ever alike, and flexibility in response is important. **The Ministry of Health (MOH) will review the measures and update the current guidelines with directives and advisories, where appropriate, based on the specific transmission characteristics of the infectious disease.**

2. It is important for companies to note that the measures outlined here may be activated at any DORSCON alert levels in responding to a pandemic disease threat, depending on the public health impact. Therefore, specific measures should not be hardwired to any particular DORSCON alert levels.

I. BASIC PRECAUTIONS

3. All employees should be encouraged to practice good personal hygiene to minimise potential transmission of respiratory infections like influenza at the workplace at all times. Some of the actions and measures that employees can do include:

- Be aware of the symptoms of the disease and how it is transmitted.
- Maintain good personal hygiene:
    - Do not spit on the floor or ground
    - Wash hands
        - Regularly and thoroughly with soap and water
        - Before and after preparing food
        - After going to the toilet
        - Before and after eating
        - After blowing their nose
        - After coughing and sneezing
        - After removing personal protective equipment (PPE)
    - Sneezing and coughing into tissues which should be then be carefully disposed of.
- Be responsible for cleanliness of own workspace.

4. In addition, the following actions should be highlighted to staff for their compliance during a pandemic.

- Comply with health and travel advisories, company and staff directives issued (e.g. to monitor one's temperature, health)
- Practice social distancing measures at work as recommended by the workplace management. Where recommended, employees should also comply with social distancing measures outside the workplace (e.g. avoid crowded places and large gatherings and curtail social activities such as social visiting).

- Comply with further directions on use of PPE and other hygiene measures to avoid cross contamination, especially if employees are tasked to carry out public health measures, e.g. symptom/temperature screening and contact tracing.

II. ENVIRONMENTAL CLEANLINESS

5. Workplaces should maintain environmental cleanliness at all times to minimise transmission of infectious diseases which can be transmitted via close contact and respiratory droplets and through contaminated environmental surfaces, e.g. influenza. Infectious agents such as influenza viruses may live up to 2 days on contaminated non-porous, hard surfaces (depending on the humidity and temperature).

6. **General cleaning of Work Area**

(a) All office space, common facilities e.g. toilets, conference rooms, multi-purpose halls etc should be cleaned daily.
(b) Clean all surfaces, frequently touched surfaces and floors daily with a disinfectant, e.g. bleach (diluted to 1% concentration or 1000 ppm).
(c) Alcohol (e.g. isopropyl 70%, ethyl alcohol 60%) can be used to wipe down surfaces where use of bleach is not suitable e.g. metal.

During a Pandemic

7. As pandemic diseases have different public health impact and virulence, additional cleaning may be necessary to prevent transmission of **more severe pandemic diseases** (e.g. SARS and human cases of avian influenza) via contaminated environmental surfaces. Additional cleaning measures for certain areas should be carried out where a suspected or confirmed case has been in. For **milder pandemic diseases such as influenza A/H1N1**, general cleaning guidelines in para 6 would suffice for effective environmental cleaning.

8. **Additional cleaning guidelines for areas exposed to a suspected/confirmed case during a severe pandemic (i.e. disease of high virulence and public health impact, for example, SARS-like disease)**

(a) When a suspected case was in the premises, the management should seal (where possible) the areas where the person has been. Open the door and windows to the affected areas (if possible) and leave the areas undisturbed for at least 8 hours. Cleaning and disinfection should be carried out after the area has been aired. There is no need for airing and special cleaning of other areas. Routine cleaning of these other areas can be carried out without additional PPE than what is usually used.

(b) When cleaning areas where a suspected case has been, cleaning crews should:

i) Wear disposable gloves, disposable gowns and an N95 mask. Avoid touching the nose and mouth (goggles may help as it will prevent hands from touching eyes). Gloves should be removed and discarded if they become soiled or damaged and a new pair worn. All other disposable PPE should also be removed and discarded after cleaning activities are completed. Goggles, if used, should be disinfected according to manufacturer's instructions.

ii) Wash their hands with soap and water immediately after the PPE are removed and when cleaning is completed.

