Health Establishments Preparation for Unusual or Unexpected Cases or Clusters of Severe Acute Respiratory Infection (SARI)

CONTENTS

1. INTRODUCTION

Emerging respiratory-transmitted diseases pose a substantial risk for humankind due to their very high potential for transmission. These diseases can produce high morbidity, and, in serious forms, show high rates of hospitalization and high case-fatality rates. It is important to emphasize that lack of previous immunity in the population to the new viruses leads to a high number of cases and to greater severity. This potential for severity requires that measures for patient care and control and prevention of new cases be put in place immediately.

In the last century there have been three major pandemics: the first occurred in 1918 (type A/H1N1 influenza) and was responsible for the death of approximately 40 to 50 million people throughout the world, mainly young people; the second was in 1957 (type A/H2N2 influenza) and the third in 1968 (type A/H3N2 influenza), with approximately 2 and 1 million deaths throughout the world, respectively. **(1)**

Currently, type A/H5N1 influenza virus has infected birds in more than 50 countries on three continents. This H5N1 strain has rarely infected people, but could easily mutate to a strain capable of infecting human beings. Cases in humans caused by this strain have shown high case-fatality, about 60%. It is not possible to determine if the next influenza pandemic will be caused by the H5N1 strain or by another strain of the influenza virus. Given this fact, world influenza surveillance is indispensable for detecting new strains of the virus as these appear, through sentinel surveillance of influenza-like illness (ILI) and of atypical clinical manifestations of syndromes of severe acute respiratory infection (SARI). **(2)**

Due to the high risk that this situation poses for humankind, International Health Regulations (IHR-2005), in effect from 15 June 2007, require that any case of human influenza caused by a new viral subtype be reported immediately (within a period of 24 hours) to the World Health Organization (WHO). **(3)**

This training module was developed by the Pan American Health Organization (PAHO) with the objective of providing professionals in healthcare facilities the necessary tools for rapid identification and proper management of cases with pandemic potential. This rapid identification will make it possible to set up the actions necessary for prevention and control of new cases.

This training module is primarily directed to workers in public and private healthcare facilities, especially those that provide hospitalization services. This includes professionals that provide care as nurses, physicians, laboratory staff, and others. The course should also include medical coordinators and other managers, since it contains components aimed at management of health services.

2. PURPOSE OF THE COURSE

Strengthen the capacity of the health services to detect and respond rapidly to one or more cases of unusual or unexpected severe acute respiratory infection (SARI), including human influenza.

3. GENERAL OBJECTIVES

Part I Prepare health professionals for detection and early management of cases or clusters of SARI at the level of healthcare facilities. This will permit the early identification of emerging agents and their investigation and control on a timely basis.

Part II Provide tools for improvement of the response by healthcare facilities for a situation of cases of SARI that exceed theirs capacity, in order to achieve adequate and efficient care.

4. SPECIFIC OBJECTIVES

PART I: Detection and Management of SARI

That the personnel of every healthcare facility be capable of detecting on a timely basis:

- Cases of unusual or unexpected SARI.
- Cluster of SARI
- Excess cases of SARI.

That the personnel of every healthcare facility be capable of responding on a timely basis to:

- Carry out treatment of cases and apply infection control standards.
- Report the cases immediately to sub-national and/or national authorities for the mobilization of rapid response teams according to the mechanisms set up in the country.
- Collect samples from these cases and send them to the laboratory in an adequate and timely way.
- Know and comply with the International Health Regulations 2005 and enhance the necessary basic skills for the tasks of surveillance and response.

PART II: Hospital Response to a Pandemic

- Train the health team in the fundamental measures for treatment response by the healthcare facilities to emergence of Influenza-Like Illness (ILI) or SARI.
- Provide the practical tools for organization of treatment response to the increase in expected demand from patients.
- Know the measures related to organization of services that contribute to efficient management of cases and utilization of the resources of the healthcare facilities.

5. METHODOLOGY

The content of the course is based on the Generic Protocol for Surveillance of Influenza developed by PAHO and Centers for Disease Control and Prevention of the United States (CDC) (4), on WHO guides, and on recent scientific articles on the subject. The course, designed for groups of 40 people, will be given in short presentations of 20 to 30 minutes, followed by a period of active and passive discussion. The material presented will be supplemented with exercises, case studies, practical demonstrations, and simulations where participants will act out a pandemic influenza situation, in groups (5 to 8 people). It is important to emphasize that the course is aimed at healthcare workers who treat patients with manifestations of unusual or unexpected SARI in healthcare facilities with hospitalization service.

References:

1. WHO Ten things you need to know about pandemic influenza. http://www.who.int/csr/disease/influenza/pandemic10things/en/
2. World Health Organization (WHO), Interim Protocol:Rapid operations to contain the initial emergence o pandemic influenza. Update October 2007. http:www.who.int/csr/disease/avian_influenza/guidelines/RapidContProtOct15.pdf
3. WHO. *International Health Regulations* 2005.
4. OPS-CDC. Protocolo genérico para la vigilancia de la influenza, 2006. PAHO/HDM/CD/V/411/06.

I - DETECTION OF AND RESPONSE TO UNUSUAL OR UNEXPECTED SARI

6. GENERAL INFORMATION ABOUT INFLUENZA

The influenza virus is a virus that contains RNA of the orthomomyxoviridae family. There are three types of influenza virus (A, B and C) that can cause the disease in humans. However, only type A and B viruses have caused outbreaks and only type A viruses, the most mutable, have caused pandemics. Virus C tends to cause a mild disease. Influenza A viruses are also classified by subtype according to the proteins present on their surface, the hemagglutinin (16 subtypes), and the neuramidase (9 subtypes). **(1)(2)** In addition to infecting human beings, the influenza virus infects other species of mammals, as well as wild and domestic birds. The subtypes of the human influenza A virus that are currently circulating A are H1N1 and H3N2.

Influenza is a disease that has a high epidemic potential, produced by the capacity of the virus to generate antigenic variations and by the existence of an extensive animal reservoir. Wild aquatic birds are the natural reservoir of all known influenza subtypes. Frequent changes in the genetic composition of type A influenza viruses are the basis of epidemics and pandemics. Minor changes produce seasonal influenza outbreaks**,** for which development of an annual vaccine that provides protection against the new strain in circulation is required.

6.1 SEASONAL INFLUENZA

Seasonal influenza is influenza or flu that people regularly get at specific times of the year, mainly in the coldest months in countries where the seasons are more marked. In countries with a tropical climate, the patterns of circulation are not clearly defined.

The period of incubation of the virus varies from 1 to 4 days, with an average of 2 days. The disease is characterized by fever, headache, myalgia, prostration, runny nose, sore throat, and cough. Cough tends to be intense and lasting. Other symptoms are limited in duration and the patient recovers in a period from two to seven days. From the clinical standpoint, influenza may not be distinguished from the diseases caused by other viruses of the respiratory tracts.

This virus is effectively transmitted from one person to another in various ways such as direct contact, droplets that in general disperse up to 1 meter, by fomite through objects and rarely by aerosols. However, disease caused by influenza can be effectively prevented with annual vaccination. For this purpose there is a virological surveillance system, the Global Influenza Surveillance Network (GISN), made up of National Influenza Centers (NIC) and 122 sentinel units in 94 countries, that does systematic sampling of patients with ILI, to find out the viral profile for every year. Based on the viruses found in circulation, WHO convenes a meeting of experts twice a year to determine the composition of the vaccine. **(3)** These vaccines should be administered before the annual peak. In industrialized countries, the influenza vaccine, when there is a good match between the antigens of the vaccine and the viruses in circulation, provides approximately 70% to 90% protection against clinical disease in healthy adults. Among older persons who do not live in institutions, vaccination against influenza can reduce the number of hospitalizations between 25% and 39% and reduce mortality between 39% and 75% during the influenza season. **(4)** Since 2004, PAHO has

recommended annual vaccination for people over 60 years of age, the chronically ill, people who are immunodeficient, health professionals, pregnant women, and children between 6 and 23 months old. **(5)**

The most frequent complication of influenza is severe acute respiratory infection (SARI) with the clinical symptoms of pneumonia. This can sometimes be a primary infection due to influenza virus or it more commonly can be secondary bacterial pneumonia *(S. pneumonie, Haemophilus influenzae, or S. aureus)*. During annual epidemics, the most serious cases and deaths take place mainly among children, the elderly, and people weakened by chronic diseases. It is calculated that annual mortality from influenza throughout the world reaches 1 million people.

In the majority of epidemics, between 80% and 90% of deaths occur in people over 65 years of age. The monthly peak of cases of influenza varies by country according to geographical location. In the United States of America, the CDC estimate that the peak is in the month of February. In the countries of the Southern Cone it is estimated that the peak in general is in the month of May, while clear evidence is still not available to determine the peak in countries with a tropical climate.

6.2 INFLUENZA OF ANIMAL ORIGIN

The pandemic strain of the virus influenza is of animal origin, the more frequent are from birds, pigs and other mammals.

6.2.1 Swine influenza

Swine influenza, or “swine flu”, is a highly contagious acute respiratory disease of pigs, caused by one of several swine influenza A viruses. Swine influenza viruses are most commonly of the H1N1 subtype, but other subtypes are also circulating in pigs (e.g., H1N2, H3N1, H3N2). Pigs can also be infected with avian influenza viruses and human seasonal influenza viruses as well as swine influenza viruses. Sometimes pigs can be infected with more than one virus type at a time, which can allow the genes from these viruses to mix. This can result in an influenza virus containing genes from a number of sources, called a "reassortant" virus. Although swine influenza viruses are normally species specific and only infect pigs, they do sometimes cross the species barrier to cause disease in humans.

Outbreaks and sporadic human infection with swine influenza have been occasionally reported. Generally clinical symptoms are similar to seasonal influenza but reported clinical presentation ranges broadly from asymptomatic infection to severe pneumonia resulting in death. The clinical case description is acute febrile respiratory illness (fever >38°C) with the spectrum of disease from influenza-like illness to pneumonia.

Swine influenza is not notifiable to international animal health authorities, therefore its international distribution in animals is not well known. The disease is considered endemic in the United States. Outbreaks in pigs are also known to have occurred in North America, South America, Europe (including the UK, Sweden, and Italy), Africa (Kenya), and in parts of eastern Asia including China and Japan. Since the implementation of IHR(2005) in 2007, WHO has been notified of swine influenza cases from the United States and Spain. Most of these swine influenza cases recovered fully from the disease without requiring medical attention and without antiviral medicines.

It is likely that most of people, especially those who do not have regular contact with pigs, do not have immunity to swine influenza viruses that can prevent the virus infection. If a swine virus establishes efficient human-to human transmission, it can cause an influenza pandemic.

6.2.2 Avian influenza or avian flu

Avian influenza or avian flu is a disease of birds (wild or domestic), that are the natural reservoir of the virus. The human being is not a regular part of this cycle. The H5N1 strain is the one causing most concern at this moment because it has shown the capacity to infect other mammals and human beings. This virus appeared originally in Asia in 1997 and starting in 2003 has been spreading rapidly to other regions.

To date, the strains of avian influenza strains with potential for transmission for human beings are strains H5, H7, and H9. Sporadic infections in humans in Asia since 1997 have resulted from contact with sick or dead birds or with their secretions, since the virus is excreted in the stools, blood, and respiratory secretions of the birds. Human cases that have occurred to date are associated with contact with birds between 76% and 100% of the time, depending on the country. Clusters of H5N1, with at least 2 cases with epidemiological ties, have been identified in 10 countries, corresponding to 25% of the cases. (2) More than 90%

of clusters have occurred among family members. In these cases, the infection was probably acquired by a common source of exposure, such as birds, but limited person-to-person and unsustained transmission has also been considered. This probably occurred during intimate contacts or contact with very sick patients, without protection. **(2)**

The period of incubation of the virus in humans seems to be less than 7 days, in the majority of cases from 2 to 5 days. The average age of infection by H5N1 is approximately 18 years, and 90% of the cases are in patients less than 40 years old. General case-fatality is 61%, this percentage being greater in the group less than 20 years old. Pneumonia occurs in 61% to 100% of the cases and the most frequent presentation of infection by H5N1 influenza in humans is severe pneumonia that rapidly evolves to an acute state of respiratory distress syndrome. Most frequent symptoms documented to date are fever (almost 100%), dyspnea (37%-94%), cough (71%-98%), runny nose (14%-33%), sore throat (32%-68%), and diarrhea (5%-52%). **(2)**

In Indonesia, for example, the initial diagnosis in the cases of patients with a confirmed diagnosis of influenza A (H5N1) was pneumonia in 46%, dengue in 12%, and acute respiratory disease in 27% of the cases. Only in 12% of the cases was the human infection by an avian influenza virus considered as the first diagnosis. The period between the onset of symptoms and hospitalization was from 3 to 5 days and the time between the onset of symptoms and death was from 8 to 13 days, with an average from 9 to 10 days. For these cases one notes that the time of the patient in the hospital is very short, with rapid evolution toward death. Other findings are leukopenia, lymphopenia, thrombocytopenia, and increase in lactic dehydrogenase (LDH). **(2)**

6.3 PANDEMIC INFLUENZA

An influenza pandemic occurs when a new viral subtype is generated by greater changes in the virus, a subtype to which the human population has not had previous exposure. When the new virus finds a susceptible population, epidemics can spread rapidly at the world level among humans and can produce high mortality.

