WHO Interim Protocol: Rapid operations to contain the initial emergence of pandemic influenza

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World Health Organization

Contents

Executive summary

Background and development of the protocol

The purpose of the rapid containment strategy is to help national authorities, with the assistance of WHO and international partners, to stop the development of pandemic influenza when it is initially detected and before the virus has been able to spread more widely. The strategy evolved from 1) recognition that the potential for widespread harm and social disruption from an influenza pandemic is considerable; 2) recognition, based in part on the experience with SARS, that mobilization of large and complicated public health operations is possible in the modern era; and 3) from mathematical modelling studies suggesting that containment of a pandemic might be possible in the initial stages if the initial outbreak of human cases is localized and antiviral prophylaxis, movement restrictions, and non-pharmaceutical interventions are implemented in the affected area within the first 3 weeks.

The *WHO interim protocol: Rapid operations to contain the initial emergence of pandemic influenza,* outlines a strategic approach to contain the initial appearance of pandemic influenza. It broadly lays out "what" should be done and to a lesser extent "how" a containment operation would be undertaken. It is expected that this general strategy would have to be tailored to meet specific conditions of the country in which the operation may be implemented.

The protocol builds on earlier versions and incorporates input from technical consultations of experts and WHO staff experienced in the areas of operational planning, outbreak response, logistics, epidemiology, laboratory diagnosis, infection control, ethics, social mobilization, and public and media communications. In addition, regional training workshops on rapid containment in 2006 and 2007 have helped to refine protocol concepts and operational aspects.

Outline of the strategy

Detection, investigation, and reporting of the first cases must happen quickly for rapid containment of a pandemic to be possible. National authorities and WHO would jointly assess all relevant technical, operational, and political factors to determine if 1) there is compelling evidence to suggest that a novel influenza virus has gained the ability to transmit easily enough from person to person to initiate and sustain community level outbreaks and, if so 2) are there any compelling reasons why a containment operation should be deferred. Ultimately, the decision to launch a containment operation lies with national authorities.

The basic containment strategy uses a geographically based approach in which antiviral medications and non-pharmaceutical measures are used in a defined area surrounding the initial cases (i.e. Containment Zone) to restrict the virus from spreading beyond the Containment Zone. Intensive surveillance for possible “break-through” cases would be done in a Buffer Zone surrounding the Containment Zone to evaluate whether the containment operation is succeeding.

The protocol describes the key activities in the Containment and Buffer Zones. Major emphasis within the Containment Zone will be placed on:

- use of antiviral drugs for treatment and prophylaxis
- movement restrictions in and out of the Containment Zone
- use of additional non-pharmaceutical interventions.

In both zones, emphasis will be placed on:

- surveillance and laboratory testing
- containment communications.

The WHO protocol should be used by countries as a foundation to build more detailed operational plans and procedures as well as by international groups that may have a substantial role in these operations. It will be updated and revised as new information becomes available and more detailed guidance and tools are developed.

Countries are strongly encouraged to develop and integrate containment planning into their national pandemic influenza preparedness plans. Table-top and other exercises can be used to test the response capabilities and operational plans and procedures necessary to mount a containment operation. Advanced planning can be used to strengthen fundamental capacities within countries.

I Background

Why was a pandemic influenza containment strategy developed?

The purpose of the rapid containment strategy is to help national authorities, with the assistance of WHO and international partners, to stop the development of pandemic influenza when it is initially detected and before the virus has been able to spread more widely. It is one of the five major strategic actions that form the basis of the *WHO strategic action plan for pandemic influenza* (*1*).

Early mathematical modelling studies supported the possibility that containment of a pandemic might be possible at the initial stages (*2*,*3*). However, these models were based on several demanding assumptions including 1) the emergence of a potential pandemic virus in a localized and geographically circumscribed area; 2) the rapid detection, investigation, and reporting of human cases signalling increased human transmission of the potential pandemic virus; 3) timely deployment of antiviral drugs and their administration to at least 80% of the population in the Containment Zone within approximately three weeks of detection of the initial cluster; and 4) measures to restrict the movement of people in and out of the affected area and use of other non-pharmaceutical interventions to minimize the mixing of infected and non-infected persons within the Containment Zone.

Stopping the development of an influenza pandemic may not be possible. For example, a new pandemic virus may appear simultaneously in several locations making containment operations unfeasible. Furthermore, it is anticipated that no single containment measure by itself will be sufficient to stop the spread of the virus and that no single measure can be applied successfully 100% of the time. Nonetheless, these combined measures applied together could stop further spread of a potential pandemic virus. This strategy is one of the few preventive options available to intervene early and possibly stop a pandemic of influenza.

Rapid containment of early pandemic influenza differs from rapid response to outbreaks of avian influenza

Rapid response = ROUTINE

- Early detection of human cases
- Initial field investigation
- Standard control measures
- Notification of national authorities and WHO

Rapid containment = EXTRAORDINARY

- Joint risk assessment by country and WHO
- Decision made by national authorities in consultation with WHO
- Large scale use of antivirals and non-pharmaceutical interventions

A key element of public health is responding to infectious disease outbreaks, including suspected avian influenza, by mounting 1) early detection and the initial field investigation of human cases; 2) implementation of immediate prevention and control measures to prevent further transmission; and 3) notification of national authorities who in turn notify WHO depending on the disease and the outbreak situation. Such rapid response activities can be considered a "routine" public health activity conducted on a frequent basis by local and national health authorities. WHO guidelines for conducting rapid response activities in the context of field investigations of suspect human cases of H5N1 have been published (*4*).

Rapid containment builds upon, but goes beyond, this typical initial rapid response. Once investigations suggest that a local outbreak may be the start of an influenza pandemic, a rapid containment operation must be considered. Rapid containment operations involve a group of activities distinct from rapid response and are intended to stop a potential pandemic of influenza from developing. Since the potential start of an influenza pandemic has immense global implications, and since a combined international and national response is anticipated, this situation should be considered as extraordinary. The rapid containment activities include 1) a joint risk assessment by national authorities and WHO as to whether a local outbreak may be the first indication of an emerging influenza pandemic; 2) a decision by national authorities, in consultation with WHO, to begin containment measures; and 3) application of both pharmaceutical and non-pharmaceutical interventions in potentially large populations to stop the spread of an emerging pandemic virus.

Rapid containment and its relation to the International Health Regulations (2005)

The purpose of the International Health Regulations (IHR (2005) is to prevent, protect against, control and provide a public health response to the international spread of a disease (*5*). Several of the key provisions of the IHR (2005) apply to, and support, a containment operation including:

- *Strengthening of core public health capacities*: The IHR promote development, strengthening and maintenance of surveillance and response capacity, which increase the likelihood that the first cluster of cases due to a pandemic virus is rapidly detected and investigated quickly.

- *Rapid notification and communications*: Following early detection, effective, transparent, and timely communications are critical pre-requisites for the launching of a time-sensitive containment operation. WHO should be notified if there is evidence of a new human influenza subtype with or without human-to-human transmission. The national health authority should also provide to WHO relevant information and biological materials in a timely and consistent manner.

- *Joint assessment*: Following notification to WHO, the IHR offer a framework for joint risk assessment.

Ethical considerations

All measures employed during a containment operation should adhere to ethical principles set within a framework of international human rights. Annex 1 summarizes the main areas of ethical concern during containment. Many of these issues are similar to those anticipated to arise during a pandemic. WHO is preparing a document on *Ethical considerations in developing a public health response to pandemic influenza* to provide additional information and guidance.

II Overview of the protocol

Purpose and scope

This protocol broadly lays out "what" should be done and to a lesser extent, "how" the containment operation would be undertaken. It is expected that the details of how to conduct such an operation must be adapted to local and national considerations and that the WHO protocol can serve as a foundation for more detailed operational planning.

Changes in this version of the protocol

This document replaces previous versions of the protocol. In brief, key changes include:

- more emphasis on rapid containment and less on rapid response which is covered in WHO guidelines published in 2007 (*4*)*;*
- an expanded discussion of the decision-making process;
- refinement of the containment strategy emphasizing the localized geographical approach and describing the key activities for Containment and Buffer Zones;
- a proposed approach for estimating the duration of a containment operation;
- new or updated annexes on ethical issues, non-pharmaceutical interventions, communications, and laboratory preparedness. Annexes on antiviral stockpile planning and preparedness issues are under revision and will be added in the near future.

The protocol will be updated and revised as new information becomes available and more detailed guidance and tools are developed.

III The decision to launch a containment operation

When to initiate containment:
Key considerations

- Novel influenza virus
- Influenza-like illness
- Sustained and efficient human-to-human transmission
- Limited spread of the novel virus
- Operational feasibility
- Decision by national government with international assistance as needed

The decision to launch a containment operation should take into account all available and relevant objective information assessed by highly qualified scientific experts. However, ultimately, this decision will require the assessment and balancing of numerous other factors. Since such an operation will have considerable implications internationally and for the country of concern, the assessment must be undertaken jointly by WHO and national authorities of the country in which the operation is proposed. A formal declaration of a public health emergency of international concern (PHEIC) does not have to be in place before a pandemic containment operation is implemented (*5*).