iii) Keep cleaning equipment to the minimum.
iv) Open window for ventilation.
v) Mop floor with bleach (1:10 dilution or diluted to 0.5% chlorine concentration or 5000 ppm).
vi) Wipe all frequently touched areas (e.g. doorknobs, armrests, seatbacks, tables, air/light controls, keyboards, switches etc) and lavatory surfaces with chemical disinfectants (use according to manufacturer's instructions) and allowed to air dry. Bleach solution can be used. Alcohol (e.g isopropyl 70% or ethyl alcohol 70%) can be used for surfaces where use of bleach is not suitable.
vii) Wipe down walls up to 3m in height as well as blinds with disinfectant.
viii) Remove curtains for washing.
ix) Disinfect cleaning equipment used in one room before using for other rooms.
x) Disinfect buckets with fresh disinfectant solution or rinse in hot water before filling.
xi) Rinse wiping cloths/mops in disinfectant several times or rinse thoroughly in hot water.
xii) Disinfectants should be applied to surfaces using a damp cloth. They should not be applied to surfaces using a spray pack, as coverage is uncertain and spraying may promote the production of aerosols. The creation of aerosols caused by splashing liquid during cleaning should be avoided. A steady sweeping motion should be used when cleaning either floors or horizontal surfaces to prevent the creation of aerosols or splashing. Cleaning methods that might -aerosolize infectious material, such as the use of compressed air, must not be used.
xiii) Avoid using the room for the following morning or afternoon sessions.

(c) Cleaning crews should be aware of the symptoms and should report to their occupational health service if they develop symptoms.

III. PERSONAL PROTECTIVE EQUIPMENT (PPE)

9. **During a pandemic**, use of **Personal Protective Equipment (PPE)** may be advisable in some situations, e.g. when handling employees who are ill or when carrying out symptom screening or temperature checks for employees or visitors**.** The following guides on the use of PPE (e.g. surgical masks, N95 masks, disposable gloves and gowns) should be observed.

10. When using masks,

(a) Masks are effective if worn according to instructions and properly fitted.

(b) In general, **surgical masks should be worn by employees who are in contact with individuals who are unwell or potentially unwell**. Surgical masks, when worn properly and coupled with other precautionary measures like hand-washing and avoiding close contact, can prevent droplet transmission of influenza and other acute respiratory infections. **Additional guidance on the use of N95 masks will be provided by MOH during a severe pandemic, where necessary in specific situations (e.g. symptom or temperature screening and contact tracing), if the risk of transmission warrants the use of N95 masks to protect individuals.** Users of N95 masks need to undergo a mask fit test (normally carried out by supplier) to ensure proper fit.

(c) Repeated adjusting of mask while wearing can be a cause of infection due to contamination of hands with droplets gathered on the mask.

(d) Mask should be discarded and changed if it becomes physically damaged.

(e) Users should be monitored for dizziness, difficulty in breathing and skin irritation.

(f) The mask should be disposed of together with other biohazard waste

(g) Avoid touching the nose and eyes which can be routes of infection.

- Discard all disposable items in a bag securely sealed and labeled.
- Hands should be washed with soap and water immediately after gloves are removed.

11. **Stockpiling of PPE for Pandemics**

Quantity

(a) **It** is recommended that agencies maintain 3 to 6 month stockpile. However, the actual quantity would depend on agencies' own estimation of the requirements for each staff as this is dependent on their operations. Mask numbers will depend on how people use them – e.g. general rule of thumb in a hospital, once a shift **and** change if soiled.

Type of PPE

(b) In general, most non-healthcare workers will be using surgical masks. This is especially true in pandemics of milder diseases where surgical masks would confer adequate protection.

(c) In specific situations where the pandemic disease is **severe** and/or additional barrier protection is required over a surgical mask (e.g. during SARS-like disease scenarios), MOH may advise the use of N95 masks as an added precaution for staff who may be coming into contact with potentially ill persons (e.g. frontline symptom/temperature screeners and contact tracers). Under these circumstances, the risk of transmission warrants the use of N95 masks for adequate protection of the staff. As N95 masks have to fit-tested, agencies are advised to stockpile a smaller quantity for the relevant staff who may be engaged in these higher-risk activities. Agencies should note that in most other situations, surgical masks (where appropriate) would be sufficient to protect staff within the confines of the agencies.

IV. SYMPTOM AND TEMPERATURE CHECKS FOR EMPLOYEES AND VISITORS DURING A PANDEMIC

12. Businesses may implement regular symptom or temperature checks for employees and visitors and monitor employees for symptoms (in line with advisories from MOH at that point in time). Such measures may be activated when there is a risk of community transmission of the virus to facilitate case detection and reduce the likelihood of disease spread in the workplace. However, such checks are meant to supplement, and not replace, individual monitoring and good personal hygiene.

13. **Key activities related to health monitoring for employees**

- Companies may need to provide employees with thermometers for the individual checks and may include supervisor’s verification of the temperature checks if needed.

- Employees who are unwell should be directed to seek medical help promptly. (Please refer to later section on *"Management of an Employee with Symptoms Suggestive of Acute Respiratory Infections"*).