The influenza virus should meet the following condition in order to result in a pandemic:

- **that it is capable of producing disease in humans;**
- **that the population is totally susceptible to the virus (that it does not have previous immunity); and**
- **that the virus is capable of being transmitted efficiently and sustainably from one person to another.**

It is not possible to know when and where a pandemic will begin or which strain of influenza will cause it or if the H5N1 virus currently in circulation will mutate so that it is transmitted efficiently from one person to another. If H5N1 were capable of generating an influenza pandemic, it is also not possible to know the severity that the new pandemic strain will show. What is known is that never before there have so many opportunities to generate a pandemic strain been documented, with so many cases in humans of infection by an avian influenza virus. In addition, the H5N1 virus has already become an enzootic virus in Asia and Africa, increasing the opportunities for human infection and the risk of emergence of a pandemic strain.

Based on information provided by countries during training workshops in the use of statistical packages for epidemic modeling developed by the CDC, (6)(7) PAHO has estimated that, in a scenario of moderate severity—such as observed in 1968—a first pandemic wave of 8 weeks of duration and 25% clinical case rate would produce, on average, a potential pandemic impact equivalent to 334,163 deaths, 1,461,401 hospitalizations, and more than 76 million outpatient visits throughout Latin America and the Caribbean. **(8)** The impact of such a pandemic wave on hospital capacity would reach its maximum around the fourth to fifth weeks of the pandemic, with nearly 43,600 daily hospitalizations, using 84% of installed capacity. In this scenario, the capacity of intensive care units and respirators would be passed after the second week of the pandemic. These estimates, of a conservative character, show the vulnerability of the healthcare services of the Region of Latin America and the Caribbean to an influenza pandemic.

This scenario makes necessary the early detection of the circulation of any virus with pandemic potential for immediate adoption of control measures aimed at containing its circulation. To meet this increased risk, the countries have developed, as a first step, National Preparedness Plans for an Influenza Pandemic.

References:

1. The Writing Committee of the World Health Organization (WHO) Consultation on Human Influenza A/H5. Avian influenza A (H5N1) infection in human. N Engl J Med 2005; 353:1374-85 [Erratum, N Engl J Med 2006; 354:884.]
2. The Writing Committee of the World Health Organization (WHO) Consultation on Human Influenza A/H5. Avian influenza A (H5N1) infection in human. N Engl J Med 2008; 358:261-273.
3. WHO. (http://www.who.int/csr/disease/influenza/vaccinerecommendations/en/)
4. WHO. (http://www.who.int/wer/2005/wer8033.pdf)
5. WHO.http://www.paho.org/Spanish/AD/FCH/IM/GTA16_2004_FinalReport_Spa.pdf).
6. Meltzer MI, Shoemake HA, Kownaski M, Crosby R. 2000. FluAid 2.0: Software and manual to aid state and local-level health officials plan, prepare and practice for the next influenza pandemic (beta test version). Centers for Disease Control and Prevention. [Online]. Available at: http://www.cdc.gov/flu/tools/fluaid/ [accessed 1 May 2007].
7. Zhang X, Meltzer MI, Wortley P. 2005. FluSurge 2.0: Software and manual to aid state and local public health officials and hospital administrators in estimating the impact of an influenza pandemic on hospital surge capacity (beta test version). Centers for Disease Control and Prevention. [Online]. Available at: http://www.cdc.gov/flu/tools/flusurge/ [accessed 1 May 2007].
8. Mujica OJ, Oliva O, dos Santos T, Ehrenberg JP. Pandemic influenza preparedness: regional planning efforts; In: Institute of Medicine (IOM) 2007. Ethical and Legal Considerations in Mitigating Pandemic Disease. Workshop Summary. The National Academies Press; Washington DC.

7. INTERNATIONAL HEALTH REGULATIONS - 2005

International Health Regulations 2005 (IHR-2005) is a set of linked legal instruments adopted by the Member States of WHO to contain the threats of diseases likely to spread rapidly from one country to another, including emerging infections such as the Severe Acute Respiratory Syndrome (English acronym SARS) or a new human influenza virus. Furthermore, the regulations encompass other public health emergencies with possible transborder impact, such as spills, leakages, or effluents of chemical products or nuclear accidents.

IHR-2005, in effect from 15 June 2007, comes from an updating of IHR-1969, which only referred to four diseases -- cholera, plague, yellow fever, and smallpox (now eradicated) -- and contained general provisions for border control and relatively passive measures of reporting and control..

The review in 2005 resulted in an unprecedented international agreement for public health that foresees containment of health emergences at the point of origin where the incident is located and not only at national borders. The new regulation encompasses all diseases and health-related events that can constitute a public health emergency of international concern.

IHR-2005 also requires all the Member States to strengthen their capacities for surveillance and response (Annex 1: figure 1, actions 2-5). PAHO/WHO is collaborating closely with Member States providing them with technical guidance, especially for development of adequately trained human resources and quality health systems infrastructure and services.

7.1 NECESSARY BASIC CAPACITIES FOR SURVEILLANCE AND RESPONSE

IHR-2005 contains a series of procedures for management of events that represent a public health threat of international concern as well as basic requirements for national systems for disease surveillance and response. These core competencies include the ability to detect, investigate, confirm, communicate, and intervene in events or diseases, defined in part A of Annex 1 of the Regulation.

7.2 IHR-2005 AND THE RISK OF A HUMAN INFLUENZA EPIDEMIC

In accordance with IHR-2005, all cases of the following diseases, smallpox, poliomyelitis (by wild poliovirus), SARS, and human influenza caused by a new virus subtype, should be reported immediately to PAHO/WHO. Reporting also includes the detection of influenza in birds.

7.3 OPERATIONAL ASPECTS OF IHR-2005

IHR-2005 introduces new operational concepts, namely:

- Specific procedures for monitoring of events and risks to public health at national level and for reporting to WHO.
- PAHO/WHO request for verification of public health events that occur in the countries
- Rapid risk assessment in collaboration with the countries and delivery of assistance to them.
- Determination if an event constitutes a public health emergency of international concern.
- Coordination of international response.

7.4 PUBLIC HEALTH EMERGENCY OF INTERNATIONAL CONCERN

According to IHR-2005, a public health emergency of international concern is understood to be an extraordinary public health event when, through specific procedures, it has been determined that:

- It constitutes a hazard for public health of other states because of the international spread of a disease, and;
- It could require a coordinated international response.

In order to facilitate timely and adequate communication with PAHO/WHO with regard to possible public health emergencies of international scope, IHR-2005 contains in Annex 2 a decision-making tool (Annex 1: see figure No.. 2) that establishes the parameters for reporting by a national government to PAHO/WHO of all events that can constitute a public health emergency of international concern, on the basis of the following criteria:

- Severity of the public health impact of the event;
- unusual or unexpected character of the event;
- possibilities of international spread of the event, and/or;
- risk of restrictions to travelers or to trade because of the event.

In order for this tool to be used appropriately by the national government, it is required that the network of epidemiological surveillance set up by the health services fulfill the functions of early detection of events and immediate communication to the higher levels of each country.

References:

1. Text adapted from information available at: http://www.who.int/topics/international_health_regulations/es/ and http://www.who.int/csr/ihr/es/index.html
2. The complete IHR is available at: http://www.who.int/gb/ebwha/pdf_files/WHA58/WHA58_3-sp.pdf
3. For additional information on the Region, consult the PAHO website at: http://www.paho.org/spanish/ad/dpc/cd/EER-IHRS.htm

8. PREPARATIONS FOR AN INFLUENZA PANDEMIC

Disturbances caused by influenza pandemics are often compared with natural disasters, but it is probable that a pandemic causes effects that are both widespread and continuous and, consequently, can rapidly exhaust rapidly national-level resources. The possibility that a strain of such characteristics may arise underlines the need for all countries to prepare a National Influenza Pandemic Preparedness Plan (NIPPP).

[stop here] The objective of preparing and implementing a NIPPP is to plan and implement the national response to a pandemic, so that countries are prepared for detecting and handling the effects of an influenza pandemic. Planning can help reduce transmission of the pandemic virus strain; diminish the number of cases, hospitalizations, and deaths; maintain essential services; and reduce the economic and social impact of a pandemic.

In the WHO Global Influenza Preparedness Plan **(1)** announced in 2005, WHO establishes 6 phases of increasing risks to public health caused by the appearance of a new subtype of the influenza virus that could represent a pandemic threat. For each one of these phases, WHO recommends measures to national authorities and describes the measures that WHO would adopt to improve international coordination and transparency in application of the measures at the national level. The Global Plan provides guidelines for preparation of the NIPPP according to these phases. Every phase is associated with national and international public health measures. The national measures during every phase are subdivided in turn according

to the epidemiological situation of the country. In accordance with this definition, in April 2008, WHO observes that the world is in phase 3 of pandemic risk.

Table 1: **WHO Pandemic Risk Phases**

Interpandemic period	***Phase 1***	**No new subtype of human influenza. Low risk of infection by virus circulating in animals**
	Phase 2	**No new subtype of human influenza. New virus circulating in animals represents a risk for humans**
Period of Pandemic Alert	***Phase 3***	**Human infection with a new subtype but without transmission from person to person**
	Phase 4	**Small clusters of cases with limited transmission from person to person**
	Phase 5	**Larger clusters of cases with transmission from person to person still localized**
Pandemic Period	***Phase 6***	**Pandemic: increased and sustained transmission in the general population**

Since 2005, PAHO has been supporting the countries of Latin America and the Caribbean in the preparation, evaluation, and implementation of their NIPPPs. At the same time, PAHO has supported the countries in strengthening basic capacities required by IHR-2005. These capacities include establishment of early warning systems within the countries that improve their capacity to detect events that can represent public health threats, through expanding the goals of surveillance and through strengthening of the existing virological surveillance network. In addition, technical cooperation has aimed at strengthening mechanisms for response to any public health emergency, which has included the training, preparation, and equipment of rapid response teams in all the countries of the Region of the Americas.

PAHO technical cooperation has as goals that **every country have a national pandemic preparedness plan** complying with the requirements of the WHO checklist **(2)** and that these plans be implemented at national, sub-national, and local levels. In addition, the plans

should be validated with simulations and drills at all administrative levels. In April 2008, all the countries of Latin America and of the Caribbean were actively involved in activities to prepare for an influenza pandemic and the vast majority had a NIPPP. **Following the orientations of WHO, the NIPPP should include specific actions for each phase, classified into five categories: 1) planning and coordination; 2) monitoring and evaluation of the situation; 3) prevention and containment; 4) response by the health system; and 5) communications.**

References:

4. OMS. Plan mundial de la OMS de preparación para una pandemia de influenza 2005 http://www.paho.org/spanish/ad/dpc/cd/vir-flu-plan-mundial-oms.htm
5. OMS. Lista de verificación de la OMS del plan de preparación para una pandemia de influenza http://www.paho.org/Spanish/AD/DPC/CD/vir-flu-oms-lista-verificacion.htm.

9. INFLUENZA SURVEILLANCE

Influenza surveillance has as its principal objectives:

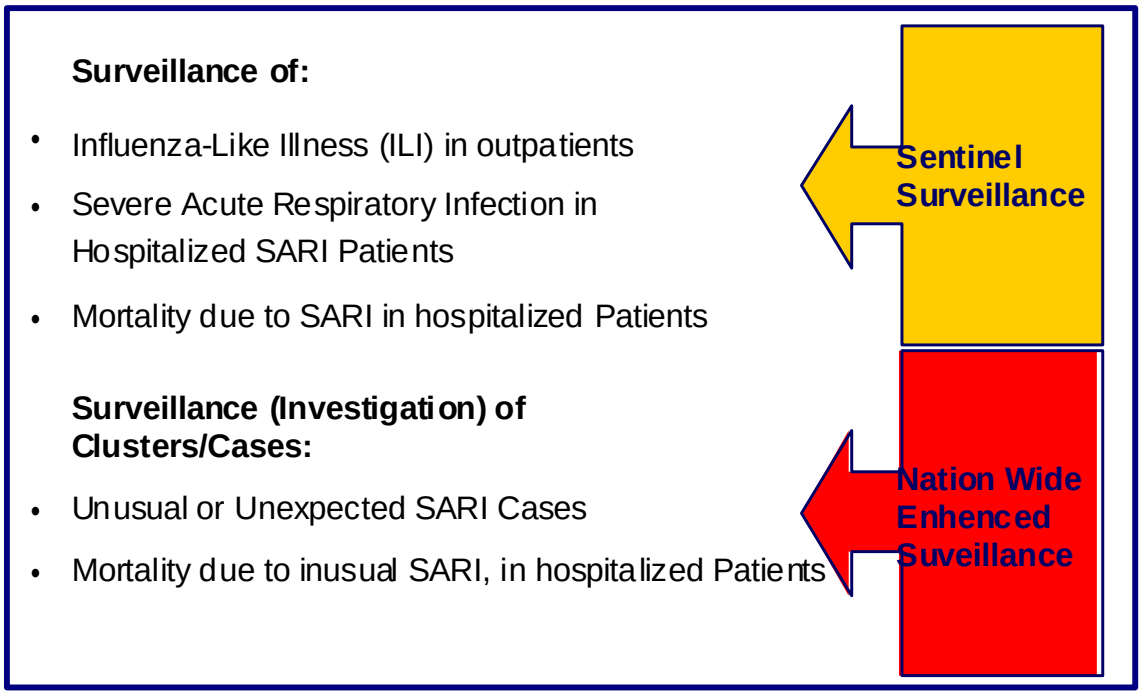
1. **Identifying the seasonal strain of the virus that is circulating in a country or region, for the purpose of determining the composition of and preparing the seasonal vaccine.**
2. **Detecting early on the presence of a strain with pandemic potential and implementing the pertinent control measures.**

In order to meet these objectives the Generic Protocol for Influenza Surveillance **(1)** establishes the following means of surveillance:

- Sentinel Surveillance of Influenza-Like Illness (ILI) and of Severe Acute Respiratory Infections (SARI), in localities strategically selected by the Ministry of Health of every country. Sentinel surveillance of ILI is carried out for ambulatory patients, and monitoring of SARI for hospitalized patients. This should include usual and unusual or unexpected forms, in addition to associated deaths. The objective of this form of

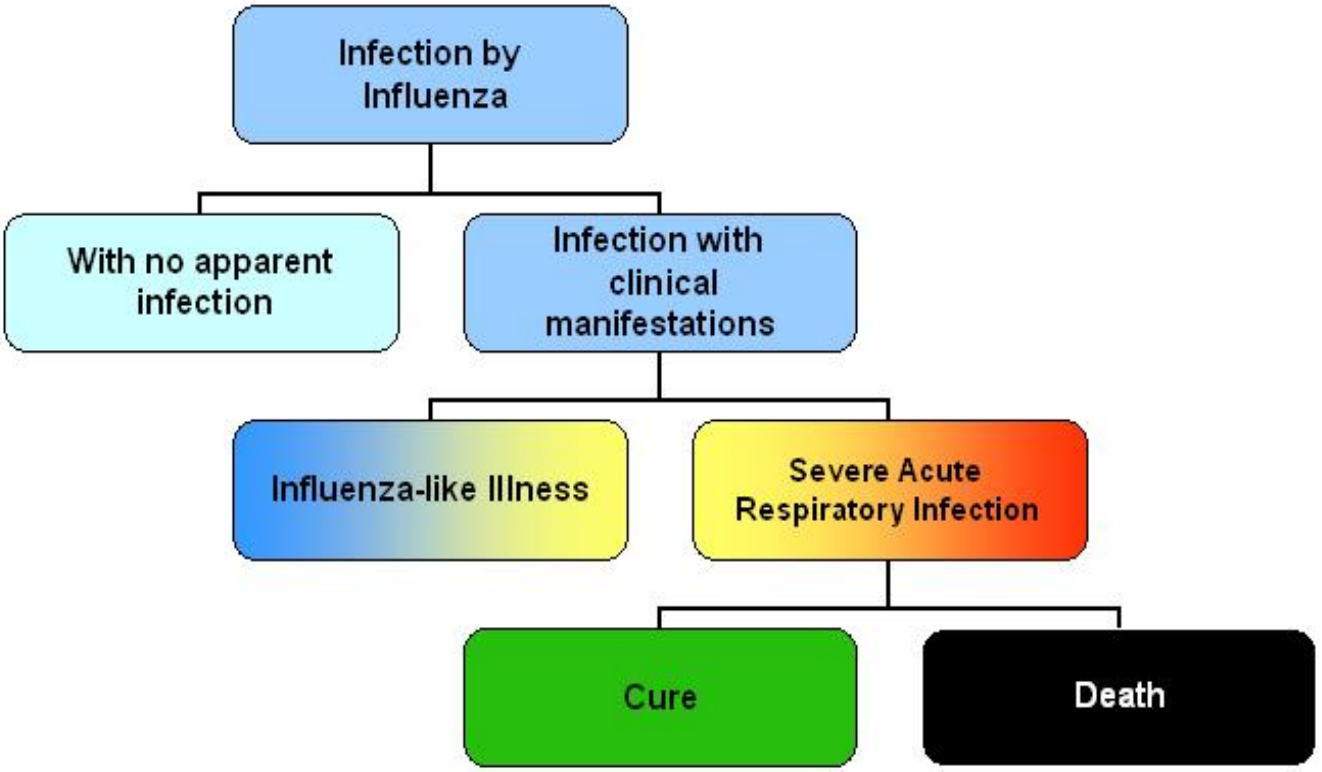
surveillance is to provide data for determination of the epidemiological characteristics of the influenza, to guide the policies and levels of action for prevention and control of the disease.

- Enhanced nationwide surveillance is carried out in all the healthcare facilities of the country and represents an improved system for reporting surveillance of notifiable diseases, that is, with the sensitivity required to detect a case of unexpected or unexpected acute respiratory infection.

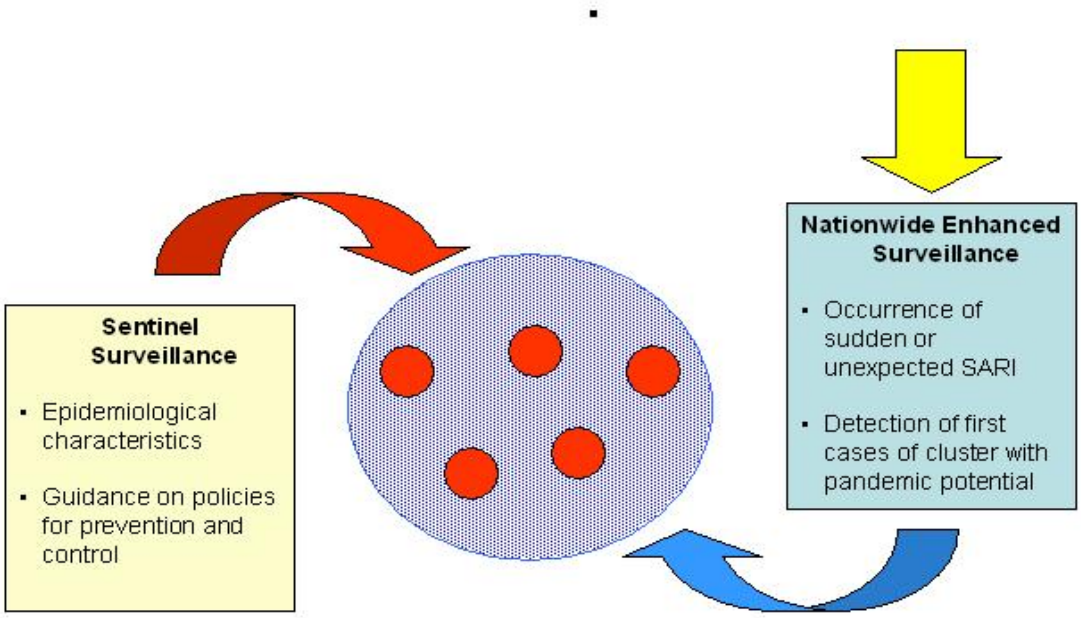


The need for using different mean of surveillance comes from the fact that the clinical manifestations of influenza are very variable, from a case without apparent infection up to complications such as pneumonia, which can evolve to severe cases of respiratory distress syndrome and death. Patients with SARI usually require hospitalization while patients with ILI are treated on an outpatient basis.

Infection by Influenza Virus: Vector of Clinical Manifestations



Sentinel influenza surveillance is in operation in the majority of countries. This course is aimed at preparation of medical and auxiliary personnel of healthcare facilities to carry out enhanced nationwide surveillance. The distinctive characteristic of the latter is that it focuses on patients with unusual manifestations of SARI of greater severity and on deaths of people who show a pattern of febrile acute respiratory infection, of an unknown cause.



9.1 DEFINITION OF ILI , SARI, AND CONFIRMED CASE OF INFLUENZA

Influenza-Like Illness (ILI):

→ Patient of any age with sudden appearance of fever higher than 38 ° C **AND**

→ Cough or sore throat

Sever Acute Respiratory Infection, SARI :

In the case of individuals ≥ 5 years:

→ Patient of any age with sudden appearance of fever higher than 38° C **and**

→ Cough or sore throat **AND**

→ Dyspnea or difficult breathing **AND**

→ **Need for hospitalization.**

For children under 5 the case definition has been adopted from the integrated management of childhood illness program **(IMCI):**

- Any child under 5 in whom there is clinical suspicion of the **presence of pneumonia or pneumonia which is severe or very severe**, **and** who requires hospitalization.

Every child suspected of **pneumonia** presents:

- Fever (temperature >38 C) and
- Cough or difficult breathing.

Difficult breathing is considered to be:

- Before 2 months old,: more than 60 breaths per minute;
- 2 to 11 months old: more than 50 breaths per minute;
- 12 months to 5 years old: more than 40 breaths per minute

Every child with **severe pneumonia** presents:

Suspicion of SARI is based on symptoms and clinical signs; a chest X-Ray is not necessary for considering a case to be suspicious.

Confirmed case of influenza

Any case with positive results for the influenza virus in laboratory tests.

Table summarizing Sentinel Surveillance and Enhanced Nationwide Surveillance.

Sentinel Surveillance ILI e SARI	**Enhanced Nationwide Surveillance Unusual or unexpected SARI**
The case definition is broader. These are all cases of ILI and SARI	The case definition is more specific. This could include a single case or clusters of outbreaks of unusual and unexpected SARI, or show epidemiological characteristics suggesting infection with a new influenza strain.
Healthcare facilities strategically selected by a Ministry of Health	All public and private healthcare facilities
Systematic nasopharyngeal specimen sampling for influenza research	Systematic sampling of nasopharyngeal specimens for research on influenza in any unusual case of SARI.
Useful for estimating the disease burden. Serves to isolate the virus for determining the composition of the seasonal vaccine. Can detect circulation of atypical viruses with pandemic potential	Indispensable for early detection of pathogens with pandemic potential and the timely establishment of response measures. **Supports implementation of International Health Regulations 2005.**

9.2 ENHANCED NATIONWIDE SURVEILLANCE

9.2.1 Introduction

This module for Enhanced Nationwide Surveillance is based on three documents: the Generic Protocol for Influenza Surveillance developed by PAHO and the CDC, the Guidelines for Investigation of Human Cases of Avian Influenza from WHO, and International Health Regulations 2005.

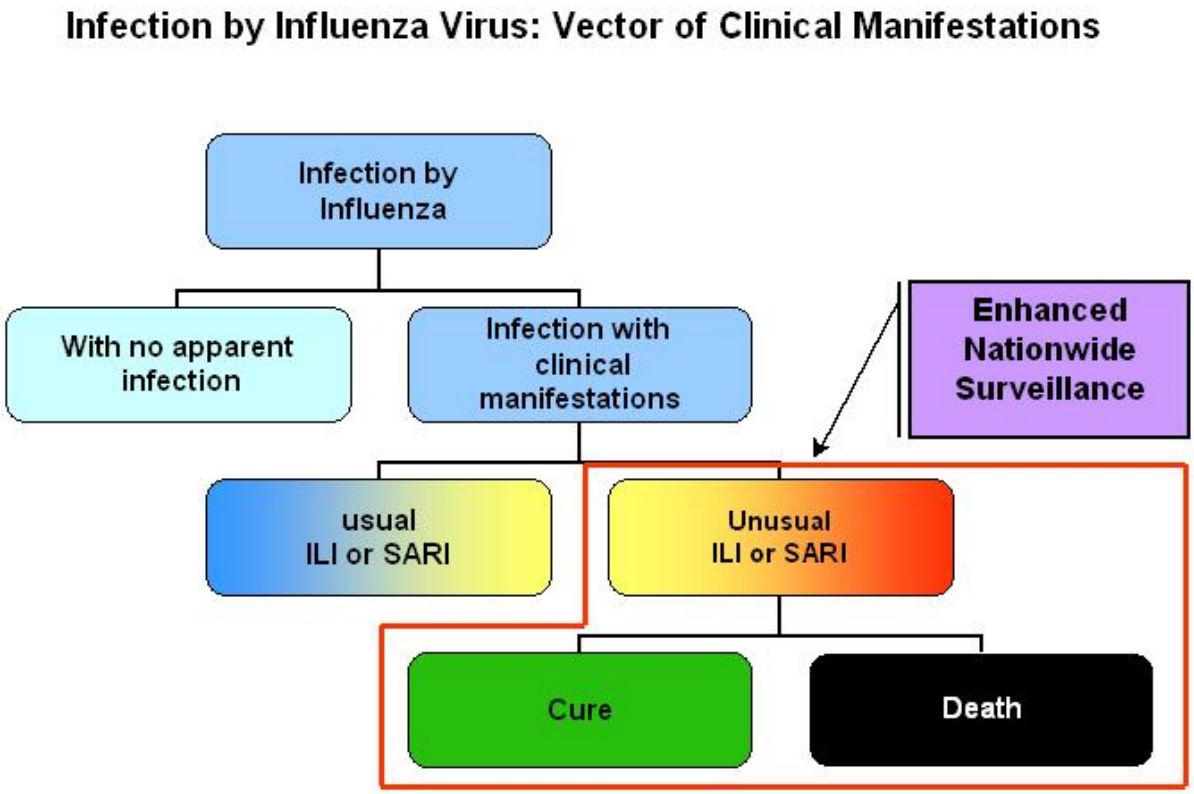
According to the Generic Protocol for Influenza Surveillance, early detection of all outbreaks of unexpected or unexpected respiratory infections is essential for effective

application of control measures aimed at limiting morbidity and mortality. An effective system for surveillance of infectious diseases should have the capacity to detect and respond to outbreaks of human influenza and atypical respiratory infections. Furthermore, early detection of sustained person-to-person transmission of a virus with pandemic potential is crucial for application of control measures designed to interrupt or stop the spread of the disease.

An Enhanced Surveillance System for notifiable diseases (nationwide surveillance) can provide an early warning for respiratory disease outbreaks with pandemic potential. Such a system requires that there be general awareness of the factors that should trigger a report and an effective report mechanism. **(1)**

This Module has been developed as a tool to facilitate compliance with International Health Regulations (IHR) with respect to detection of influenza in humans caused by a new subtype. Its purpose is to respond to the need to protect world public health.

As the following figure shows, the focus of this module is Enhanced Nationwide Surveillance, corresponding to those cases with unusual and atypical manifestations of SARI of greater severity and with deaths of people with symptoms of febrile acute respiratory infection, from an unknown cause.