Factors to consider when deciding whether to launch a containment operation

In considering whether to launch a rapid containment operation several technical factors, some of which cannot be anticipated, should be taken into account. However, the need to weigh other critical factors including operational, logistical and political considerations, will also be necessary.

Technical factors

- *Virological*: Laboratory evidence of a novel virus will be critical. Certain aspects of such a virus, including whether it contains a mix of avian and human influenza virus genes or an increased number of mutations, may suggest newly advanced adaptation to humans.

- *Epidemiological*: Evidence of efficient and sustained human-to-human transmission (e.g. clustering of 5 or more cases closely related in time or space or two or more generations of transmission) is a second critical element. An epidemiological assessment that demonstrates sustained human-to-human transmission capable of supporting community level spread of the virus will strongly indicate the need to consider containment.

NOTE: The clinical severity of the first detected cases per se is not an important consideration for initiating or not initiating rapid containment. Early pandemic influenza cases or outbreaks may be "mild," with later cases and outbreaks becoming "severe". The severity of illness should therefore not be considered an important deciding factor, although severe cases are more likely to be detected than mild cases.

Operational, logistical, security and political factors

These types of factors (e.g. size of the cluster, time elapsed since the first cases became ill, geographical characteristics of the area such as accessibility and natural boundaries, operational readiness of the affected country, ability to ensure basic infrastructure and essential services such as food, water and sanitation, national authorities' willingness to decide to launch, lead, and manage the containment operation in consultation with WHO, general security situation, and international support to provide any necessary human, financial, technical, or logistical resources) are important to consider because they will determine the feasibility of initiating and maintaining a timely and effective containment operation.

Assessment and decision-making

Once the potential start of an influenza pandemic is suspected, national authorities should immediately notify WHO and begin discussions to jointly assess all relevant technical, operational, logistical, and political factors and other available information. WHO will additionally consult with external experts about the situation and provide input and relevant advice to national authorities. If the information is insufficient to make a decision, additional field assessment (with WHO and international support as needed) would be undertaken.

Although the joint discussions are expected to be critical to the assessment and decision-making process, national authorities will make the ultimate decision to launch a containment operation and be responsible for leading and managing the national activities related to the containment operation.

In the assessment process preceding the decision, there will be two critical and central questions to address.

- Is there compelling virological and epidemiological evidence to suggest that a novel influenza virus has gained the ability to transmit easily enough from person to person to initiate and sustain outbreaks, especially community level outbreaks?
- If so, are there any compelling reasons why a containment operation should be deferred?

If a decision is made to proceed with a containment operation, WHO will also request and coordinate assistance from international agencies and partners to support the containment operation. Such support could include personnel (e.g. epidemiologists, logisticians, laboratory staff, and communications and social mobilization experts), supplies (e.g. personal protective equipment (PPE) and antivirals), and other essential requirements.

Phase change decisions

Any potential changes in the pandemic phase will be decided separately by the WHO Director-General (*6*).

Conditions under which a rapid containment operation would not be initiated

A decision to initiate a rapid pandemic containment operation might be deferred for several reasons, including the following:

- a novel influenza A virus could not be confirmed;
- it was not operationally feasible, including for security reasons, to rapidly implement pharmaceutical and non-pharmaceutical interventions at a level considered minimally acceptable;
- national authorities decide against supporting a containment operation;
- evidence suggests that the novel influenza virus has already spread too far to make containment realistically feasible.

IV The containment strategy

Localized geographical containment

The basic containment strategy is to identify the initial cases (i.e. Index Cluster) as early as possible, while they are still limited to a localized area, and implement routine control measures. A geographically-defined Containment Zone would then be created around the cases where widespread antivirals and non-pharmaceutical interventions should be used.

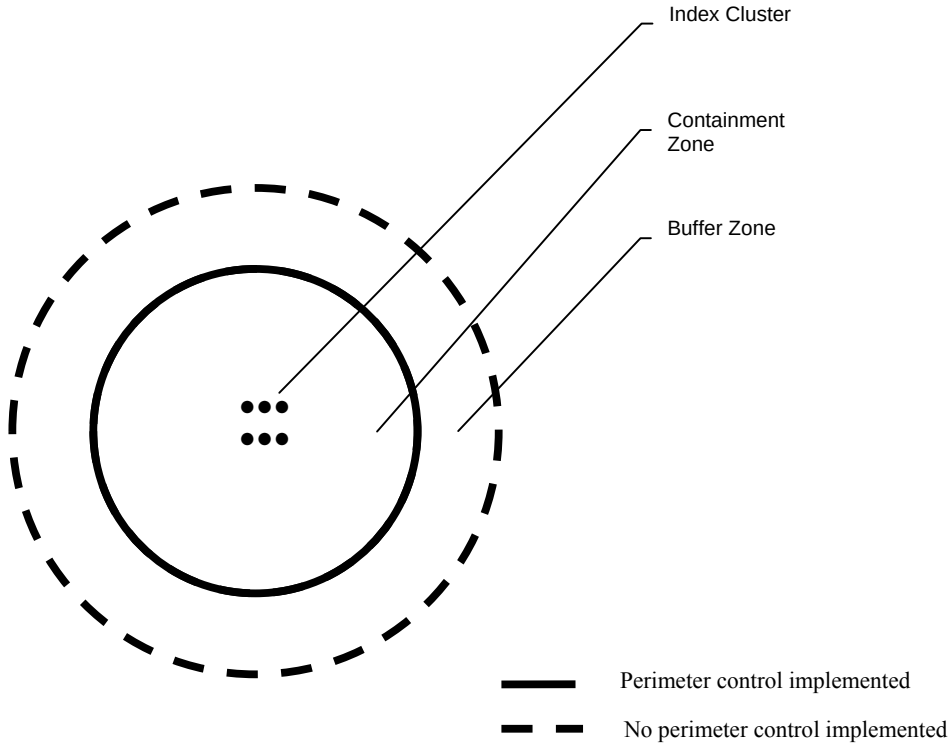
In addition to the Containment Zone, a Buffer Zone will be defined surrounding the Containment Zone. The Buffer Zone is an area where active and complete surveillance should be initiated to detect any possible cases of pandemic influenza (Figure 1).

The major activities of the containment strategy are summarized in Table 1 and detailed in Sections V and VI.

The Containment Zone should be the largest possible area that can be created and feasibly maintained and must be large enough to surround all known persons infected by pandemic influenza and as many of the people in frequent contact with them. While a circular Containment Zone is conceptually the simplest, the actual size and shape of the Containment Zone and the Buffer Zone is expected to be influenced by pragmatic considerations such as:

- known movements and geographical distribution of cases and contacts;
- important local or national administrative boundaries as well as important natural boundaries that may limit the movement of people;
- infrastructure and essential services (e.g. power, water, sanitation, food supply, communications) considerations that may substantially affect the safety and health of people within the Containment or Buffer Zones.

Fig 1. Containment and Buffer Zones for Rapid Containment



Containment Zone: The geographical area and population which contains the Index Cluster and where extensive interventions are applied
Buffer Zone: The geographical area and population around the Containment Zone where active and complete surveillance is applied.

Follow-up of persons who have moved outside the Containment Zone

It is possible that some persons may have left the Containment Zone either before or after it had been established. Such persons may have been exposed to the virus. As part of the containment operations, every reasonable effort should be made to identify such persons through media messages and other communication channels so that they can be given antiviral prophylaxis, quarantined, and carefully monitored. Persons who have an influenza-like illness when they are first evaluated or who develop a respiratory illness while in quarantine should be tested, isolated, given antiviral therapy, and their contacts traced.

If, despite such measures, human-to-human transmission is detected outside the Containment Zone and Buffer Zone, then WHO and national authorities would need to jointly re-assess the situation and decide whether to continue the containment operations.

Table 1. **Major activities undertaken during the rapid response investigation of the Index Cluster and in the Containment Zone and Buffer Zone during rapid containment**

	Isolation and treatment of cases	Contact tracing	Antiviral prophylaxis	Voluntary quarantine	Hand and respiratory hygiene	Social distancing measures	Perimeter control	Surveillance strategy
Index Cluster	✓	✓	Contacts of cases	Contacts of cases	✓	No	No	●Active case-finding ●All cases laboratory confirmed
Containment Zone	✓	Not routinely*	Everyone	Contacts of cases	✓	✓	✓	●Active and passive surveillance** ●Sample of cases laboratory confirmed**
Buffer Zone	✓	✓	Contacts of cases	Contacts of cases	✓	No	No	●Active and complete surveillance ●All cases laboratory confirmed

* All contacts of possible cases identified after antiviral prophylaxis in the Containment Zone is completed should be traced.