- Employees should also be advised to screen themselves for symptoms before coming to work. Those who are sick should not come to work and comply with staff policy (e.g. mandatory sick leave)

14. **Key activities related to symptom or temperature screening for visitors**

- Symptom or temperature screening for visitors will likely be recommended for pandemic of diseases of high virulence and public health impact. For mild diseases (e.g. influenza A/H1N1), symptom screening may not be necessary for all settings.

- In general, employees carrying out symptom checks (including temperature screening) of visitors should don N95 masks. This should be combined with frequent hand washing, especially after touching bodily secretions and after removing gloves (if worn). Guidance on N95 mask usage will also be provided by MOH during a pandemic, if necessary.

- Record information of all visitors[7], including date and time of visit, name of visitor, IC number, telephone number and the location/meeting room he/she will be going to for contact tracing purpose[8].

- MOH will advise on the symptoms to be looked out for in visitors (e.g. fever, cough or runny nose). Temperatures of visitors should be checked and recorded as per MOH's advisory.

- Anyone with symptoms should not be allowed into the facility. They should also be asked to wear a surgical mask and advised to seek medical assessment/ treatment promptly.

- Disposable ear thermometer covers should be used, if using ear thermometers. Otherwise, it should be disinfected between use (e.g. use of disinfectant wipes). To further minimise body contact, workplaces can use thermal scanners.

V. Monitoring and quarantine of employees with travel history or contact with case during a Pandemic

15. Employees may have had contact with a confirmed case or have travelled to areas reporting cases of novel influenza or respiratory infections. In such instances, the following can be carried out:

- **Self-monitoring of symptoms.** Advise the employee to monitor his/her own health for any flu-like symptoms and to seek medical attention immediately if he/she feels unwell.
- **Voluntary home quarantine.** For a severe pandemic, organizations may elect to advise the employee not to report for work/ go on voluntary home quarantine for 1 incubation period/ 10 days (or period as advised by MOH). This may reduce the spread of disease if the employee subsequently develops symptoms, but has to be

[7] It also applies to contractors, suppliers and others.
[8] Contact tracing will be carried by the authorities as long as operationally feasible.

weighed with the impact on absenteeism caused by voluntary home quarantine as not all exposed individuals become ill. The organisation is to decide on the leave and cover arrangements.

- **In-house phone surveillance.** For a severe pandemic, companies may also check on employee's health status by phone during his/her absence from work. This will facilitate treatment if the employee becomes symptomatic.

16. If required, MOH will contact individuals directly if they have been identified as close contacts of confirmed cases and require **mandatory phone surveillance or quarantine**. Close contacts with unprotected exposure may be given post-exposure prophylaxis as advised by an attending physician. These public health measures are recommended based on MOH's risk assessment. In such instances, no further action will be required on part of the companies and in the workplaces, unless specified by MOH.

17. As the purpose of quarantine is to contain a disease so that transmission is halted, for diseases which are highly transmissible, such as influenza, quarantine may only be effective up to a certain point. MOH will cease home quarantine and phone surveillance measures when it is assessed to be no longer feasible or have an impact on community transmission. Other measures such as social distancing will then be emphasised. Measures such as quarantine and social distancing are also necessary only for pandemic diseases with high virulence and public health impact. As mentioned in para 15, for severe diseases, organisations may wish to continue to implement home quarantine (on a voluntary basis) and in-house phone surveillance to prevent the spread of disease in the workplace.

VI. Management of an Employee with Symptoms Suggestive of Acute Respiratory Infection during a Severe Pandemic (i.e. High Virulence and Public Health Impact)

18. During a severe pandemic, companies and organisations should put in place procedures to manage staff who become ill at work. The procedures should be implemented in line with advisories from MOH. Health advisory will be issued at the point in time on the symptoms of the disease, relevant contact and where applicable, travel history.

19. In the event supervisors or work managers observe or receive a report of an employee who is unwell, the unwell person should be:

- Provided with a surgical mask to wear in order to reduce the amount of droplets coughed into the air. Masks should be changed if they become wet, hard to breathe in, physically damaged or visibly soiled.
- Advised to cover his/her mouth and nose with tissues when coughing or sneezing.
- Isolated and moved to a room or area away from other people.
- Advised to use only the toilet facility designated for him/her (if possible).

20. In addition, the management should keep the number of employees attending to the ill person to a minimum. Staff attending to the ill person should wear, at a minimum, surgical masks or, if MOH has explicitly recommended during a pandemic, N95 masks[9] and disposable gloves.

21. The ill person should seek medical attention promptly. He/She should inform the doctor of relevant contact and/or travel history, if any. If necessary, the GP or polyclinic staff

[9] Please follow manufacturer's instructions on the proper use of N95 masks. N95 masks should be discarded after attending to each person suspected to have pandemic influenza.

will transfer the patient to a designated healthcare facility for further assessment/ admission as appropriate.