The central subject of this module is unusual or unexpected cases and clusters of SARI. The terms "unusual" or "unexpected" are used in IHR-2005 to distinguish those events that deserve particular attention from national surveillance systems, so that they can be evaluated and it can be determined whether or not they constitute events of international concern. For enhanced nationwide surveillance, these are events that trigger further investigation, as noted below. In order to further clarify the terms "unusual" and "unexpected," several examples and specific situations are included, illustrating the objective of enhanced nationwide surveillance.

An unusual case is one that is different, atypical, unusual, or uncommon and should always be regarded as a warning signal for the professional to initiate a report; take a sample for early diagnosis, and undertake immediate infection control measures.

Another unusual situation is the emergence of cases of SARI at an unexpected time of year or outside the normal season. This means that if, for example, the normal seasonal influenza peak is at the end of spring and the beginning of winter, and cases increase in the fall, this fact should cause us to pay attention.

An unexpected or unexpected event, according to IHR-2005, is caused by a disease or an agent that was already eliminated or eradicated or not previously reported, such as a case of avian influenza in humans.

9.2.2 Objectives of enhanced nationwide surveillance

Detection

- Detection on a timely basis of unusual or unexpected cases of SARI.
- Detection on a timely basis of clusters of SARI.
- Excess of cases of SARI.

Reporting

- Immediate reporting of unusual or unexpected cases or clusters of SARI to local and/or national authorities for mobilization of the rapid response team according to established national procedures.

Research

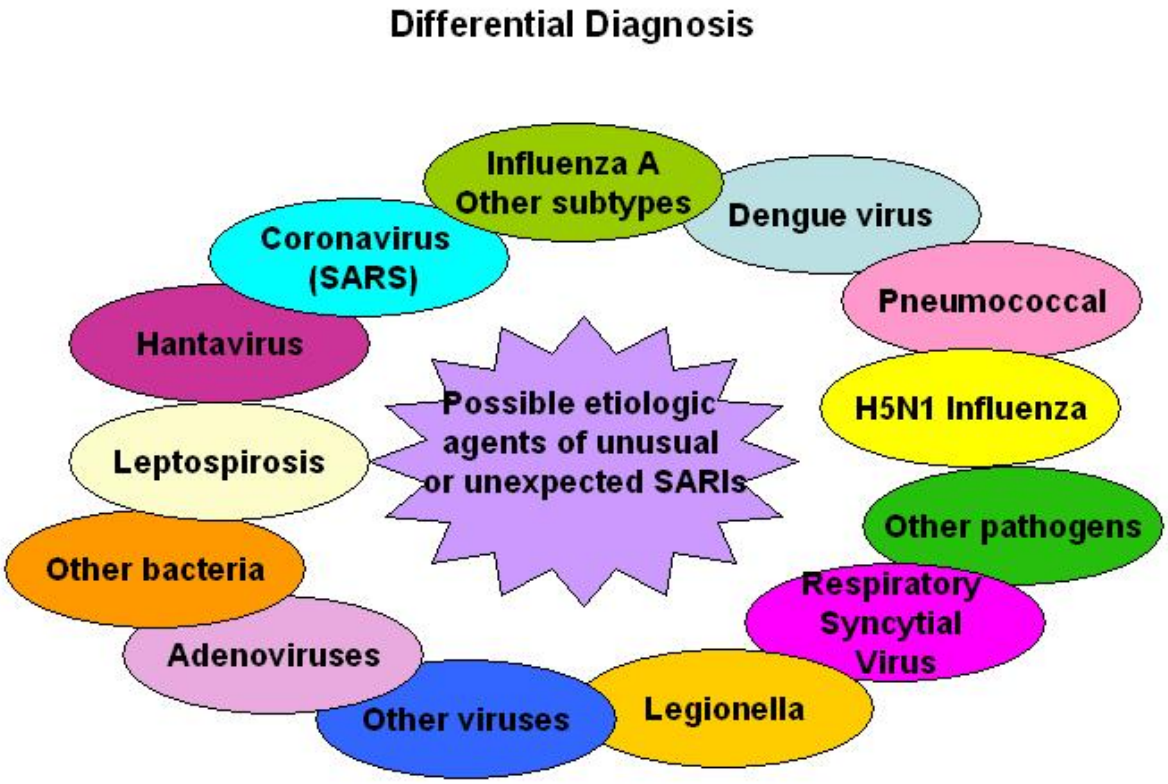
- Collaboration in epidemiological research, including active search for additional suspect cases in the community, and in the initial control of the outbreak, when this is required.

9.2.3 Early detection of unusual or unexpected SARI

Healthcare facility personnel should be alert to *unusual, uncommon, or unexpected* diseases (including respiratory infections linked with epidemiological factors, for example, clusters of SARI, cases of SARI related to travel or exposure to sick animals),

in order to report these immediately to public health authorities and so that control measures can be taken in a timely fashion.

There are many diseases that can manifest themselves as SARI. Among the principal etiologic agents we have viruses, followed by bacteria. The figure below illustrates the most common diagnoses:



9.2.4 Triggering Factors for Investigation (1) (2) (3)

Healthcare workers should be attentive to the appearance of unusual cases of severe acute respiratory infection, since these constitute triggering factors for investigation, as noted below:

- **Unusual (atypical or uncommon) cases of SARI**

Definition of unusual (atypical or uncommon) cases of SARI:

→ **In healthcare workers** or others exposed in a work context who develop unexplained SARI after close contact with people (live or dead) with SARI of uncertain origin or that results in a positive test for avian influenza virus.

→ **In people who travel** to areas of circulation of the avian influenza virus H5N1.

→ Cases in previously healthy **young adults**.

→ **Deaths** by SARI of unknown cause.

→ Any case that the professional considers as an unexpected or unusual case.

→ Any unexplained case of SARI in a person that works with birds.

- **Clusters (outbreaks) of SARI**

Definition of Clusters of SARI:

A cluster is defined as **TWO or more people** with manifestations of SARI or who died of unexplained SARI, linked social or geo-spatially within a period of 2 weeks. **(2)**

→ Clusters that include two or more members of a family, social nucleus or workers at a given site. .

- **Excess number of cases of SARI**

Definition of excessive number of cases of SARI:

When the number of cases of SARI exceed the number expected for the healthcare facility, or occur within a short time period.

This is a parameter that healthcare facilities should monitor. For this purpose, it is necessary for the healthcare facility to have a time series, of 5 years or more, of the number of cases hospitalized for SARI per epidemiological week. Based on these data, it is possible to construct the endemic range for defining the epidemic threshold. Thus one can see if the number of cases fall within the expected range or not, for the time period being evaluated. The rate of SARI cases per epidemiological week in proportion to the total number of hospitalized patients is one of the parameters most used for this surveillance (% of SARI hospital cases, per epidemiological week). Another important parameter is the rate of deaths by SARI in proportion to total deaths for the healthcare facility (5). Annex 3 includes some rates used for monitoring SARI in the healthcare facility. .

The epidemiological week is the time unit for reporting, tabulation, and analysis and is established on the basis of the epidemiological schedule for each year. Once the data have been collected and analyzed on the basis of the weekly trend, information is generated that **allows early detection of clusters for adults and children** who require medical care for SARI and reporting of an epidemiological alert. Some models for forms to capture the data collected in routine surveillance for SARI and deaths by SARI in a healthcare facility are found in Annex 4.

Epidemiological history to investigate for confirming a suspicion of avian influenza: (1) (2) (3)

[Any of the following events **must be reported and an investigation begun** to identify changes in the agent or in the host and confirm its etiology. Patients with SARI who have a background that strongly indicates possible exposure to the avian influenza virus A, within seven (7) days prior to the appearance of symptoms, are the ones that:[1] :

- Travel or reside in an area affected by influenza outbreaks in birds or other animals (especially if they have visited livestock establishments, farms, markets for meat or live animals or have participated in game hunting activities).
- Have a history of direct contact with animals, especially dead or sick birds, in an affected area
- Indicate possible occupational exposure to animal products or products of animal origin,[2] including work as a butcher, veterinarian, a worker in a livestock establishment, laboratory technician, worker in a storage or transport facility, or a poultry worker who has been in contact with domestic fowl presumably infected by virus H5N1, or an outbreak of SARI among poultry workers.
- Consumption of products originating from domestic or wild birds, either raw or cooked (for example, meat, eggs, blood, liver)

Laboratory confirmation of a human case of avian influenza (H5N1), for example, should immediately trigger a full investigation.

Epidemiological surveillance also should begin to investigate **rumors:**

[1] It is necessary to point out that human cases of infection by influenza A (H5N1) have been diagnosed in some areas in which there had been no previous notice of disease or death in birds..

[2] Certain types of exposure imply greater risk: plucked birds, slaughtered birds, cooked birds, cleaning of cages, living together in the home, handling of excrements used as fertilizers, etc.

- Unofficial reports of respiratory infection outbreaks have demonstrated usefulness in early identification of cases. Healthcare workers should be alert to such information, which can come from communications media, the public, other professional groups, and laboratory staff.

Other triggering factors for investigation of outbreaks can be clusters of animal deaths or excessive absenteeism at schools and work places.

In summary, the triggering factors for an investigation, beginning with cases detected in health facilities, are:

→ **Unusual cases of SARI;**

→ **clusters of SARI;**

→ **excess number of cases of SARI..**

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It is important to point out that investigation should begin immediately, without waiting for confirmation of laboratory results identifying the causative agent.

In situations of unusual or unexpected SARI, there should be an active search of clinical histories to detect additional cases, as well as death notices for deaths caused by respiratory disease in the previous period of a month or more. Always investigate travel and other activities that took place in the 10 days preceding the appearance of symptoms. It is important to involve all healthcare facility professionals, so that all are alert to the appearance of new cases for them to be reported and investigated immediately.

An essential element for success of epidemiological surveillance, early detection, and setting up control measures, is strengthening basic capacities in healthcare facilities in these matters. One should also add the need for integration in the healthcare facility of healthcare workers and epidemiological and laboratory professionals.

9.3 IMPORTANCE OF HOSPITAL EPIDEMIOLOGICAL SURVEILLANCE

Both public and private hospitals are entry points into the health system, that are important for detection of serious or unusual cases, of emerging diseases, and of outbreaks, as well as of severe acute respiratory infection. Hospitals constitute the principal location for detection of cases of unusual or unexpected respiratory infections, with the possibility of pandemic potential. Thus, professionals who work in these establishments should know the procedures required to respond to these cases, from adequate treatment to complying with biosafety standards; immediate reporting; research on risk factors; investigation of cases among family members, and collection of laboratory samples, in order to make it possible for health authorities to take appropriate control measures. Similarly, health authorities should get continuous updating from hospital personnel on disease outbreaks and other risks occurring in the population.

9.3.1 Entry Points for Hospital Cases

The principal entry points for cases of SARI are the first aid and emergency units, from which patients are referred to intensive care or intermediary units. All staff of these areas should receive training on procedures to follow with these cases. **All unusual events, not only with respect to respiration, but also hemorrhagic symptoms of jaundice, or neurological systems, should also be reported immediately to the corresponding health authorities.** In case of death of a patient without samples having been collected of material from the oro/nasopharynx and of blood, blood samples and tissue biopsies should be carried out when possible for the purpose of laboratory investigation of the case and contact should be established immediately the unit responsible for local epidemiological surveillance.

It is important to stress that adoption of measures for the interventions to follow should be simultaneous. This means that reporting, proper management, and taking samples should be carried out upon detection of the case or cases.

9.4 NOTIFICATION

Immediately report to local and/or national authorities for mobilization of rapid response teams:

→ **Unusual cases of SARIs;**

→ **clusters of SARI;**

→ **excess cases of SARI.**

FLOW OF REPORTS

- The healthcare facility should immediately report to the appropriate local authorities any case or cluster of SARI that is determined to be unusual or unexpected. This report should rapidly trigger epidemiological investigation by the epidemiological surveillance rapid response team.
- Reporting unusual or unexpected SARI should follow the channels of information flow of the national surveillance system. The information should pass from the healthcare facility where it is generated up to the appropriate authorities at the central level (commonly the epidemiology department of the Ministry of Health), following the established channels of national surveillance for transmission of information and research.

Follow guidelines established at the national level for the flow of reports and investigation by the rapid response team.

INVESTIGATION OF AND ACTIVE FINDING OF SUSPECT CASES

This action is a responsibility of health secretariats at the level of the municipio, but when the healthcare facility treating the patient is the only healthcare unit in the municipio, it will have the responsibility for initiating epidemiological investigation, including active case-finding of additional suspect cases and initial control of the outbreak.

Initiating an investigation to identify additional cases beyond immediate contacts is fundamental for prevention and control of infection. The search for active cases should concentrate on:

- people that may have been exposed to the same source as that of the cases identified;
- people with exposures to animals, especially sick birds;
- people with unexplained SARI or people who have died of a unexplained febrile respiratory disease.

The strategy for case-finding in the area under investigation can focus on the community, through house-to-house visits (carried out by municipal surveillance) or on institutions, through telephone surveys of healthcare facilities, private physicians, and laboratories, or through review of records.

There should also be prepared a record of all co-exposed contacts and people, with demographic information, date of last exposure or date of contact with the case.

During the investigation, it is fundamental to prepare daily reports on the situation and establish effective and timely communication with relevant authorities at local and national level, and with other stakeholders (for example, the public and the communications media).