** Depending on the number of cases in the Containment Zone, both active and passive surveillance and a sampling schema to laboratory confirm cases may need to be used. After antiviral prophylaxis in the Containment Zone is completed, active and complete surveillance and laboratory confirmation of all cases should be done.

Rapid containment communications

Appropriate and timely public communication will underpin the success of all aspects of containment operations. Rapid containment communications, which includes the range of local, regional, national and international public communications activities required, will play a direct role in the containment effort, guiding and organizing the ways in which information and advice are disseminated to those inside and outside of the Containment and Buffer Zones. In addition, it will also guide the international coordination and collaboration required for a successful effort.

The objectives of an effective communications response during rapid containment are :

- to provide the best information available in a timely and easily understood fashion;
- to promote compliance with containment measures, identify barriers and facilitating factors to compliance, and adapt approaches to the local context through a policy of transparent communication.

- to identify and address inaccuracies, rumours and misperceptions quickly and work to reduce stigmatization of affected groups;
- to instil and maintain public confidence in the national and international public health system but at the same time convey realistic expectations about its ability to stop the initial emergence of a pandemic virus;
- to prepare for a possible pandemic if containment does not succeed.

These objectives follow from *The WHO Outbreak Communications Guidelines (7)* and WHO's *Communication-for-Behavioural-Impact (COMBI) (8)* approach. *The WHO Outbreak Communications Guidelines* articulate key principles which are essential to the effective management of communications during an outbreak. These include: building and maintaining trust, promoting transparency in decision-making and outbreak related information, acknowledging uncertainty and announcing potential problems early, and listening to -- and reflecting back to operation managers -- the concerns and information needs of key audiences. The WHO's COMBI approach to planning and managing health communications reinforces the critical need to understand the communication process from the communities' point of view. It requires a radical shift from thinking "outside in" (what messages we need to give) to "inside out" (what communities tell us about themselves, their needs and their wants) and how appropriately planned and implemented communication can facilitate a continuous and meaningful dialogue throughout the containment operation in order to:

- overcome fear, anxiety and helplessness;
- understand and address people's concerns and needs;
- address perceptions of risk as well as actual risks;
- promote survival and appropriate individual and collective action.

Rapid containment presents an enormous challenge for any public health authority, particularly in a context of existing economic and social disparities and inequalities. Planning for rapid containment communications should build on existing pandemic influenza communications plans as well as local experiences and knowledge of controlling previous outbreaks (Annex 2).

V Activities in the Containment Zone

Key activities

- Extensive antiviral prophylaxis and treatment
- Perimeter control
- Multiple non-pharmaceutical interventions
- Surveillance and laboratory testing
- Assessment of the novel virus

Pharmaceutical interventions

Antiviral prophylaxis strategy: All persons in the Containment Zone who are not ill with influenza would be given 20 days of antiviral prophylaxis. Although a 10-day course is the usual period for prophylaxis for seasonal influenza, extending prophylaxis to 20 days would allow for:

- simpler logistical considerations: since it may take several days to distribute antivirals throughout the Containment Zone, extending the period of prophylaxis will increase the duration of time during which most or all of the population in the Containment Zone is on prophylaxis or treatment at the same time;
- uncertainty about the characteristics of the emerging virus: the virus may have a longer incubation period than seasonal strains of influenza;
- packaging considerations: oseltamivir is packaged in blister packs of 10 tablets.

The duration of oseltamivir prophylaxis that has regulatory approval varies by country (ranging from 10 days to 6 weeks). The safety and efficacy of prophylaxis for seasonal influenza have been demonstrated in three controlled clinical trials lasting 6 weeks each in adults (*9,10*) and in two controlled studies of post-exposure use for 10 days, one of which included children aged 1–12 years (*11,12*). Very limited data are available for longer periods of prophylaxis in children at present, although uncontrolled data from a high-risk population of children indicated that the drug was adequately tolerated up to 8 weeks (*13*).

If new cases are detected in the Containment Zone after 20 days, it will be critical to assess their exposure to ill persons and receipt and compliance with antiviral prophylaxis. Decisions about additional prophylaxis will be dependent on the overall assessment of the situation.

Antiviral treatment strategy: Cases of influenza-like illness should be clinically managed using standard treatment regimens for seasonal influenza, including antivirals. Laboratory testing of all cases is preferable, but may not be possible if there are large numbers of persons with an influenza-like illness (see section *Laboratory testing and preparedness*). Persons whose illness was not laboratory confirmed should seek medical care if they develop another influenza-like illness during

the containment operation. Laboratory testing for influenza and other respiratory pathogens can help guide further treatment.

Antiviral stockpiles: WHO currently has an antiviral stockpile of 3 million treatment courses (i.e. 2 doses per day for 5 days) of oseltamivir donated by F. Hoffmann-La Roche Ltd reserved for a containment operation. In addition to the WHO global stockpile, available regional and national stockpiles of antivirals also could be used. The global stockpile can be used to replenish national stockpiles if they are used for rapid containment.

WHO would authorize F. Hoffmann-La Roche Ltd to deploy an agreed amount from the WHO global stockpile to the nearest international airport, where direct handover to the WHO Country Office will take place. National authorities should be ready to authorize any package type and composition, waiver liability, and assume responsibility for customs release and compliance with importation requirements.

More detailed information on stockpile planning and preparedness issues is under revision and will be annexed to this document in the near future. Annex 3 contains more information about antiviral prophylaxis including paediatric, consent, compliance, and adverse events issues.

Possible role for vaccine: If a vaccine is available against the newly identified pandemic virus, as is possible if the pandemic virus was H5N1, and if that stockpile is available to WHO for this purpose, then such vaccine should be used to supplement antiviral prophylaxis.

Containment Zone perimeter controls

The Containment Zone should include all known persons infected by the pandemic virus. Persons inside the Containment Zone, are therefore, most at risk of having influenza or to have been exposed to someone with influenza. Persons outside of the Containment Zone are less likely to have been infected or exposed. **It is critical that all non-essential movement of persons in and out of the Containment Zone is discouraged as much as possible.**

The boundaries of the Containment Zone should be made known to the local population. Legally-enforced restriction of movement along the entire boundary of the Containment Zone (i.e. *cordon sanitaire)* may not be possible or practical in most settings. However, there is some suggestion that antiviral prophylaxis and non-pharmaceutical measures may "compensate" for incomplete control of the perimeter (*2,3,14,15,16*). Several steps can be taken to reduce movement in and out of the Containment Zone.

- When feasible, physical reminders (such as signs) of the boundaries should be evident and clear.
- Antivirals and other measures can be incentives for persons to remain in the Containment Zone.
- Since some residents, as well as non-resident travellers and visitors, may wish to leave, clear entry and exit points should be established and communicated to the local population. Screening procedures should be put into place at these points to reduce spread of pandemic influenza outside the Containment Zone.

- If the Containment Zone encompasses major air, land, and sea transit points, it is possible that screening procedures could be used but the preferable alternative is to close that entry point.

Screening procedures should not be allowed to interfere unduly with the movement of goods and services (i.e. trade) across borders.

In brief, exit screening procedures would include:

- asking travellers if they have symptoms of influenza; have had close contact with someone with influenza; and received and took antiviral prophylaxis;
- performing a visual screen for signs of influenza;
- temperature measurement (e.g. thermal scanning or ear-temperature).

Persons who have no signs of illness and who passed the screen would be issued with a certificate indicating that the person went through screening procedures and left the Containment Zone under controlled conditions. Completion of the 20-day course of antiviral prophylaxis would still be necessary after leaving the Containment Zone. In addition, such persons should be provided with information about monitoring their health and what to do if they develop influenza (e.g. seek health care, provide information about travel to or residence in the Containment Zone).

Persons who failed the initial screen would have a more detailed secondary evaluation. Persons with signs or symptoms compatible with influenza or who had close contact with a person with influenza would not be permitted to travel out of the Containment Zone. Ill persons would be isolated and directed to appropriate medical care.

Travel into the Containment Zone should be restricted to essential services and supplies. Persons who do enter for these reasons should be provided antiviral prophylaxis.

Non-pharmaceutical interventions

It will be necessary to implement multiple non–pharmaceutical interventions (NPIs) (Annex 4) including:

- isolation of ill persons;
- voluntary quarantine of contacts;
- social distancing measures such as school closures and cancellation of mass gatherings;
- other measures to minimize person density (e.g. staggered work and market hours).

In addition, community-wide practice of hand and respiratory hygiene would be strongly encouraged (*17*).

The primary reason for all of these measures is to reduce the possibility that a non-infected person will come into contact with a person infected by and infectious with pandemic influenza. In the context of containment, isolation of persons with an

influenza-like illness and quarantine of their contacts should be implemented as quickly as possible, i.e. before laboratory test results may be available.

It is unlikely and unrealistic to expect that any single NPI can be comprehensively implemented with total compliance. However, it has been suggested that incomplete implementation of multiple measures may reduce transmission, especially since influenza is only moderately infectious (i.e. Reproductive number: Ro<2) (*14,18*).