22. For emergency situations (e.g. person is unconscious or has difficulty breathing), the 995 emergency ambulance should be activated.

23. To facilitate contact tracing, if necessary, the management may decide to take down the names and contact details (IC number, address, telephone number) of all persons who have come into contact with the employee when he/she was unwell. If the ill employee is confirmed to have the disease, MOH officers will contact the organisation to trace all those who came into contact with him/her. Employees who need to be put on phone surveillance or be quarantined will be contacted and advised accordingly.

24. Cleaning of the areas the suspect case has been to have to be carried out. Please refer to the section on **Environmental Cleaning**.

VII. SOCIAL DISTANCING

25. The spread of respiratory infections is exacerbated by increased social contact, crowded places and large gatherings. To protect employees from being exposed to infectious persons, a strategy called social distancing can be employed to minimise contact with others during a **severe** pandemic. Companies and organisations can implement measures to **increase social distance at work,** should the need arises, in line with MOH's latest advisory. Any measure that achieves this would minimize transmission of the disease.

26. Examples of social distancing measures include:

(a) **Dividing staff into work teams.** Where office workflow permits, organisations can consider dividing their staff into work teams. Each team should, where possible, avoid contact with the other teams.

(b) **Telecommuting.** Similarly, organisations can consider the feasibility of telecommuting and allow their staff to work from home.

(c) **Others.**

- Avoid meeting people face-to-face. Use other means to carry out discussion, business.
- If people have to meet, advise staff to maintain a distance of at least 1 metre (or as advised by MOH) from visitors/ colleagues, if possible. Whenever possible, choose a larger venue or meeting room where is possible to maintain this distance.
- Introduce staggered lunch hour to reduce crowding of staff cafeterias.
- Use of systems where customers/clients can pre-order/ request information via phone, mail/fax and prepare requested items ready for fast pickup or delivery.
- Advise employees to avoid activities even outside the workplace where they may be exposed to infected persons e.g. avoid crowded places and large gatherings, and curtail social activities such as social visiting.

VIII. Annual Influenza Vaccination

27. Companies may wish to encourage their employees to have their annual influenza vaccination. While this does not protect them against pandemic influenza strains, the

seasonal influenza vaccination will still protect employees from circulating viruses and reduce the overall burden of disease.

Summary tables for response measures under the DORSCON matrix

Possible scenarios	Applicable response phases	Border Control	Public health measures						
			Temperature screening in institutions / buildings	Social distancing	School closures	Contact tracing	Phone surveillance or quarantine	Antivirals for influenza	Vaccination
GREEN - Negligible to low public health impact									
• **High virulence** • **No or limited H-H transmission** • **Disease mainly overseas**	Alert (with containment of imported cases)	Health Advisory Notices (HANs) (Posters, Cards)	No	No	No	Yes, if cases are imported	Consider to implement depending on risk	Treatment of case where necessary	No
• **Similar or lower virulence and transmissibility as seasonal flu**	Mitigation	No	Consider to implement if necessary			No	No		Vaccination for high risk groups, if available
YELLOW									
• **High virulence but low transmissibility** • **Disease mainly overseas**	Alert (with containment of imported cases)	HANs Health Declaration Cards (HDCs) and temperature screening of inbound passengers, if necessary	No	No	No	Yes, if cases are imported	Consider to implement depending on risk	Treatment of cases where necessary	Procure and offer vaccine when available
• **Local epidemic with low virulence but high transmissibility**	Mitigation	HANs	Consider to implement if necessary			No	No		
• **High virulence and transmissibility, but vaccine available**	Mitigation		No						Distribute vaccine to mitigate impact
ORANGE									
• **High virulence and transmissibility** • **Disease mainly overseas**	Alert	HANs HDCs and temperature screening of inbound passengers, if necessary	No	No	No	Yes, if cases are imported	Quarantine	Treatment of cases, consider limited prophylaxis of personnel providing essential services	Procure and offer vaccine when available
• **High virulence and transmissibility** • **Disease in Singapore**	Containment		Yes, depending on risk	Yes, depending on risk	Yes, selective closures if cases or clusters are detected in schools	Yes, as far as operationally feasible	Quarantine, as far as operationally feasible		
• **High virulence and transmissibility** • **More cases in Singapore**	Limited mitigation	HANs Temperature screening of all passengers. if necessary				No	No		
RED									
• **High virulence and transmissibility** • **Widespread transmission**	Mitigation	Temperature screening of all passengers, if necessary	Yes	Yes	Yes	No	No	Treatment of cases and prophylaxis of personnel providing essential services	Procure and offer vaccine when available