References:

1. OPS-CDC. Protocolo genérico para la vigilancia de la influenza, 2006.
2. World Health Organization. WHO guidelines for investigation of human cases of avian influenza A (H5N1). 2006. revised in 2007.(Accessed 9 April 2008, at http://www.who.int/csr/resources/publications/influenza/WHO_CDS_EPR_GIP_2006_4r1.pdf)

3. WHO. Alerta epidémica y respuesta. Plan mundial de la OMS de preparación para una pandemia de influenza. Función y recomendaciones de la OMS para las medidas nacionales antes y durante las pandemias. 2005.(Accessed 9 April 2008, at http://www.paho.org/spanish/ad/dpc/cd/vir-flu-plan-mundial-oms.pdf)
4. Centers for Disease Control and Prevention (CDC). Case studies in applied epidemiology. Influenza A(H5-N1) in humans: Surveillance and case management (international setting), December, 2007.
5. Centers for Disease Control and Prevention (CDC). FLU VIEW, a weeky influenza surveillance report prepared by influenza division. (Accessed 9 April 2008 http://www.cdc.gov/flu/weekly/)

10. LABORATORY

SARI can be caused not only by the influenza virus but also by other viruses, such as respiratory syncytial virus (RSV), Parainfluenza subtypes 1, 2 and 3 and Adenovirus. SARI can also be of bacterial origin. The only way of knowing with certainty the etiology of a case of ILI or SARI is by means of laboratory diagnosis.

Laboratory diagnosis of influenza is an important public health tool, for prevention, surveillance, containment, and therapeutic management. It is also required for identifying the circulation of the influenza virus and formulating compatible vaccines.

The sensitivity and specificity of the diagnosis method for influenza will depend on technical laboratory operation, the type of test used, and the specimen analyzed (the time it is taken, the sample quality, and the sample origin).

10.1 Laboratory Tests for Diagnosis of SARI and Influenza

Samples of nasopharyngeal secretion and blood for serology and hemoculture should be collected in all cases of SARI. Differential laboratory diagnosis of SARI is very broad. (Annex 6)

For diagnosis of influenza, several characteristics of the specimen are very important:

→ **Collection of samples within the first 72 hours of onset of symptoms.**

→ **Adequate specimen collection procedures.**

→ **Conditions of shipment and storage of samples before they are processed in the laboratory**

The virus influenza is replicated primarily in epithelial cells of the respiratory tract. For this reason it is necessary to capture cells in taking samples of material and not only secretion.

The most used respiratory specimens are:

→ **Nasopharyngeal swab**

→ **Nasopharyngeal aspirate**

→ **Tracheal aspirate and broncoalveolar lavage are only used in special situations, according to medical criteria.**

Laboratory Tests (1)

- **Indirect immunofluorescence**

Samples are processed and are analyzed in the laboratory to detect the presence of viral antigens (*Adenovirus*, *Influenza* virus of types A and B, *Parainfluenza,* and respiratory syncytial virus) using the immunofluorescence test with monoclonal antibodies. The sensitivity of this technique varies from 70% to 100% and its positive predictive value is from 84% to 94%, reaching the maximum in periods of higher virus circulation. Ideally this technique is carried out using level 2 biosafety practices. However, in suspected cases of avian influenza, unusual or unexpected cases or outbreaks of SARI, the processing should be at level 2 biosafety, applying level 3 practices at the national reference laboratory. This is a test that can be carried out in some reference laboratories, although in general it is carried out by the public health laboratory.

- **Virus culture**

This is a method of high sensitivity and high utility for diagnosis of viral infections, when the specimens are high-quality. This is the gold-standard laboratory test for influenza. It can be carried out in a cell culture or in fertilized eggs. The test can give results in 2 to 3 days using immunological methods for reading the results, since immunofluorescence with the conventional system can take from 7 to 10 days. The culture performed in fertilized eggs allows isolation of the virus for vaccine production. The principal advantage of viral isolation is that this method amplifies the virus of the initial material and makes possible antigenic characterization with reference antibodies that is indispensable for the selection of the virus for vaccination, as well as tests of antiviral resistance antiviral. It is a test carried out in **National Influenza Centers (NIC) or in the Reference Centers for the Region.**

- **Molecular Techniques--Polymerase Chain Reaction (PCR)**

The PCR detects genetic material of the virus that is present in clinical samples and in viral cultures. The tests are based on amplification of the nucleic acid RNA. Another technique used is RT-PCR (in real time), with a more rapid result, although few laboratories are using this due to the cost of equipment. Sequence analyses of the virus permit study of its evolution and of the mutations that modify the antigenic sites for strain selection for the vaccine. This test is carried out in **National Influenza Centers of Influenza (NIC) or in the Reference Centers for the Region.**

- **Serological techniques**

The technique used is hemoagglutination inhibition (HI). It requires two paired serum samples from the patient (with 10 to 15 days difference among them). This allows checking seroconversion for a given viral strain. The test is carried out making use of a reference panel of antigens and antisera provided by the CDC.

- **Rapid Influenza Test**

There are three types of tests, those that only detect influenza A, those that detect influenza types A and B but do not distinguish between them, and those that detect influenza A and B and distinguish between the two types.

These are useful to support the investigation of outbreaks and initiate antiviral treatment within 48 hours of appearance of the symptoms Among the disadvantages are that they do not permit identification of viral subtype and the fact that they have low sensitivity, principally by comparison with viral isolation, which leads to results with false negatives and high cost. In addition, this is a low-sensitivity test in comparison with viral isolation.

10.2 *SAMPLING AND SHIPMENT TO THE LABORATORY* (2)(3)(4)(5)

Collect samples of these cases, sending them to the laboratory in a proper and timely way.

Important aspects for taking respiratory samples:

- Satisfy the definition of an unusual case of SARI
- Samples for isolation of respiratory viruses should always be taken. If possible collected during the **first 3 days** from appearance of the symptoms.
- The sample should be taken before administering antiviral drugs.
- Several samples should be collected on different days.
- **In children under 5, the ideal respiratory sample to take is that using the nasopharyngeal aspirate technique.**
- In adults and children over 5, the ideal respiratory sample is the nasopharyngeal aspirate, since it is more effective. However, it can be obtained through nasopharyngeal swab or nasal lavage. Directions for collection and management of respiratory samples are found in Annex 7.
- After being collected, the sample should be kept in ice until placed in the refrigerator.
- If samples for viral isolation are going to be transported to the laboratory within 2 days, they should be kept at 4˚ C, and transported to the laboratory promptly. Otherwise, the samples should be frozen to -70˚ C until they are transported to the laboratory.
- Avoid freezing and thawing of samples. Annex 8.

- The serum should be stored to 4˚ C for approximately a week but afterwards should be frozen to -20˚ C (see more detail in Annex 7 and Annex 8). Group paired samples, the 1st sample collected on the first 3 days and the 2nd sample during convalescence (10 to 15 days after the 1st sample).
- It is important in these cases to take an additional serum sample (10ml of blood), because of differential diagnosis with other pathologies.

References:

1. World Health Organization WHO. Role of laboratory diagnosis of influenza.
2. World Health Organization (WHO). Guidelines for collection of clinical specimens during field investigation of outbreaks, 2000.
3. Control Diseases Center (CDC). Rapid response for avian pandemic influenza. Module 5: Laboratory Diagnostics, Specimen Collection, and biosafety issues. Training of trainers workshop Bangok, Thailan July 17-21, 2006.
4. World Health Organization (WHO). Guidelines for The storage and transport o human and animal specimens for laboratory diagnosis os suspected avian influenza A infection. January 2005.
5. World Health Organization (WHO). Guidelines for Collecting, preserving and shipping specimens for the diagnosis of avian influenza A(H5N1) virus infection Guide for field operations, October 2006.

11. INFECTION CONTROL

11.1. *Principles of Infection Control*

The model of the epidemiological chain with its three links, going from the infectious agent up to the susceptible host, through a more or less simple transmission mechanism, helps in understanding how infection occurs and also makes for rapid comprehension of the control mechanisms available, by breaking any of the links of the chain.

- The first link is **the infectious agent** in the reservoir and/or source of infection.
- The second link of the epidemiological chain is **the transmission mechanism**. Infectious agents leaving the source of infection reach the entry point to the susceptible host through one or more transmission mechanisms.
- The third link is **the susceptible host**. When the infectious agent reaches the host, it must find contributory mechanisms for producing the infection.

11.1.1 Types of transmission

The types of transmission vary depending on the type of microorganism, and some can be transmitted through more than one route. The three most important ways of transmission are:

- **By Contact**

  Microorganisms are transmitted by direct or indirect contact with the patient or the environment of the patient. Direct transmission occurs when microorganisms are transferred from one person to another person without an object or a contaminated person as intermediary. Indirect transmission includes transfer of an infectious agent through an intermediary object or contaminated person. Precautions for contact also apply where there is presence of excessive drainage from wounds, fecal incontinence, or other discharges from the body that have greater potential for environmental pollution and a greater risk of transmission. In addition to transmission by droplets, some respiratory pathogens, for example, parainfluenza and respiratory syncytial virus (RSV), can be transmitted through contact; particularly contamination of the hands and auto inoculation in the conjunctiva or the nasal mucous membrane. Transmission by contact can also play a role in infections by SARS and avian flu A (H5N1).

- **By Droplets**

  Transmission by droplets implies contact with the conjunctiva or with the mucous membranes of the nose or mouth of a susceptible person, and droplets of particles that contain microorganisms coming from a person who has a clinical disease or is a carrier of a microorganism. Droplets are generated mainly in the person-source when the person coughs or sneezes or during conversation. Droplet transmission requires close contact between the source person and the receptor person, because droplets do not remain suspended in air and usually only travel short distances (approximately three feet or 1 meter) through the air. Respiratory pathogens that are transmitted through droplets include adenovirus, human flu, SARS, and avian flu A (H5N1).

Based on epidemiological patterns of transmission of the influenza virus, transmission by droplets has been considered to be the most important transmission route.

- **By air (aerosols)**

  Pathogens transmitted through the air are transmitted through inhalation of droplet nuclei that continue to be infectious over a great distance (more than 1 meter), and require special systems of air management and ventilation (for example, negative pressure rooms). Their transmission is classified as**: required airborne transmission,** *Mycobacterium tuberculosis* that causes lung tuberculosis and **preferential airborne transmission,** referring to respiratory pathogens that can also be transmitted through other routes (for example, measles).

  Under special circumstances, the transmission of droplet nuclei over short distances could occur with human flu, and perhaps with other respiratory viral infections, for example, during procedures that generate aerosols in rooms that are not adequately ventilated or that do not make adequate use of personal protective equipment (PPE) (for example, SARS). This type of transmission has been known as "opportunistic airborne transmission," and is not the same as the classical airborne transmission that involves transmission over a great distance.

11.1.2 Routine precautions for infection control

Standard Precautions

Standard precautions are **routine** precautions for infection control, which should be applied for **ALL** patients, in **ALL** health contexts.

These have the purpose of minimizing the spread of infection associated with healthcare and avoiding direct contact with blood, bodily fluids, secretions, and non-intact skin of patients. The SARS outbreak in Hong Kong in 2003 illustrated the critical importance of basic precautions for infection control in healthcare facilities. Generally the transmission

of SARS in a healthcare facility is associated with lack of compliance with standard precautions.

The threat of emerging respiratory infectious diseases implies that promotion of standard precautions is more important than ever, and should be a priority in all healthcare facilities.

Hand hygiene

Hand hygiene is one of the most important measures for preventing and controlling spread of disease in health facilities and it is a principal component of the standard precautions. Although it is a simple procedure, numerous studies have demonstrated that compliance with hand hygiene is low. The use of alcohol-based hand solutions has been implemented in health facilities in recent years in an attempt to increase compliance with hand hygiene. The principal points are:

- Routine hand hygiene includes washing the hands with water and liquid soap (avoid bar soap) and using an individual towel for drying (do not use hand dryer); alternatively, if the hands are not visibly dirty, using an alcohol-based hand solution with 60% or 70% concentration
- If the hands are visibly dirty or spotted with blood or other bodily fluids, or if injured skin could have been exposed to potentially infectious material, hands should be washed thoroughly with water and soap.

Indications for hand hygiene:

- Before and after direct care of a patient.
- Immediately after taking off gloves.
- Before handling an invasive device that does not require a surgical procedure, including central intravascular catheters, urinary catheters, or peripheral vascular catheters.

- After touching blood, bodily fluids, secretions, excretions, non-intact skin, or contaminated elements, even if gloves are used.
- When going from a contaminated body part to a clean body part of the same patient, during patient care.
- After contact with inanimate objects in the immediate proximity of the patient.
- After using the bathroom.

11.1.3 Precautions based on the type of transmission

Diagnosis of many infections requires laboratory confirmation. Since diagnostic tests often require two or more days for their results, **precautions based on transmission should be implemented while waiting for the results, based on the clinical presentation and on possible pathogens.** The use of appropriate precautions based on transmission at the time that the patient develops the symptoms or signs of infection, or upon arriving at the health facility, reduces the opportunities for transmission to others.

Precautions for contact, for droplets, and for airborne transmission are elaborated in detail in the following section.

Discontinuation of precautions based on the type of transmission:

These precautions should remain in effect over limited periods (for example: while the risk of transmission of the infectious agent persists or during the natural history of disease). For the majority of infectious diseases this duration reflects known patterns of persistence and elimination of the infectious agent associated with the natural history of the infection and its treatment.

11.1.4 Use of Personal Protective Equipment (PPE)

PPE should be used in the context of other strategies for prevention and control, and according to recommendations for infection control (for example, standard precautions for contact, droplet, or airborne transmission).

- **Appropriate training should be given on the use of PPE**.

- Provision of adequate supplies of PPE should be a national and institutional priority.
- Recycling of disposable PPE should be avoided. It is not known whether using disposable PPE again gives the same efficacy and safety of protection as using new PPE, and recycling can increase the risk of infection for healthcare workers.