Implementation of NPIs will require considerable advance planning and international support to alleviate the expected social, economic, and psychological impacts (Annex 5). National and local governments should be prepared to legally and operationally enforce NPIs as well as perimeter controls.

Surveillance

Surveillance in the Containment Zone is needed to identify suspect cases of pandemic influenza. This information will be critical to 1) laboratory confirm or exclude persons as cases of pandemic influenza; 2) monitor the evolution of the outbreak; 3) evaluate the effectiveness of the containment operation; and 4) help guide decisions to modify, continue or end the containment operation.

A surveillance system that actively seeks potential cases is strongly preferable to one that is passive. To achieve as complete ascertainment of cases as possible, surveillance should be instituted in hospitals (including patients and health-care workers), formal outpatient health care structures (e.g. physician practices, outpatient clinics, pharmacies, laboratories, and other pre-existing health networks) and informal community-based networks such as NGOs, traditional healers, telephone hotlines, radio networks or rumour registries. Death registries should be reviewed as well.

If the number of influenza-like illness cases becomes overwhelming, it may be necessary to use a combination of active and passive surveillance approaches. However, after antiviral prophylaxis in the Containment Zone has ended, active surveillance to achieve complete case ascertainment and laboratory testing will be necessary to detect and confirm any possible remaining cases.

Laboratory testing and preparedness

Laboratory testing of all suspect cases is preferable, but may not be possible if there are large numbers of persons with an influenza-like illness. As patient numbers increase, it may be necessary to develop a sampling schema. For example, every "n^{th}" hospitalized patient with suspect influenza could be tested with consideration for geographical, gender and age representativeness. Once antiviral prophylaxis in the Containment Zone has ended, laboratory confirmation of any possible cases will be required.

The potentially large number of persons reported with an influenza-like illness in the Containment Zone and the Buffer Zone will place unprecedented demands at global, regional and national laboratory levels. It is critical to develop a strategy that will ensure laboratory capacity at all levels necessary to support a containment operation. Development of such a strategy requires engagement with many stakeholders as not all elements of the strategy are under the laboratory's control.

Advance preparation to develop and maintain reliable and timely laboratory services at the country-level is critical -- beginning with laboratory testing of the Index Cluster of cases, during the containment operation and after antiviral prophylaxis has ended. This will allow WHO collaborating centres and other WHO reference laboratories to perform advanced molecular and genetic characterization studies of the emerging pandemic virus, assess its anti-viral susceptibility profile and produce urgently needed diagnostic reagents. Annex 6 outlines some of the most important preparatory steps for building, protecting and maintaining country-level laboratory operational capacity during rapid containment.

Management of contacts

Tracing of household and other close (face-to-face) contacts should be done as part of the initial investigation of the Index Cluster. However, after the containment operation is launched, contact tracing in the Containment Zone should be discontinued because pharmaceutical and non-pharmaceutical interventions will be implemented throughout the Containment Zone. Once widespread antiviral prophylaxis in the Containment Zone has ended, contacts of any suspect cases should be traced, placed in voluntary home quarantine and given antiviral prophylaxis while laboratory testing is pending for the possible case.

Assessment of key characteristics of the novel virus and disease patterns

The concentration of cases in the Containment Zone provides an important opportunity to determine critical epidemiological, clinical and virological characteristics of the emerging pandemic virus. Such information will help to manage the containment operation, or if containment is not successful, help mitigate the morbidity and mortality of a pandemic.

Priority features to document will include:

Population level

- Reproductive number (Ro)
- Intergeneration time

Patient level

- Clinical efficacy of antiviral agents for treatment and prophylaxis
- Vaccine effectiveness if vaccine is used
- Disease severity including case-fatality rates, hospitalization rates, duration of hospitalization
- Spectrum of disease
- Incubation period
- Risk factors for infection

Virus

- Resistance of the emerging virus to antiviral agents

VI Activities in the Buffer Zone

Key activities

- Active and complete surveillance with laboratory testing of all suspect cases
- Isolation and treatment of suspect cases
- Antiviral prophylaxis and quarantine of contacts of suspect cases

Surveillance and laboratory testing

The purpose of the Buffer Zone is to conduct surveillance in a well defined area where new cases of pandemic influenza are likely to appear first if the containment operation is not effective. This information will be critical for decisions about whether to modify, continue or end the containment operation. For example, cases detected in the Buffer Zone soon after the start of the containment operation and close to the border of the Containment Zone may indicate that the initial demarcation of the Containment Zone was too small and needs to be extended.

Active surveillance to achieve complete ascertainment of all possible cases in the Buffer Zone is essential to assess if the containment measures in the Containment Zone are working. Laboratory confirmation of all suspect cases in the Buffer Zone must be done.

Management of suspect cases and contacts

Persons who develop an influenza-like illness in the Buffer Zone should be isolated pending the outcome of laboratory testing. Depending on the clinical severity of illness, such persons should be isolated at home or be admitted to a hospital. Early treatment with antivirals should be initiated before the result of laboratory testing for the emerging virus.

Household and other close (face-to-face) contacts of ill persons should be traced, placed in voluntary home quarantine and given antiviral prophylaxis while laboratory testing is pending for the possible case.

Perimeter controls and non-pharmaceutical interventions

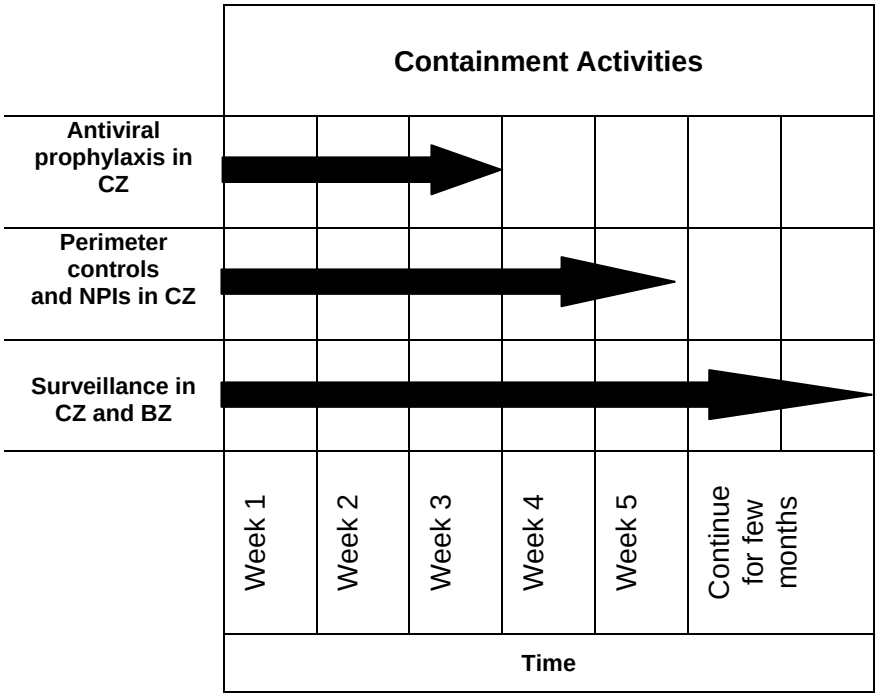
Persons in the Buffer Zone would be restricted from entering the Containment Zone as described previously. However, there would be no restrictions on transit out of the Buffer Zone. Other NPIs, apart from the management of suspect cases and their contacts, would not be implemented.

VII Duration of the containment operation

The duration of the containment operation will depend to a large extent on how quickly, comprehensively and effectively the pharmaceutical and non-pharmaceutical measures were implemented after early recognition of the Index Cluster of cases. For planning purposes a minimum of 4–5 weeks for the containment operation may be required (Figure 2).

- Administration of antiviral prophylaxis for a total of 20 days in the Containment Zone.
- Continuation of NPIs in the Containment Zone for an additional 7–14 days (i.e. 1–2 estimated incubation periods) after completion of antiviral prophylaxis.
- Continued maintenance of the Containment Zone perimeter will be essential until the containment operation is formally ended.
- If containment is successful, enhanced surveillance should be maintained in the Containment and Buffer Zones and probably extended beyond these geographical areas for at least a few months after the containment operation has formally ended.

Fig 2. Timeline of Containment Activities



CZ= Containment Zone; BZ = Buffer Zone

The timeframes depicted are provided for illustration purposes only. During an actual rapid containment operation it is likely that adjustments would be necessary.

VIII Conclusion

Deployment of a containment operation will require extraordinary international advance planning on the part of WHO and countries worldwide. Countries are encouraged to develop and integrate containment planning into their national pandemic influenza preparedness plans (*19*). In addition, table-top and other exercises can test the response capabilities and operational plans and procedures necessary to mount a containment operation. Such planning can strengthen fundamental capacities within countries. These capacities can be adapted to address other emerging infectious disease threats.

It is highly unlikely that any single country, no matter how well prepared and resourced, will be able to undertake containment without assistance from the global community. Preventing the emergence of a fully transmissible pandemic virus will require a global response characterized by unprecedented international coordination and resolute focus to provide the necessary human, financial, technical, and logistical resources.

Previous global public health responses such as the one to SARS point to the necessity for a clear organizational structure at global and national levels with well-defined roles, responsibilities, chains of communication and the authority to implement the measures detailed in a containment plan (Annex 7). A containment operation will require government officials, policy-makers, health-care and public health professionals at international, regional, and national levels as well as community leaders, and the public to work together in a well-defined manner.

During a containment operation real time data will be required to guide decisions on whether to continue, stop or modify the containment measures. Surveillance data on the number and location (i.e. in the Containment Zone, Buffer Zone, or elsewhere) of cases and case-fatality rates over time; virological data such as the antiviral susceptibility of the virus; as well as information about general compliance with taking antivirals, movement restrictions and NPIs and the ability to meet basic infrastructure needs are just some of the data that will be needed. Real time modelling may also help estimate the behaviour of the virus, predict its spread, and determine effectiveness of containment measures.

Ultimately, national authorities and WHO will need to jointly assess all available information on an ongoing basis to determine if changes in strategy are required.

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Annex 1. Ethical issues during rapid containment

Basic ethical principles for public health measures

- There must be a demonstrable health threat to the community to justify the instituted interventions.
- Reasonable and effective means should be applied to combat a public health threat.
- There should be a reasonable balance between the public good to be achieved and the degree of burden on the individual.
- Benefits and burdens should be distributed fairly.
- Transparency is essential to create and maintain public trust and accountability.
- Governments and institutions have reciprocal obligations to individuals or countries that contribute to public health efforts.
- Human rights documents, particularly the Siracusa principles[1], provide the framework for ethically and legally sound public health activities.
- Personal information should be kept confidential and secure to the extent possible.

Critical ethical issues for rapid containment

1. Pharmaceutical measures, treatment and care

- During the rapid containment operation antivirals will be available to everyone who requires them for prophylaxis or treatment. However, other types of medical care, such as hospitalization in an intensive care unit or mechanically-assisted ventilation, may be in short supply. Planning at the country-level should include how patients would be prioritized when access to treatment and care is limited.
- Before receiving antivirals for prophylaxis or treatment, individuals should give informed consent, based on complete information about potential benefits and risks, and be informed that they have the right to refuse. Special issues arise for use during pregnancy and in infants (see also Annex 3).

2. Obligations of and to health-care workers

Health-care workers and other responders will have moral, professional or legal obligations to work during the containment operation. In turn, national authorities and employers have reciprocal obligations to support and protect workers to reduce their risk of infection during rapid containment by:

- Establishing the nature and scope of workers' duties during containment and seeking worker input during this process.
- Reducing occupational risks to the extent possible by providing 1) information on how workers can protect themselves, 2) personal protective equipment, 3)

[1] The Siracusa principles state that any limitations on human rights must be in accordance with the law; based on a legitimate objective; strictly necessary in a democratic society; the least restrictive and intrusive means available; and not arbitrary, unreasonable, or discriminatory. Siracusa Principles on the Limitation and Derogation of Provisions in the International Covenant on Civil and Political Rights, Annex, UN Doc E/CN.4/1984/4 (1984).

antiviral prophylaxis, 4) medical care and treatment when needed and 5) psychosocial support.

- Developing comprehensive benefit systems to provide medical, social, and if necessary, death benefits to workers and their families if workers become infected as a result of workplace exposures during rapid containment.

3. International cooperation

While national authorities would make the ultimate decision to launch a containment operation and be responsible for leading and managing national activities, international cooperation and coordination will be essential. The principles of solidarity, international law, the International Health Regulations (2005), and national interest oblige countries to join efforts in stopping the spread of an emerging pandemic. When international assistance is provided, care should be taken to:

- Ensure that it is provided in a manner that is technically sound, sensitive to local social and cultural circumstances, and in line with the containment strategy agreed to by the country and WHO.
- Ensure that the affected persons are treated equitably, regardless of factors like ethnic and national origin, religious beliefs, political views, or a person's legal status in the country.

4. Non-pharmaceutical interventions

Non-pharmaceutical interventions must balance the interests of the national and international community with those of affected individuals. Respecting the rights of individuals is not only an intrinsic ethical duty, but it will also enhance compliance with containment measures. To address these concerns national authorities should:

- Review existing public health laws to ensure that they provide adequate legal authority and procedures for non-pharmaceutical measures that would be used during containment, including isolation, quarantine or social distancing measures such as closure of schools and public places.
- With community input, develop strategies for communicating with and mobilizing the public in a way that is culturally and linguistically appropriate.
- Ensure that measures are put into place to minimize adverse economic, social, emotional, and health effects for individuals and communities.
- Ensure that isolation of ill persons and quarantine of contacts is voluntary to the extent possible; mandatory measures should only be instituted as a last resort when voluntary measures cannot reasonably be expected to succeed and the failure to institute mandatory measures is likely to have a substantial impact on public health.
- Ensure safe, habitable, and humane conditions of confinement, including the provision of basic necessities such as food, water, shelter, and access to care.
- As part of perimeter controls, obtain informed consent from travellers for screening, prophylaxis, and treatment.
- Provide access to a fair legal process for persons who believe that non-pharmaceutical interventions have violated their rights.

Annex 2. Rapid containment communications

1.1 Planning assumptions

Planning for rapid containment communications should be consistent with several planning assumptions, including:

- National authorities will lead public communications associated with the domestic containment operation and will establish a national communications coordination mechanism among relevant ministries, departments and support agencies.
- WHO will lead on global aspects of the containment effort, and in addition to its own direct public communications role, will establish a communications coordination mechanism among national authorities, international agencies and partners.
- To ensure consistency between public communications and other elements of the containment effort, communications specialists must be fully integrated within the broader rapid containment decision making and risk management activities.
- Rapid containment communications will be a separate function which strategically manages both internal and external information requirements and coordinates the work of official spokespersons, media relations, media monitoring, information dissemination, rumour monitoring, and community relations and outreach.
- Communications strategies for rapid containment operations will be based on knowledge of local communities, built on existing infra-structures, and address preparedness, response and recovery phases.
- Rapid containment will be a global high profile media story and information demand from the public, partners and the media is likely to far exceed normal dissemination capacity, especially in its early stages.

1.2 Public communication characteristics of rapid containment

Planning for public communications should take into account that while many aspects will be similar to routine outbreaks and build from existing public communications systems and approaches, rapid containment will pose unique challenges:

- Uncertainty and anxiety will make the maintenance of trust and ongoing confidence in authorities challenging.
- Many critical questions (e.g. case-fatality rate, reproductive number, effectiveness of antivirals) will not be known for weeks and this delay will magnify anxiety and provide opportunities for speculation.
- Information about the outbreak is likely to be incomplete, evolving and, at times, wrong.
- Extreme time pressures will require that national authorities, together with other partner organizations, rapidly provide as much information as possible to minimize the likelihood of misinformation, uninformed speculation and rumour.

- It will be necessary to simultaneously address multiple audiences inside and outside of the affected geographical area to ensure that:
  - affected populations have the information they need to minimize risk;
  - public communications reinforce the international collaboration and cooperation required for containment;
  - economic disruption and stigmatization are minimized.

1.3 Planning recommendations

Rapid containment communications planning should be integrated as a key element of the broader pandemic influenza public communications planning. The core elements that should be addressed are outlined below.

1.3.1 Mechanisms should be in place to ensure the different elements of rapid containment communications (e.g. international media relations and direct community outreach) work closely together to ensure consistent and complimentary messaging.

1.3.2 Domestic, regional, and international public communications networks should be engaged to better coordinate public communications activities among partners. Where such networks do not exist, at a minimum, standard operating procedures for the sharing of information between stakeholders should be developed and any existing plans and protocols should be shared.

1.3.3 Information on rapid containment (its role, activities and limitations) should be included as part of any pandemic influenza readiness information campaigns.

1.3.4 Adaptable key messages linked to the key elements of a rapid containment operation should be developed in advance, and if possible, be pre-tested to minimize the time required to disseminate clear and useful information.

- Messages should be simple, short and may be pre-packaged around likely key events.
- Messages should promote risk reduction behaviours and should be sensitive to the effect being sought in affected populations (e.g. promoting survival, collective action and vigilance, rather than fear).
- Useful message formats include household checklists and frequently asked questions that address monitoring symptoms and when to seek help; antiviral medications - what they are and how to take them as well as potential side effects; what to expect if hospitalized; the importance of recovered patients and their role in helping to minimize potential stigma.
- Key audiences for rapid containment communications materials include clinics, hospitals, schools, places of work, religious institutions and civil society groups.
- Communications vehicles should be broad and designed to reach diverse audiences. Options could include traditional media as well as direct public service announcements, web based communications, text messaging, telephone hotlines and other mechanisms based on the communications situation assessment (see 1.3.6).