If resources are limited and disposable PPE is not available, one can use material that can be reused (for example, cotton gowns that can be disinfected), and disinfect them adequately after each use.

In order to avoid wastage, critically evaluate the situations in which PPE is indicated using the analysis in **Table 3**, and take the maximum clinical precautions during each visit to the room of a patient.

- **Selection of PPE on the basis of risk assessment**
  - Routinely evaluate the risk of exposure to bodily substances or contaminated surfaces before any planned healthcare activity.
  - Select the PPE on the basis of the risk assessment.
  - Have adequate PPE available for the case of an unexpected emergency.
- **Gloves**
  - Gloves should be used whenever contact is foreseen with blood, bodily fluids, secretions, excretions, mucous membranes, or non-intact skin. Change gloves between tasks and procedures for the same patient.
  - If the supply of gloves is limited, reserve them for situations in which there is probability of being in contact with blood, respiratory secretions or bodily fluids, including procedures that generate aerosols associated with a defined risk of pathogen transmission.
  - Carry out hand hygiene immediately after removing gloves.
- **Protection of the face**
  - Use face protection, including a medical mask and protection for the eyes (safety glasses, facial protectors) to protect the conjunctiva and mucous membranes of nose, eyes, and mouth during activities that have a possibility of generating splatters or aerosols of blood, bodily fluids, secretions, or excretions. When one is

treating and is in close contact with a patient with respiratory symptoms (for example, cough or sneezing), there can be sprays of secretions and ocular protection should be used.

- **Gowns**
  - Use gowns to protect the skin and to avoid soiling of clothes during activities with a possibility of generating splatters or aerosols of blood, bodily fluids, secretions, or excretions.
  - Select a gown adapted for the activity and the amount of fluid that is expected. If the gown being used is not resistant to liquids, a waterproof apron should be used if splatter or sprays with potentially infectious material is expected.
  - If the supply of gowns for health workers is limited, their use should be prioritized for carrying out procedures that generate aerosols associated with a defined risk of pathogen transmission and for activities that involve being close to the patient (for example, in a pediatric environment), or when other prolonged and direct contacts with the patient are anticipated.
- **Medical masks**
  - Medical masks should remain adjusted to the face of the user and should be discarded immediately after use. If the mask is soaked or soiled with secretions, it should be changed immediately.
- **Ocular protection**
  - Conventional glasses are not designed to protect the ocular mucous membrane against splatters and should not be used as protection of the eyes.
  - Reusable ocular protection equipment (for example, safety glasses, facial protectors) can be used. However, this can pose a potential risk of cross infection if they are not adequately cleaned and decontaminated after each use according to the manufacturer's instructions. Cleaning should precede disinfection. Hand hygiene should be carried out after discarding or cleaning ocular protection equipment that may be contaminated with splatters or aerosols.

PPE has the purpose of giving protection to the user but should not produce a greater risk for other individuals nor for the environment. PPE supplies can be limited and their

recycling may be unavoidable, but recycling should be carried out in safety conditions. Furthermore, unnecessary use of PPE should be avoided.

11.1.5 Handling of Corpses

Removal of body from the isolation room or area

According to standard precautions, use PPE to avoid direct contact with bodily fluids.

Cultural sensitivity is required. If the family of the patient wishes to see the body after it has been taken from the isolation room or area, this can be permitted, applying standard precautions.

11.1.6 Structure for Infection Control in the Healthcare Facility

Infection control strategies in healthcare facilities are generally based on the following types:

- **Reduction and elimination**

Examples of reduction and elimination are promotion of respiratory hygiene and cough etiquette as well as treatment to make the patient noninfectious.

- **Management controls**

These include establishment of infrastructures and activities for sustainable infection control, clear policies on early recognition of SARI of potential concern, implementation of adequate measures for infection control, among others.

- **Environmental and engineering controls**

The latter include methods for reducing the concentration of infectious respiratory aerosols (for example, droplet nuclei) in the air: adequate environmental ventilation (≥ 12 ACH), spatial separation between patients (> 1m) between patients, reduction of the presence of surfaces and contaminated elements according to the epidemiology of the infection.

These types of control are closely interrelated. They should be integrated to promote an institutional climate of safety, the basis of safe behavior.

Summary of Key Aspects of Infection Control in Healthcare Facilities

1. **Isolation, and limitation of movement of cases and limitation of visitors**; by means of identifying and separating patients by symptoms; hospitalize only the severe cases. Identify the appropriate structure: good ventilation, a single process flow. Discontinue non-essential services.
2. **PPE: at the very least, standard precautions;** mask, gloves, gown, eye protection, if necessary, depending on the type of pathogen and the type of exposure (expected risk).
3. **Emphasize hand hygiene.**
4. Emphasize **cleaning, disinfection, and sterilization.**
5. **Appropriate management of waste,** especially of contaminated material.
6. **Protection for health workers and family members who take care of the patient**: prophylaxis when indicated (example, in case of contact without protection), health surveillance, education: respiratory hygiene, hand washing, social distancing
7. **Proper management of corpses**

References:

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2. Infection Prevention and Control of epidemic- and pandemic-prone acute respiratory diseases in health care, WHO Interim Guidelines. WHO/CDS/EPR/2007.
3. Control de infección. Precauciones estándar. Política de aislamientos, *Infection control. Standar precautions. Isolation policy*, T. Rubio, J. García de Jalón, F. Sanjuan, M.A. Erdozain, J.I. Sainz de Murieta, E. Escobar Anales, Universidad de Navarra, Spain 2000.

11.2 SPECIFIC PRECAUTIONS FOR UNUSUAL OR UNEXPECTED SARI

These guidelines concentrate on infection prevention and control measures of respiratory infections that:

- cause acute respiratory tract infection, including pneumonia and acute respiratory distress syndrome;

- cause severe diseases in susceptible people with apparently normal immune systems;
- can constitute a public health emergency of international concern as defined by IHR-2005.

The fundamentals of infection control in care of patients with unusual or unexpected SARI include:

- Early and rapid recognition of suspected cases.
- Application of standard precautions for infection control.
- Additional precautions in selected patients (on the basis of the presumed diagnosis).
- Establishing an infection control infrastructure for healthcare facilities.

11.2.1 Early recognition, isolation, reporting, and surveillance of episodes of unusual or unexpected SARI:

These are extremely critical activities for preventing dissemination of unusual or unexpected SARI, which have been widely covered in other sections. This section focuses on prevention and control measures that are applied as soon as the suspected case is identified. :

- **Action algorithm:** This should be established and be known to all staff who work in entry points for patients into the healthcare facility, to ensure early recognition and proper management of people with possibilities of having a SARI of epidemic or pandemic potential.
- **Rapidly strengthen infection control precautions when there is a suspicion of an unusual or unexpected SARI (see Table 3).**
- **Isolation:** all patients with suspicion or confirmation of an unusual or unexpected SARI should be located in a room or area separated from other patients and be evaluated as rapidly as possible.

- **During care prior to hospitalization and during transportation of these patients there, procedures that generate aerosols should be avoided,** since they are associated with a defined risk defined of pathogen transmission (for example, intubation), unless this is clinically necessary to preserve life. During transportation, optimize ventilation in the vehicle to increase the volume of exchange of air (for example, opening the window). Whenever possible, use vehicles that have separate compartments separated for driver and patients.

The principles of infection control are the same throughout the entire sequence of healthcare. Areas that require particular attention are the following:

Emergency and Outpatient Care Areas.

For these the following is recommended:

- Put up notices to alert people with severe acute febrile respiratory disease to report it immediately to healthcare personnel and implement the respiratory hygiene and cough etiquette:[3]
- Evaluate patients with acute febrile respiratory disease as rapidly as possible.
- Consider processing outpatients with acute febrile respiratory disease in different locations than other patients, either totally separated, or at least ≥ 1 m (3 feet) between every patient in the waiting room.
- Provide paper handkerchiefs in the waiting room for containing respiratory secretions from coughing or sneezing whenever possible. Provide receptacles for discarding used handkerchiefs (if possible, receptacles that do not need to be touched).
- If possible, provide masks for people with acute febrile respiratory disease when they are admitted, but if these are not available, alternatives may be used to replace them

[3] http://www.cdc.gov/flu/protect/covercough.htm

- Promote hand hygiene after contact with respiratory secretions and provide facilities for hand hygiene (for example, washstands equipped with water, soap and disposable towels, alcohol-based solution with a concentration of 60% to 70%) in the waiting rooms, if possible.
- Eliminate or reduce the use of objects shared by patients, such as pens, paperclips, telephones, etc.
- Make sure that equipment used for patient care is cleaned and disinfected between patients.
- Healthcare workers should implement standard precautions and droplet precautions when providing care, in close contact, to patients with acute febrile respiratory disease.
- If a patient with confirmation or suspicion of being infected with a SARI of epidemic or pandemic potential is referred to another healthcare facility, report this to the reception personnel at the healthcare facility so that necessary precautions can be taken for infection control.

If it is known that there have been cases of unusual or unexpected SARI admitted at the facility or in other healthcare facilities in the area, in addition to the previous measures, also implement the following:

- Establish criteria for triage for rapidly identifying people having a risk of infection with an unusual or unexpected SARI.
- If there is suspicion of an unusual or unexpected SARI, the healthcare worker should use the appropriate PPE (see Table 3), depending on availability.
- High-risk procedures that generate aerosols in patients with SARI should not be carried out in an outpatient environment, unless it is necessary for saving life and there is no alternative.
- If such as procedure is carried out, it should be in a separate and well-ventilated room, and the healthcare worker involved should use adequate PPE.

- After a patient with confirmed or suspected unusual or unexpected SARI has left the outpatient care environment, clean and disinfect environmental surfaces in the physician's office or other areas where the patient was and clean and disinfect any equipment used to treat the patient.

11.2.2 Isolation Precautions

When treating patients with SARI, adequate isolation precautions should be taken. In addition to the application of standard healthcare precautions, other additional precautions should be applied depending on:

- presence of epidemiological and clinical signs that suggest that patients have an unusual or unexpected SARI;
- presumed or confirmed causative agents of SARI; and
- type of contact with the patient.

The majority of acute respiratory infections are transmitted mainly through droplets, but in some cases other forms of transmission can have an important role. The type of precautions for infection control should be adjusted accordingly (Table 3). Furthermore, transmission of some of these infections has been associated with specific procedures such as those that generate aerosols. The latter have the potential to increase the risk of infection transmission. Greater personal protection is justified, at least for those procedures with a documented increase of risk of infection transmission (see table 1).

11.2.3 Isolation and special measures for unusual or unexpected SARI

- Due to the risk of transmission, whenever possible suspect patients should be isolated in individual rooms.
- When individual rooms are not available, groups of patients infected or colonized with the same pathogen should be grouped in a single room or wing, whenever possible, in order to implement isolation measures.

- The number of people assigned to the isolation unit or area, or for special measures, should be limited to the minimum necessary for care and support of the patients.
- Whenever possible, the healthcare worker assigned to care for units with patients with unusual or unexpected SARI or unexpected should be experienced and not rotated or also assigned to other patient care areas. Monitoring the appearance of symptoms similar to influenza in all healthcare workers exposed to these patients is recommended, up to 7 to 10 days after the last possible exposure to a patient with unusual or unexpected SARI (model Annex 10).
- Consider having designated portable X-ray equipment available in the assigned areas.

Table 1.

Procedures That Generate Aerosols:

In this document reference is made to implementation of the following procedures in patients with SARI:

- Intubation and related procedures (for example, manual ventilation, aspiration);
- cardiopulmonary resuscitation;
- bronchoscopy;
- surgery and autopsy.

Additional precautions for healthcare workers that carry out procedures that generate aerosols in patients with SARI seem to be justified.

A.1.1 PPE for procedures that generate aerosols

The PPE should cover the torso, the arms, the hands, the eyes, the nose and the mouth, and should include a long-sleeve gown, disposable gloves, ocular protection (for example, safety glasses, facial protectors) and respiratory protection. The use of a cap for the hair is optional.

A particle respirator with at least N95 protection certified by the National Institute for Occupational Safety and Health (NIOSH), EU FFP2 or equivalent is the minimum level of respiratory protection required for healthcare workers who carry out procedures that generate aerosols with a greater documented risk of transmission of respiratory pathogens.

A.1.2 Environmental controls for procedures that generate aerosols

Carry out the procedure in an adequately ventilated individual room and far from other patients.

For patients with unusual or unexpected SARI who high-flow oxygen or ventilation with non-invasive positive pressure, add an outlet with a filter for bacteria/virus (for example, HEPA filter) to reduce emission of aerosols.

For the patients with unusual or unexpected SARI who receive ventilation with intermittent positive pressure, filter filters for bacteria/virus (for example, HEPA filters) can be connected to the respiratory support system, and, whenever possible, use a closed system for tracheal aspiration to take up respiratory secretions.

ADDITIONAL PRECAUTIONS IN SELECTED PATIENTS (ON THE BASIS OF A SUSPECT DIAGNOSIS)

11.2.4 Precaution against Droplets

Respiratory pathogens that are transmitted through droplets include **adenovirus, human flu, SARS and influenza type A (H5N1).** During an influenza pandemic it is expected that the circulating human virus will be transmitted just as seasonal influenza viruses, and as a result droplet precautions should be applied in addition to standard precautions.

Droplet precautions include:

- **PPE**: Use of a medical mask if working within a radio of 1 m around the patient. For practical purposes, the use of a medical mask is recommended when entering the room of a patient.
- **Location of the patient:** in individual rooms or groupings of patients with the same etiological diagnosis. If a diagnosis of the etiology is not possible, patient should be grouped by similar clinical diagnoses and on the basis of epidemiological risk factors, with a spatial separation greater than or equal to 1 meter.
- **Transport of patients:** limit the transfer of patients; patients should use a medical mask when outside their rooms.