1.3.5 Planning should include the allocation of dedicated communication resources responsible for real-time tracking of rumours and misinformation as well as information gaps or misunderstandings. Additionally, there should be an agreed upon procedure through which this intelligence is fed back into other response components.

1.3.6 A public communications situation assessment should be done to help design and implement effective rapid containment communications. This should include an appraisal of:

- The behavioural environment
  - Which audiences (e.g. all households, care-givers, businesses); what should they be doing (e.g. risk reduction behaviours); where (e.g. geographical area); when (e.g. when should they start risk reduction behaviours and for how long); why (e.g. rationale for interventions and consequences of non-compliance).
- The programme environment
  - Social, cultural, economic, demographic and political factors that could influence household and community decision-making and action.
  - Social networks, groups and organizations that could support dissemination of information, promote risk reduction behaviours and surveillance strategies.
  - Financial and human resources required to carry out activities.

1.3.7 Community outreach and liaison activities should include specific mechanisms to:

- Engage decision-makers inside and outside the Containment and Buffer Zones so they have access to timely, accurate information and can establish community dialogue.
- Effectively engage with the local media in providing appropriate information as well as developing forums such as local phone-ins, to understand and address people's concerns.
- Coordinate the work of local support agencies such as grassroots organizations, advocacy groups and religious institutions to ensure communities' basic needs are met.
- Ensure that information is provided in appropriate languages and through appropriate channels.

1.3.8 Simulation exercises of the public communications demands of rapid containment, even activities as simple as guided discussions among representatives of organizations who would be involved in a containment operation, should be part of the preparation process.

1.3.9 Containment communications planning should also include human resource planning to ensure a quick mobilization of required staff resources from organizations not directly involved in the containment response.

Annex 3. Antiviral prophylaxis issues

Paediatric administration

Recommended prophylaxis dosages of oseltamivir for children (Table 1) vary by the weight of the child. Practical considerations related to administration of oseltamivir in children include the need for extemporaneous preparation[1] if the commercially manufactured Oral Suspension is not available. Constituted suspension must be kept under refrigeration at 2–8 °C and should not be frozen.

Table 1. Oseltamivir weight-adjusted doses in children 1 year of age or older[2]

Body weight	Recommended dosage
≤ 15 kg	30 mg
>15 kg to 23 kg	45 mg
>23 kg to 40 kg	60 mg
> 40 kg	75 mg

Informed and voluntary consent

Prior to receiving antivirals for prophylaxis or treatment, individuals should give informed consent based on complete information about potential benefits and risks and be told that they have the right to refuse. National authorities will need to decide how to best provide information about contraindications and possible adverse events.

Antiviral drugs have not been approved for use during pregnancy, in breastfeeding women or in infants younger than one year of age as there are limited or no clinical studies to assess their safety or efficacy in these populations. Because the effects of influenza antiviral drugs in these groups are not known, they should be used only if the expected benefit outweighs the potential risk. Pregnant and nursing women and parents of infants younger than 1 year of age should be provided with this information and given appropriate counselling.

[1] See the manufacturer's web site at http://www.tamiflu.com/hcp/dosing/extprep.aspx (accessed August 2007) for further information

[2] For details, see *WHO rapid advice guidelines on pharmacological management of humans infected with avian influenza A(H5N1) virus*. Geneva, World Health Organization, 2006. (http://www.who.int/csr/disease/avian_influenza/guidelines/pharmamanagement/en/index.html, accessed August 2007).

Monitoring

A system to monitor compliance with antiviral prophylaxis and any associated adverse events needs to be developed and implemented in the Containment Zone.

Possible approaches include telephone surveys or household visits by a monitoring team. The frequency of telephone or face-to-face contact will depend on resources but should be at least once weekly and preferably more often. Depending on resources and operational issues, this monitoring could be incorporated into a larger scheme that assesses other essential household parameters (e.g. availability of food and water) or delivers necessary supplies to households. The monitoring system will depend on a number of considerations such as 1) the size of the population in the Containment Zone, 2) how antivirals are distributed (e.g. entire course distributed at a single visit to a household versus daily visits to provide antivirals and directly observe drug ingestion versus distribution at clinics or other facilities on a one-time or daily basis) and 3) other logistical considerations.

Compliance

Compliance with prophylaxis regimens is necessary to achieve the maximum benefits at the individual and population-levels. In the Containment Zone it will be critical to determine if new cases represent poor compliance with prophylaxis. If compliance was good, antiviral resistance should be evaluated as a possible explanation.

Adverse events

A system to monitor adverse events should be set-up in advance of drug distribution and publicized. A passive reporting system (e.g. provision of a hotline number) is a minimal standard. Over-sampling pregnant women, children and persons with underlying medical conditions should be done if possible.

All people reporting adverse events should be given advice on management of the event. National authorities should examine their responsibility for liability in their respective public health and legal systems should severe adverse events occur.

Annex 4. Non-pharmaceutical interventions

Community-wide hygiene measures

Promotion and adherence to basic hygiene measures should begin before rapid containment and continue through a pandemic. The most important are frequent hand washing and covering coughs and sneezes.[1,2]

Isolation of ill persons

Isolation is the separation and restriction of movement or activities of ill persons to prevent disease transmission to persons who are not ill. The public should be informed about the most common symptoms of the emerging pandemic virus so that ill persons are isolated quickly. Isolation in a hospital or other healthcare facility is preferable. However, this may not be feasible if a large number of persons are ill. Persons who have milder illness may need to be isolated and cared for at home or in specially designated sites such as schools or community centres. Telephone hotlines or home visits by medical staff or trained community workers may be helpful to advise if ill persons should stay home or seek formal medical care.

Specific infection control measures can help protect healthy persons such as health-care workers and other care givers from becoming ill and prevent the environment from being contaminated. WHO has recently produced new infection control guidance on *Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care*.[1] These guidelines include detailed recommendations for health-care facilities and general guidance for home care settings. The public will need to be told how to safely care for ill persons at home (e.g. minimize the number of caretakers which will minimize the exposure of family members, cover mouth and nose with masks or other materials when in close contact with the ill person). During a containment operation, more specific infection control advice may be developed as new information about the emerging virus becomes available.

Voluntary quarantine of exposed persons

Quarantine is the separation and restriction of movement or activities of persons who are not ill but have been exposed to an infectious agent to prevent further transmission of disease. It can be applied at the individual, group or community level using individual homes or designated facilities.

Experience during the SARS outbreak suggests that quarantine, applied on a voluntary basis, may be as effective as enforced quarantine. However, for voluntary quarantine to

[1] *Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care. WHO Interim Guidelines*. Geneva, World Health Organization, 2007 (WHO/CDS/EPR/2007.6) (http://www.who.int/csr/resources/publications/WHO_CD_EPR_2007_6/en/index.html, accessed August 2007).

[2] *WHO/UNICEF Informal discussion on behavioural interventions for the next influenza pandemic, 12-14 December 2006, Bangkok. Summary and recommendations*.
(http://www.unicef.org/avianflu/files/WHO_UNICEF_API_Mtg_Bangkok_Dec_06.pdf)

succeed, the public will need to understand when, where, and how it would operate and be provided with essential services to allow them to stay at home.

Quarantine must include health monitoring, medical care and other essential services:

- Contacts should be informed about what they can do to reduce the chance that they will become infected, the common signs and symptoms of influenza and how to monitor themselves for influenza.
- Contacts should be told how to report an influenza-like illness to health authorities and receive further instructions about medical care. Depending on the severity of illness, contacts who become ill may be isolated at home or at a health-care facility.
- Ideally, as resources permits, health authorities should visit or make telephone contact daily to check and record contacts' health status, including compliance with antiviral prophylaxis. In remote and inaccessible areas, community focal points could be identified and trained to monitor contacts.

Social distancing

In addition to isolation and quarantine, other "social distancing" measures should be implemented. The goal of these measures is to reduce the number of people that are in close contact which in turn should reduce the risk of becoming infected with influenza.

Examples of social distancing measures include:

- closing schools in combination with other measures to prevent children from gathering in large groups in places other than schools;
- cancellation of mass gatherings and public events;
- closing workplaces or having non-essential workers stay at home;
- staggering work hours or access to market places;
- minimizing use of public transportation.

Annex 5. Checklist for non-pharmaceutical intervention planning[1]

General

- ☐ Ensure that local and national authorities have a clear understanding of the legal basis for non-pharmaceutical interventions (NPIs) such as perimeter controls and quarantine.
- ☐ Establish links with key ministries such as defence, education, transportation, health, commerce, and other partners such as police, acute and primary care providers, businesses and marketplaces, schools, religious leaders, utilities, UN agencies.
- ☐ Develop exercises and drills to test feasibility and logistics of implementing NPIs.
- ☐ Develop communication strategies for the public to explain the role of NPIs in stopping an emerging pandemic, how the community would be supported during a containment operation and encourage compliance.