11.2.5 Contact Precautions

In addition to droplet transmission, some respiratory pathogens [for example, **parainfluenza and respiratory syncytial virus (VRS),** SARS, and influenza type A (H5N1)] can be transmitted through contact; particularly contamination of the hands and auto inoculation in the conjunctiva or nasal mucous membrane. Contacts precautions include:

- **PPE:** (put on when entering the room and remove it when leaving)
- **Gloves: Clean, non-sterile latex gloves should be used and discarded after every contact with the patient. Change the gloves between tasks and procedures for the same patient.**
- **Gown:**
    - One can use a disposable gown made of synthetic fiber, or a gown of washable cloth. Ensure that gowns are of the size needed to completely cover the areas to be protected.

- Gown should preferably be used once and then placed in a receptacle for waste or clothes to wash, as appropriate, and hand hygiene should be observed.
- Aprons should only be used when the gown is permeable in order to reduce penetration of fluids. They should not be used only for preventing contamination by contact.

- **Equipment and environment**
  - If possible, use disposable equipment or instruments or designate instruments such as stethoscopes, blood pressure cuffs, thermometers, etc., for patients for whom contact precautions are being applied. If it is necessary to share the equipment among patients, it should be cleaned and disinfected after use with each patient.
  - Healthcare workers should avoid touching their eyes, nose, or mouth with their hands with or without gloves, since these potentially be contaminated.
  - Avoid contaminating environmental surfaces that are not directly related to patient care (for example, door handles, light switches).

- **Location of patients:** using individual rooms or forming groups of patients with the same etiological diagnosis can facilitate implementation of infection control measures. In rooms with multiple patients, maintain a spatial separation of at least 1 meter between the beds.
- **Transport of patients**: limit the transfer of patients; contact with uninfected people should be minimized.

*11.2.*6 Prevention of Airborne Transmission

For pathogens transmitted by air, the following should be added to the standard precautions:

- **PPE:** Upon entering the room or area of isolation or when treating a patient with an infection regularly or sometimes transmitted through air in other environments, use a particle respirator with a least a level of protection equivalent to a N95 NIOSH certificate.

- **Patient location (Table 2):**
    - Place the patient in a room for prevention of airborne transmission.
    - If a ventilated isolation room is not available, put patients in well-ventilated separate rooms.
    - If individual rooms are not available, form groups of patients by the same etiological diagnosis in well-ventilated places.
    - Procedures that generate aerosols with pathogen transmission should be carried out using appropriate PPE in a room for prevention of airborne transmission.

Transport of patients: limit the transfer of patients; Patients should use a medical mask outside their room or area. Subsequently, the vehicle used for the transfer should be disinfected.

Table 2 **Environmental Ventilation**
– The purpose of ventilation[4] is to maintain good indoor air quality, that is to ensure that the indoor air is safe to breath. The majority of respiratory diseases (for example, **virus parainfluenza, RSV, influenza virus**) do not spread easily by air over great distances in a health environment, and patients can be housed adequately without controls for ventilation of the environment.
– However, since **some SARI can be airborne, especially through opportunistic airborne transmission, airborne transmission precautions should be implemented for patients who are infected (or suspected of infection) with a new agent causing an** unusual or unexpected **SARI until the mode of transmission is clarified**.
– As a result, if there are rooms with airborne transmission precautions, these patients should be placed there. If the facility does not have this kind of room, one should consider locating these patients in adequately ventilated individual rooms, that have ≥ 12 ACH but not necessarily controlled directional air flow.

Precautions for control of diseases that can be transmitted opportunistically through droplet nuclei

[4] Ventilation of the environment refers to the process of introducing and distributing external air, and/or treated recycled air in an adequate way, in a building or room. Ventilation and air conditioning are two different concepts.

For the majority of these diseases, precautions against droplets should be added to the standard precautions, and special measures should be taken for room ventilation and PPE during procedures that generate aerosols associated with the transmission of pathogens.

- **PPE:**
    - At the very least, use a well adjusted medical mask (surgical mask or procedures mask), on entering the room of the patient; the use of the mask is compulsory if working less than 1 meter from the patient.
    - When carrying out procedures that generate aerosols associated with transmission of pathogens, use a particle respirator that satisfies at least a protection level of N95 certified by NIOSH, EU FFP2 or equivalent, as well as gloves, gown and ocular protection (for example, protective glasses).

- **Location of patients:**
    - Rooms for prevention of airborne transmission are not compulsory. If they are available, they should be prioritized for patients with airborne transmitted diseases;
    - If possible, individual rooms should be used; if they are not available, groups can be formed according to etiological diagnosis. If etiological diagnosis is not possible, place the patients so that they have more than 1 meter of separation between them;
    - Procedures that generate aerosols associated with transmission of pathogens should be carried out in well-ventilated individual rooms.
    - Transport of patients: limit the transfer of patients; patients should use medical masks when they are outside their room or area.

When patents with unusual or unexpected SARI are treated, make sure that health

workers make proper use of personal protective equipment (for example, using supervisors).

Establish an infection control infrastructure for healthcare facilities as support for infection control activities:

The administration of healthcare facilities should promote and provide education about respiratory hygiene and cough etiquette for all health workers, patients, and members of the families of patients with acute febrile respiratory disease.

Respiratory hygiene / cough etiquette

For diseases transmitted through droplets and/or droplet nuclei, all individuals with respiratory symptoms should implement respiratory hygiene and cough etiquette. All individuals (health workers, patients, and visitors) with signs and symptoms of respiratory infection should:

- Cover mouth and nose upon coughing/sneezing;
- use paper or cloth handkerchiefs, cloth masks, or medical masks, if they are available, to control respiratory secretions at the source, and discard them in waste receptacles;
- use a medical mask on a person who is coughing or sneezing if it is tolerated and properly placed; and
- implement hand hygiene

11.2.7 Selection of Equipment for Respiratory Protection

Particle respirators:

- **Healthcare workers who treat patients infected by a microorganism with an unknown mode of transmission, or by a pathogen known to or suspected to be capable of airborne transmission**, or when procedures that generate aerosols are carried out, should select respiratory protection equipment of the highest possible level, preferably a particle respirator.
- Adjustment and sealing of disposable particle respirators are important for their effective functioning. If good adjustment and sealing are lacking, particles transmitted

through the air can be inhaled through filtrations, and the particle respirator may not be effective.

- The people who use particle respirators should receive training on how to use the device (for example, placement of the respirator, avoiding auto-contamination during use and removal, and ways of achieving a better seal). Hospitals should follow local regulations with respect to regular implementation of adjustment tests.
- The user should check the seal whenever using a disposable particle respirator.

Environmental controls: cleaning and disinfection

Cleaning **MUST** precede the disinfection. Objects and surfaces cannot be disinfected if they are not cleaned first of organic matter (excretions, secretions from the patients, dirt, spots, etc.).

- Cleaning should be carried out to avoid possible aerosol generation to avoid the possible aerosol generation. This process significantly reduces the environmental biological charge.
- Follow manufacturers' instructions for use/dilution, contact time, and management of disinfectants.
- Common hospital disinfectants include:
    - sodium hypochlorite (domestic bleach);
    - alcohol at 60% or 70% or >60%;
    - phenolic compounds;
    - quaternary ammonium compounds;
    - compounds of peroxygen.

Particular attention should be paid to:

- Cleaning of the patient-care environment.
- Equipment and instruments for patient care.
- Bedclothes and clothes to be washed.
- Waste management.

- Packing and transportation of equipment for patient care, bedclothes and clothes to wash and waste from isolation areas.
- All staff that handles equipment that has been used, dirty bedclothes, and waste should use standard precautions and carry out hand hygiene after removing the PPE.

11.2.8 Duration of Precautions for Infection Control

The duration of precautions for infection control varies according to the known or presumed infection period of the specific SARI. In the case of avian influenza in humans precautions should be implemented for infection control according to the age of the patient.

- Adults and adolescents of more than 12 years old–implement precautions at the time of admission and continue for 7 days from resolution of the symptoms.
- Babies and children of less than 12 years old–implement precautions at the time of admission and continue for 21 days after the beginning of the symptoms (young children can transmit seasonal flu virus for up to during 21 days).

Note: In immunocompromised patients, production of pathogens can be prolonged and there are no precise data to define the duration of the infection. Microbiological control is advised to determine the absence of detectable pathogens, whenever possible.

More recently emergent SARI

Implement precautions at the time of admission and continue until a week after symptoms have been resolved, or until there is laboratory evidence of absence of active infection. Precautions, including their duration, should be implemented according to the information available and recommendations of the local health authorities

11.2.9 Duration of Precautions for Infection Control

Removal of the body of the room/the area of isolation

- In accordance with the standard precautions standard, EPP will be used to avoid the direct contact with bodily fluids.

- Cultural sensitivity should be considered. If the family of the patient wishes to see the body after it has been retired of the room/the area of isolation, they do it applying the standard precautions.

Mortuary care

- The personnel of the funeral home and of burial should apply the standard precautions. That is, to disinfected hands adequately and to use the EPP appropriate (use of gown, gloves, protection of the face if there is risk of splatter of body fluids/secretions of the patient to the body and the face of the personnel.
- Embalmment can be carried out in accordance with the standard routine, subject to the regulations/ local legislation.
- A hygienic preparation of the corpse can also be carried out a (for example, clean the body, arrange hair and nails; shave) applying standard precautions.

Transmission of lethal infectious diseases associated with the mortuary care has been reported. However, the cultural context of the local community should also be respected. It is essential to evaluate the risk during the process of mortuary care, giving an adequate explanation to the family. If it is indicated, EPP should be provided to the family after instructing them about its use. Each family should be treated individually, making a balance between its rights and of the risks of exposure to an infection.

Postmortem examination

- Postmortem examination and the collection of samples for microbiological analyses are crucial for a better comprehension of the ARI. However, there is the risk of transmitting infections. Therefore, they should be carried out only when necessary and always observing the required safety measures. The appropriate safety measures to protect the people who conduct the examination should be implemented beforehand.
- In the procedure, the quantity of personnel should be kept at a minimum. It should only be carried out if:
    - a well ventilated room suitable for the procedure and the appropriate EPP are available.

Engineering and environmental controls for the autopsy

- Carry out autopsies in rooms well ventilated with ACH>12.

- Minimize aerosols in the autopsies room
    - avoiding the use of electric saws whenever possible;
    - avoiding splatters when removing, handling and/or to washing organs, especially pulmonary tissue and intestines;
    - using extracted ventilation to contain the aerosols and reduce the volume of aerosols liberated in the air of the environment. The extracted ventilation systems around the autopsy table should direct the air and the aerosols far from the health worker that carries out the procedure (for example, extraction with downward direction).
- The surfaces that have been contaminated with bodily or tissue fluids should be cleaned and be decontaminated as follows:
    - remove most of tissue or corporal substance with absorbent materials;
    - clean the surfaces with water and detergent;
    - apply the standardized disinfectant of the healthcare facility. If a solution with sodium hypochlorite is used, soak the surface and allow it to act by contact at least 10 minutes;
    - rinse thoroughly.

The safety procedures for people who died infected with an unusual SARI should be consistent with those used for any autopsy procedure. In general, the recognized dangers of the work in the autopsies room appear to arise from the contact with infectious materials, and particularly with splatters on the body surfaces of the health worker more than by inhalation of infectious material. However, if a patient with an unusual SARI died during the infectious period, the lungs and other organs can still contain live viruses. Therefore, additional respiratory protection is required during the aerosol-generating procedures of small particles (for example, use of mechanical saws, intestines washing). As a result, the examinations postmortem of these patients deserve special precautions with regard to the environment.