Community hygiene measures

- ☐ Strengthen general knowledge on personal, hand and respiratory hygiene.
- ☐ Ensure that advice about reducing the risk of transmission of influenza is easily available to the public, for instance on an official influenza web site.

Isolation and quarantine

- ☐ Evaluate surge capacity of hospitals and other health-care facilities to provide medical care and isolation of seriously ill persons (for additional details see *WHO checklist for influenza pandemic preparedness planning)*, including adequate staffing levels.
- ☐ Identify community facilities with adequate basic infrastructure (e.g. electricity, ventilation, waste and sewage disposal) that could be used for isolation or quarantine of persons who would not have access to home isolation (e.g. travellers, the homeless).
- ☐ Develop plans for equipping and staffing such facilities.
- ☐ Develop education and training materials for the community about the necessity of home isolation for persons who are not seriously ill and what is needed to provide care at home (for additional details see *Infection prevention and control*

[1] Adapted in part from *WHO checklist for influenza pandemic preparedness planning.* Geneva, World Health Organization, 2005 (http://www.who.int/csr/resources/publications/influenza/WHO_CDS_CSR_GIP_2005_4/en/index.html, accessed May 2007)

of epidemic- and pandemic-prone acute respiratory diseases in health care. WHO Interim Guidelines).[1]

- ☐ Develop informational materials about how to provide basic care at home, indicators of disease progression that require immediate medical evaluation, and instructions on where to seek medical care.
- ☐ Evaluate supplies of personal protective equipment (PPE) and availability of training and instructions about correct indications and use of PPE in health care, community and home isolation settings.
- ☐ Ensure that essential services and supplies for persons who are isolated or quarantined (e.g. food and water, medicine, transportation for medical services if needed, psycho-social support) can be provided (for additional details see *WHO checklist for influenza pandemic preparedness planning*).
- ☐ Establish hotlines or other methods of communication for persons in home isolation and quarantine.
- ☐ Establish procedures for monitoring compliance with voluntary quarantine.

Social-distancing measures

- ☐ Work with the ministry of education to develop a plan for closing schools and universities during rapid containment and preventing children and students from re-grouping in other venues.
- ☐ Ensure that the necessary laws and procedures are in place to restrict movement in and out of a Containment Zone, cancel mass gatherings, close businesses and public buildings and modify use of transportation as needed.

Perimeter controls

- ☐ Identify personnel (e.g. transportation, public health, military) who will be trained to perform exit screening.
- ☐ Identify necessary screening equipment (e.g. thermometers, thermal screens).
- ☐ Plan for necessary PPE for screeners.
- ☐ Identify areas for temporary isolation and quarantine of ill or exposed persons.
- ☐ Identify health-care facilities to transport ill persons.
- ☐ Work with managers of seaport and airports to develop detailed plans.
- ☐ Conduct practice exercises at ports of entry.

[1] *Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care. WHO Interim Guidelines*. Geneva, World Health Organization, 2007 (WHO/CDS/EPR/2007.6) (http://www.who.int/csr/resources/publications/WHO_CD_EPR_2007_6/en/index.html, accessed August 2007).

Annex 6. Laboratory preparedness for rapid containment

The success of rapid containment depends to a large extent on adequate laboratory capacity and preparedness at global, regional and national levels. The emergence of a novel influenza virus may be suspected on the basis of epidemiological clues such as efficient and sustained human-to-human transmission and an influenza-like illness. However, only laboratory diagnosis and advanced molecular characterization can confirm if the cause is a novel influenza virus and will be required to assess its pandemic risk.

Delays in reporting and ambiguous or incorrect laboratory results can compromise the chances that the containment strategy will be successful. Timely, clear and accurate laboratory reporting can also help avoid unnecessary public panic and social disruption. Laboratory results inform public health officials and the general public whether, where and how an influenza virus of pandemic potential is circulating and monitors the effectiveness of the containment operation.

Countries should develop, implement and test operational protocols and procedures for laboratory biosafety and biosecurity, specimen collection, storage, transport, testing and reporting mechanisms. WHO guidelines should be reviewed to assist in preparing country-specific guidelines for field and free-standing laboratories.[1,2,3]

The following checklist highlights some of the critical preparatory steps to build, protect and maintain country-level laboratory operational capacity during rapid containment.

[1] *Collecting, preserving and shipping specimens for the diagnosis of avian influenza A(H5N1) infection: Guide for field operations.* Geneva, World Health Organization, 2006 (http://www.who.int/csr/resources/publications/surveillance/MainTextEPR_ARO_2006_1.pdf, accessed June 2007).

[2] *Laboratory biosafety manual.Third edition.* Geneva, World Health Organization, 2006 (http://www.who.int/csr/resources/publications/biosafety/WHO_CDS_CSR_LYO_2004_11/en/, accessed June 2007).

[3] *Biorisk management: Laboratory biosecurity guidance*. Geneva, World Health Organization, 2006. (http://www.who.int/csr/resources/publications/biosafety/WHO_CDS_EPR_2006_6/en/, accessed June 2007).

Country preparedness checklist for laboratories

Identification of laboratories

- ☐ Identify which laboratories can perform reliable diagnostic testing for novel strains of influenza and other respiratory viruses and record contact information for each laboratory (i.e. names, telephone numbers, and addresses).
- ☐ Identify which laboratories can perform confirmatory testing for novel strains of influenza and record contact information for each laboratory.
- ☐ Develop a coordinated national surge capacity laboratory testing plan to triage, process and test large numbers of specimens.
- ☐ Liaise with reference laboratories (e.g. WHO reference laboratories, WHO collaborating centres) and record contact information for each laboratory. Maintain continuous operational links through communication and specimen shipping.

Field response teams

- ☐ Establish national team(s) ready to be deployed either in-country or to assist another country (i.e. team members should have valid and current passports, appropriate vaccinations, and current CVs) for rapid collection and safe transport of specimens; capacity to perform rapid on-site testing during a containment operation is desirable.
- ☐ Ensure that laboratory response team personnel have sufficient experience and training in influenza diagnostics, safe specimen handling and dangerous goods packaging and shipping.

Sample collection

- ☐ Identify sites where specimens would likely be collected (e.g. hospitals and other health-care facilities and assess if personal protective equipment (PPE) and sampling equipment (e.g. swabs, viral transport media, packaging material) are available. If supplies are not available, determine how to get them to the sites.
- ☐ Provide the rapid containment protocol to collection sites as well as training on sample collection, aliquoting, storage and transport.
- ☐ Identify in advance how specimens will be transported from the collection site to the appropriate laboratory.
- ☐ Develop a consistent and systematic method to label specimens and link them to patient clinical and epidemiological data.

Specimen testing and reporting

- ☐ Ensure that validated and up-to-date laboratory protocols are in place; reagents, other durable materials and PPE are in stock; equipment is in good operational condition; storage capacity at (-70^{o} C) is adequate and a data management system is available.

- ☐ Identify additional skilled personnel who could be recruited to assist with testing the high volume of specimens.
- ☐ Determine which staff are qualified to interpret and report results.
- ☐ Develop a plan in advance for reporting test results (i.e. how and by whom laboratory results will be reported to the collection site, patient, national authorities and other relevant partners) and what level of detail will be provided (e.g. "positive" or "negative," strain type, antigenic or genetic characterization).

Specimen shipping

- ☐ Identify in advance how specimens will be transported from anywhere in the country to a hub, preferably the national influenza laboratory.
- ☐ Ensure that a mechanism is in place to rapidly ship specimens to a WHO reference laboratory and/or a WHO collaborating centre.
- ☐ Identify a dangerous goods shipper and record contact information.
- ☐ Ensure that shipping protocols are in place including templates for import and export permits and waivers and appropriate package labels.
- ☐ Obtain appropriate packaging material (e.g. boxes, containers, ice packs, dry ice and liquid nitrogen with containers).

Specimen storage

- ☐ Develop a plan and capacity for storing as many representative specimens, isolates and nucleic acid extracts as possible for research during and after the containment operation, such as evaluating the molecular evolution of the virus, testing susceptibility to antivirals, and improving diagnostic testing.

Annex 7. Major roles and responsibilities for countries and WHO

Countries

Pre-containment

- Integrate planning for rapid containment into national pandemic influenza preparedness plans.
- Establish a national command, control and coordination structure, including agreements with ministerial offices and national emergency response agencies.
- Identify and modify legislative, administrative and other impediments to implementation of containment measures.
- Assess current emergency response, surveillance, clinical, laboratory, epidemiological, logistics, public health, communication and social mobilization expertise to identify gaps in capacities.
- Build or strengthen core capacities for epidemic alert and emergency response in accordance with the requirements of the International Health Regulations (2005).
- Test critical operational aspects of the national rapid containment plan (e.g. rapid transport of specimens to national and WHO reference laboratories; receipt and delivery of antivirals from the WHO global stockpile).
- Train public health staff, clinicians, primary health care providers, traditional healers and primary care providers in other sectors (e.g. animal health) to detect and rapidly respond to clusters of respiratory illness and to report these clusters to the appropriate public health authorities.
- Build or strengthen the health-care infrastructure to manage potentially large numbers of ill persons during rapid containment including identification and training of supplementary health-care workers (e.g. workers who have retired or changed professions).
- Develop a strategy for rapid containment communications.
- Identify multidisciplinary teams for training in all aspects of rapid containment.
- Develop and implement a strategy for the identification and protection of critical infrastructure including health care facilities, security, water and sanitation, public utilities (e.g. electricity, gas), the food supply, and operational and public communications technology
- Identify and train technical partners and non-governmental organizations that may be required to support containment operations. These could include providers of emergency services, water and sanitation, transport and catering.

During containment

- Direct and coordinate all containment activities with support as needed from WHO and other partners.
- Activate the national command and control structure
- Mobilize necessary national human, material, and logistics resources
- Establish the boundaries of the Containment and Buffer Zones in consultation with WHO.

- Request, distribute and provide security for antivirals from the WHO global stockpile and/or other stockpiles.
- Monitor antiviral drug compliance, effectiveness, and safety.
- Initiate perimeter controls for the Containment Zone.
- Implement and monitor compliance with and effectiveness of non-pharmaceutical measures.
- Intensify surveillance to detect new cases.
- Collect specimens for testing in national, regional or international laboratories using protocols and procedures developed in collaboration with WHO.
- Implement the rapid containment communications plan to provide information to the media and general public.
- Collect, analyze, and report data to assess the effectiveness of the containment operation in collaboration with WHO.
- Ensure public safety as well as the security of international staff assisting with containment activities.

WHO

Pre-containment

- Establish a command, control and co-ordination structure within the WHO system (Headquarters, Regions, and Country offices).
- Assist countries as requested with the development of national rapid containment plans.
- Support countries in developing/strengthening core capacities for detection, response and containment of possible influenza pandemic including efforts to build upon other existing WHO surveillance and response networks.
- Provide a WHO 24-hour on-call system for reporting cases and requesting antivirals from the global stockpile.
- Develop and implement rapid containment training for countries.
- Recruit and train international response teams for rapid deployment during containment; teams can be drawn from partner institutions in the GOARN and other international sources.
- Strengthen mechanisms for transport of clinical specimens for rapid testing and confirmation at a WHO reference laboratory.
- Develop protocols and procedures for collection, aliquoting, labelling, and testing of specimens.
- Develop a plan for coordination at national, regional, and international levels for laboratory surge capacity.
- Develop and implement the necessary arrangements and operational plans for the rapid deployment of the WHO global stockpile of antiviral drugs.
- Develop infection control guidance for health care facilities and home settings.

- Develop information, education and communication materials for distribution in the Containment and Buffer Zones to encourage behavioural changes.
- Continue to develop and refine the rapid containment strategy, operational plans and tools.

During containment

- Consult with the affected country and external experts on the decision to launch a containment operation.
- Provide ongoing advice to the affected country on the management of the containment operation.
- Activate the WHO command and control structure.
- Coordinate the international response to rapid containment, including the deployment of international field teams as requested.
- Mobilize and dispatch resources (e.g. antivirals, other materials and logistics) for rapid containment.
- Mobilize financial resources for the rapid containment operation.
- Activate the rapid containment communications plan to disseminate information and advice via media, promote compliance with containment measures, identify barriers to compliance and develop new approaches.
- Issue a daily global situation report and other web postings to keep public health partners and the general public informed.
- Develop or refine guidance, in consultation with the affected country and external experts as needed, on surveillance, laboratory testing, clinical management, use of non-pharmaceutical and pharmaceutical control measures, and advice for travellers.

Glossary

Active surveillance: conducting surveillance by regularly contacting (e.g. telephone, personal visit) facilities (e.g. hospital, laboratory) or individuals (e.g. physician, pharmacist) or regularly reviewing data bases (e.g. death records) to identify cases of influenza.

Antivirals: type of drug or medication used specifically to treat an infection caused by a virus such as influenza.

Buffer Zone: a geographically-defined area and population surrounding the Containment Zone where active and complete surveillance is done to detect all possible cases of pandemic influenza.

Case-fatality rate: proportion of cases which result in death within a specified period of time.

Containment Zone: a geographically-defined area and population that surrounds the Index Cluster of persons with pandemic influenza and where widespread pharmaceutical and non-pharmaceutical measures would be used to stop further spread of the pandemic virus.

Cordon sanitaire (a sanitary barrier): widespread, legally enforced quarantine of a community or other large population group.

Hand hygiene: includes hand washing with soap and water and the use of alcohol-based hand rubs to prevent possible self-inoculation of mucous membranes and transfer of microorganisms to the environment or other patients by contaminated hands. See *Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care. WHO Interim Guidelines.* Geneva, World Health Organization, 2007 (http://www.who.int/csr/resources/publications/WHO_CD_EPR_2007_6/en/index.html, accessed August 2007)for more details.

Index Cluster: the first detected cases of pandemic influenza.

Intergeneration time: average number of days for an infected person to transmit an infectious agent to another person.

International Health Regulations (2005): The International Health Regulations are an international legal instrument which is legally binding on all WHO Member States. The purpose and scope of the IHR(2005) are to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade. See *Revision of the International Health Regulations.* Geneva, World Health Organization, 2005 (http://www.who.int/csr/ihr/IHRWHA58_3-en.pdf) for more details.

Isolation: separation of ill persons from others to prevent the spread of infection; can occur in a health-care facility, home or other site.

Laboratory biosafety: containment principles, technologies and practices that are implemented to prevent unintentional exposure to pathogens and toxins, or their accidental release. See *Laboratory Biosafety Manual.Third Edition*. Geneva, World Health Organization, 2006 (http://www.who.int/csr/resources/publications/biosafety/WHO_CDS_CSR_LYO_2004_11/en/) for more details.

Laboratory biosecurity: protection, control and accountability for valuable biological materials within laboratories in order to prevent their unauthorized access, loss, theft, misuse, diversion or intentional release. See *Biorisk management: Laboratory biosecurity guidance.* Geneva, World Health Organization, 2006 (http://www.who.int/csr/resources/publications/biosafety/WHO_CDS_EPR_2006_6/en/) for more details.

Non-pharmaceutical interventions: use of measures other than drugs or vaccines (e.g. isolation, quarantine) to help stop the spread of an infectious agent by minimizing the exposure of susceptible persons to the agent.

Passive surveillance: conducting surveillance by relying on potential reporters of cases (e.g. hospitals, physicians) to initiate contact with public health authorities.

Perimeter controls: measures to limit all non-essential movement of persons out of and into the Containment Zone to reduce spread of influenza outside the Containment Zone or increase the number of susceptible persons in the Containment Zone.

Pharmaceutical interventions: use of drugs and vaccines to help stop the spread of an infectious agent.

Prophylaxis: medicine (e.g. antivirals) given to persons exposed to an infectious disease such as influenza to prevent them from developing the disease.

Public health emergency of international concern (PHEIC): an extraordinary public health event which is determined to 1) constitute a public health risk to other Member States through the international spread of disease; and 2) potentially require a coordinated international response. See *Revision of the International Health Regulations.* Geneva, World Health Organization, 2005 (http://www.who.int/csr/ihr/IHRWHA58_3-en.pdf) for more details.

Quarantine: restriction of activities and/or separation from others of persons who are not ill but who are presumed to have been exposed to an infectious disease; usually done in a home or a designated facility and can be voluntary or mandatory.

Rapid containment: extraordinary public health measures, including widespread use of pharmaceutical and non-pharmaceutical interventions, to stop a potential pandemic of influenza from developing.

Rapid response: routine public health actions that local and/or national authorities initiate for infectious disease outbreaks including early detection and investigation of ill persons, immediate implementation of prevention and control measures, and timely notification of appropriate authorities.

Reproductive number (Ro): the average number of secondary cases of an infectious disease that result from one infected person in a fully susceptible population with no prevention and control measures in place.

Respiratory hygiene/cough etiquette: use of measures (e.g. tissues, masks) to cover the mouth and nose when coughing and sneezing, followed by disposal of contaminated tissues and masks, and hand hygiene. See *Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care. WHO Interim Guidelines.* Geneva, World Health Organization, 2007 (http://www.who.int/csr/resources/publications/WHO_CD_EPR_2007_6/en/index.html, accessed August 2007)for more details.

Social distancing measures: variety of measures (e.g. closure of schools or businesses) to reduce transmission of infectious diseases by reducing contact between people.

Surveillance: the systematic ongoing collection, collation and analysis of data for public health purposes and the timely dissemination of public health information for assessment and public health response as necessary.