Table 3

Pathogen		Without an identified pathogen no risk factor of ARI of potential concern (that is, disease similar to flu but without risk factor of ARI of potential concern)	Pathogen					
			Bacterial ARI	Parainfluenza RSV & adenovirus	Flu virus with sustained transmission of human to human (for example, seasonal flu, pandemic flu)	New flu virus without sustained transmission of human to human (for example, avian flu)	SARS	New agents of ARI
Hand hygiene		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gloves		Risk assessment	Risk assessment	Yes	Risk assessment	Yes	Yes	Yes
Gown		Risk assessment	Risk assessment	Yes	Risk assessment	Yes	Yes	Yes
Ocular protection		Risk assessment	Risk assessment	Risk assessment	Risk assessment	Yes	Yes	Yes
Medical masks for healthcare workers and healthcare providers		Yes	Risk assessment	Yes	Yes	Yes	Yes	Not as routine
Particle respirator for healthcare workers and healthcare providers	For entry to the room	No	No	No	No	Not as routine	Not as routine	Yes
	Within 1 m of the patient	No	No	No	No	Not as routine	Not as routine	Yes
	For proc that generate aerosols	Yes	Not as routine	Not as routine	Yes	Yes	Yes	Yes
Medical masks for patients outside the isolation areas		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual room		Yes, if available	No	Yes, if available	Yes, if available	Yes	Yes	
Precaution room for airborne transmission		No	No	No	No	Not as routine	Not as routine	Yes
Summary of precautions for infection control for routine patient care, excluding procedures that generate aerosols		Standard precautions plus droplet precautions	Standard precautions	Standard precautions plus droplet precautions plus contact precautions	Standard precaution plus droplet precautions	Standard precautions plus contact precautions	Standard precautions plus droplet precautions plus contact precautions	Standard precautions plus airborne transmission precautions plus contact precautions

a. Bacterial SARI represents common bacterial respiratory infections caused by microorganisms such as *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Chlamydia* spp., and *Mycoplasma pneumoniae*.

b. When a new ARI has recently been found, the mode of transmission is usually unknown. Implement the maximum level of precautions available for infection control until the situation and the mode of transmission are clarified.

c. Take hand hygiene measures according to standard precautions.

d. Gloves and gowns consonant with standard precautions should be used. If the demand for gloves exceeds those available, the use of gloves should always be a priority during contact with blood and bodily fluids (unsterilized gloves), and contact with sterile sites (sterilized gloves).
e. If splatters of blood or other bodily fluids are foreseen and the gloves are not resistant to liquid, a waterproof apron should be used over the gown.
f. Healthcare workers should use protection for the face (medical masks and protection for the eyes) consonant with standard precautions if there are possibilities that the activities will generate splatters or spraying of blood, bodily fluids, secretions, or excretions onto the mucous membrane of the eyes, nose, or mouth, or if they are in close contact with a patient with respiratory symptoms (for example, cough or sneezing) and sprayings of secretions could reach the mucous membrane of the eyes, nose or mouth.
g. As of the date of this document, effective transmission between human beings of avian flue A is not known, and the evidence on hand does not suggest airborne transmission from one person to another. Therefore it is adequate to use a medical mask for routine care.
h. The current evidence suggests that transmission of SARS in a healthcare environment occurs mainly by droplet and direct contact. Therefore, it is appropriate to use a medical mask for routine care..
i. Some procedures that generate aerosols have been associated with a greater risk of transmission of SARS and tuberculosis (Table 6). To date, the risk of infection associated with procedures that generate aerosols in patients with SARI, SARI caused by rhinovirus, parainfluenza, RSV, and adenovirus has not been determined. At the very least, a well adjusted medical mask should be used.
j. If medical masks are not available, use other methods for control of the infection source (for example, cloth or paper handkerchiefs, or the hands) in case of cough or sneezing.
k. These are common pathogens in children, who may not be capable of complying with these recommendations.
l. Form groups of patients with the same diagnosis. If this is not possible, locate the patients in beds with a separation of at least 1 m at least from each other.
m. Rooms for prevention of airborne transmission can have natural or mechanical ventilation, with an adequate index of air circulation of at least 12 ACH and air flow with a controlled direction.
n. Rooms for prevention of airborne transmission, if they are available, should be prioritized for patients with infections with airborne transmission (for example, lung tuberculosis, chickenpox, measles) and for those with new microorganisms that cause SARI.

*For further details, see original document from which this information was taken.

Infection Prevention and Control of epidemic- and pandemic-prone acute respiratory diseases in health care, WHO Interim Guidelines. WHO/CDS/EPR/2007.

12. CASE MANAGEMENT

OBJECTIVE

Identify the basic actions that should be considered by the health facility for appropriate and safe management of sudden or unexpected cases of SARI or ILI.

DESCRIPTION

The current dynamics of travel by persons and technological advances have increased the possibility of man reaching remote locations rapidly. In addition, they have increased potential transmission of infectious agents. The most recent example was the SARS outbreak in 2003. In theory, this is also a latent possibility for any emerging disease. The following variables influence management of sudden or unexpected cases of SARI due to their potential to cause epidemics and/or pandemics:

- *There is clear evidence that **health workers are a high-risk group** and that **health facilities can easily become locations where infections are spread.*** For example, during the SARS epidemic, out of 138 cases of secondary and tertiary transmission in Hong Kong, 85 (62%) occurred in health workers (*1*). Out of 144 cases in Toronto, 73 (51%) were in health workers (*2*).
- The main purpose of appropriate and early case management is not only **recovery of the individual's health. It also plays an important role in control of the outbreak**.
- **Many countries have limited ability to rapidly increase their hospital capacity (human and logistic resources)** in the event of sudden emergence of a high number of cases. Consequently, **preparation** is a key part of the response.

This situation demands that the health workers in health facilities remain alert. They should be aware that an outbreak of sudden or unexpected cases of SARI could occur at any time and they should be prepared to manage this situation appropriately.

The sequence followed by a patient from the time of arrival at the health facility and admission until discharge due to recovery or death is shown below. In addition, the specific characteristics of appropriate management of a patient suspected of sudden or unexpected SARI have also been identified in each of these steps.

12.1 TRIAGE

Triage is the first step in case management. It is a systematic process that allows a patient to be classified based on his condition, which is then related to the type of immediate care the patient should receive.

The overall organization of the triage process depends on the magnitude of the problem. Treatment of a few cases is not the same as the wide-scale demand that might occur in an epidemic or pandemic. Accordingly, during a wide-scale outbreak, in some situations additional facilities or centers where initial screening of the patients can be conducted may be required in order to prevent overflow of the health facilities. For example, use of fever clinics during the SARS outbreak in Asia or hydration stations during the cholera outbreaks.

Action protocols must be developed and circulated at the hospital-wide level in order to separate and manage suspected patients in the emergency departments and other patient admission areas.

There are some useful general considerations for implementation of triage in the health facility (*7*):

- **The physical site of "triage"** should be located at the entrance to the emergency department. Suspected cases should be differentiated as of this time.
- A map of the emergency department that **clearly indicates the "triage" routes** should be prepared.

- **Suspected cases and their companions (preferably one for each case)** should be referred to a waiting room. It is advisable for the waiting room to be large and to have its own toilet facilities, in the event of a high number of cases.
- The waiting room should be equipped with devices for use of oxygen tanks in patients when required.
- The patient and his companion(s) should receive instructions on infection control and have surgical masks.
- Patients should receive care in the cubicles adjacent to the waiting room.
- The number of cubicles will depend on the needs and availability of the emergency department.
- A route to reach the diagnostic x-ray area in the emergency department should be defined. There should also be a route for intra-hospital transfer from the emergency department to the regular hospital floor if admission is required.

The objectives of triage are:

- Reduce the risk of transmission or contagion.
- Prioritize care, and define or assign the immediate destination of the patient (e.g., isolation, ambulatory management, other departments, home). All patients that undergo triage receive some type of care.
- Assign patients according to the required level of care in order to prevent unnecessary overload of the health facilities and inappropriate use of human and technical resources.
- Compile information that facilitates identification or subsequent location of the patient
- The following are the general steps of any triage. They are applied regardless of the triage scale that is routinely used in the health facility (if any).
- Determine the type and severity of disease (differential diagnosis).

When the patient arrives at the health facility, the following question is inevitably posed at the emergency department, outpatient office, and the hospital wards:

Does this patient have sudden or unexpected SARI? Based on this question, a systematic process should begin that leads to diagnosis, treatment, and the most appropriate management of the patient in the context of a comprehensive approach to care that includes factors such as biosafety variables, infection control, referral and counter-referral, and resource management.

It is important to clarify that the clinical characteristics aid in the diagnostic process. However, they are not sufficient to rule out or confirm a definitive diagnosis since the correlation with epidemiological data is an essential element for diagnosis (*4)*. Management of the suspected case of SARI is a key aspect that is directly influenced by the clinical, epidemiological, laboratory, and administrative variables of the health facility.

At any rate, as more cases are reported (e.g., in an outbreak or pandemic), the specificity and predictive value of the diagnostic impressions based on clinical manifestations are expected to improve.

The case definitions aid in the triage process for conducting patient management, particularly in outbreak situations. For this process, it is important to take into account the concepts of SARI that have already been defined. In addition, it should be taken into account that clinical and epidemiological criteria are fundamental variables when defining the therapeutic behavior for each case.

Clinical symptoms of sudden or unexpected SARI

The clinical manifestations are not specific, as shown in the following table that summarizes the case definitions. Rather, they are shared by many different infectious diseases. Therefore, it is always important to consider the characteristic of the clinical condition that makes it atypical, unusual, or unexpected, as described in the section on surveillance.

ILI	SARI[a]
Sudden fever >38ºC	Sudden fever >38ºC
Cough	Cough
Sore throat	Sore throat
	Dyspnea
	Pneumonia[b]

a Requires hospital management

[b]As criteria for IMCI in children under 5 years

Furthermore, it should be pointed out that the clinical symptoms may be accompanied by other concurrent symptoms that can occur in either of the two conditions:

Nasal Congestion	Weakness	Loss of Appetite	Headache	Myalgia
Diarrhea	Conjunctivitis	Altered state of consciousness	Vomiting	Seizures

Differential diagnosis

As in clinical management of any patient, in the event of unusual or unexpected SARI, several different possible diagnoses that could lead to appropriate therapeutic behavior should be considered. Some of the diseases to be considered in differential diagnosis are as follows:

Viral diseases associated with respiratory infection: Rhinovirus, Coronavirus, Parainfluenza, Influenza, Adenovirus, Respiratory Syncytial Virus	Other Viral Diseases: Mononucleosis, Hantavirus, Dengue, Cytomegalovirus	Leptospirosis, Typhoid Fever, Tuberculosis	Atypical Pneumonia: *Mycoplasma pneumoniae, Chlamydia pneumoniae, Chlamydia psittaci, Coxiella burnetii* (Q fever), Legionnaire's disease	Subacute Bacterial Endocarditis

Preexisting conditions

Some preexisting diseases can represent clinical conditions of greater severity than ILI and SARI. Consequently, health workers should take this into account in case management. Some of these conditions are:

- Diabetes
- HIV/immunodeficiency
- Heart disease
- Pulmonary disease
- Pregnancy

12.2 EVALUATION OF THE REQUIRED LEVEL OF CARE

Although it is a routine practice, it is mentioned here due to its importance. During or immediately after the triage process, the level of care required by the patient should be determined in accordance with the initial diagnosis and the severity of the condition. This process is of vital importance in order to *locate the patient as soon as possible* in the place where *the required level of care and biosafety* will be received (this could be in another facility). This evaluation is also important in order to *avoid overloading the health facility* and use the health care network rationally.

12.3 EVALUATION OF THE AVAILABILITY OF MEDICAL RESOURCES FOR MANAGEMENT

For the previous step, the resources available in the health facility should be known (e.g., trained human resources, isolation rooms or areas, equipment, supplies). The capacity of other facilities in the health care network as well as the operating procedures established for these cases by the facility management and/or the respective authorities should also be known in order to determine the need for referral to another institution that has the required resources.

12.4 NEED FOR PATIENT REFERRAL AND TRANSPORT

The evaluation of the steps of triage will determine whether or not the patient should be referred to another institution and, if so, in what conditions, according to the operating procedures of the health care facility and the respective authorities.

12.5 ORGANIZATION OF THE HEALTH FACILITY FOR CASE MANAGEMENT

Care for one or more cases of sudden or unexpected SARI in a health facility entails the joint and integrated effort of many persons with responsibilities in the facility (e.g., clinicians, administrative staff, logistic services).

- **Management of suspected cases:**

  The health facility should define and set aside an area exclusively for clinical assessment and management of suspected cases that ensures application of the infection control measures. Inpatient admission or hospitalization should ideally be done in a respiratory isolation unit. The human and physical resources assigned to management of the suspected case or cases should be set aside exclusively for care of such cases insofar as that this can be achieved based on the capacity and resources of the facility. In any case, standard and special infection control measures should always be followed.

Special attention is required in the following situations *(6)(7):*

- **Movement of the patient in the hospital facilities:** Logistics and resources should be available for this purpose. This implies use of a clear travel route, unobstructed elevator or ramps, and use of a surgical mask by the patient whenever possible. In all cases, patient transfer or movement within the hospital should be limited to that which is strictly necessary. All of the surfaces in contact with the patient during the transfer should be cleaned appropriately.

- **Sample collection for laboratory tests:** Etiological identification is a fundamental element for management of cases of unexpected SARI. Therefore, the health facility should ensure availability of the resources and mechanisms required for collection and subsequent processing of samples, either in their own laboratory or by safe and proper shipment of the sample to a reference laboratory. It should be pointed out that, in the event of wide-scale emergence of disease, it will no longer be necessary to collect and analyze samples of all of the cases.
- **Medical care and case treatment**: The health facility should attempt to maintain an inventory of appropriate drugs and case management protocols should be available.
- **Aerosol-generating invasive procedures:** In procedures such as bronchoscopy, tracheal intubation, or respiratory nebulizers, the health workers must use the complete personal protective equipment, including high efficiency N-95 respirators.
- **Patient transfer by ambulance:** Since they are narrow and poorly ventilated environments, the vehicles used for patient transport require special attention in terms of biosafety. Crew members should wear surgical masks at all times and persons who come into contact with the patient should use gloves. As an additional measure, the patient may also have a surgical mask. If the patient and the driver compartments are separated by a window, the separation should be maintained at all times during patient transfer and opening the window should be avoided. Only the crew members required for patient movement and care should come into contact with the patient. Therefore, if the driver has only been assigned to driving, he should not enter the patient compartment under any circumstances.
- After the transfer has been completed, before it is used for another transfer, the patient compartment and the equipment used should be cleaned and disinfected.
- **Patient referral and counter-referral:** It is essential to have a referral and counter-referral system for management of sporadic suspected cases and situations that require wide-scale care. In some situations the health facility will have to provide treatment or referral for cases of SARS because of its level of complexity. In order to do so, clear and timely communication about the case between the facility that makes

the referral and the facility that receives the patient is essential. All of the characteristics of the referral process should be specified: identification, diagnosis, treatment introduced, required biosafety conditions, companions, transfer time, and other items. The receiving facility will ensure the appropriate conditions for care of the case taking into account the infection control measures. When the patient arrives at the receiving facility, it is recommended that he/she be taken directly to the final destination that was the reason for referral (e.g., intensive care unit, operating room, radiology). The patient should not be stationed at transitory points that increase the risk of contagion to other persons. This is one of the subjects to be defined by the hospital.

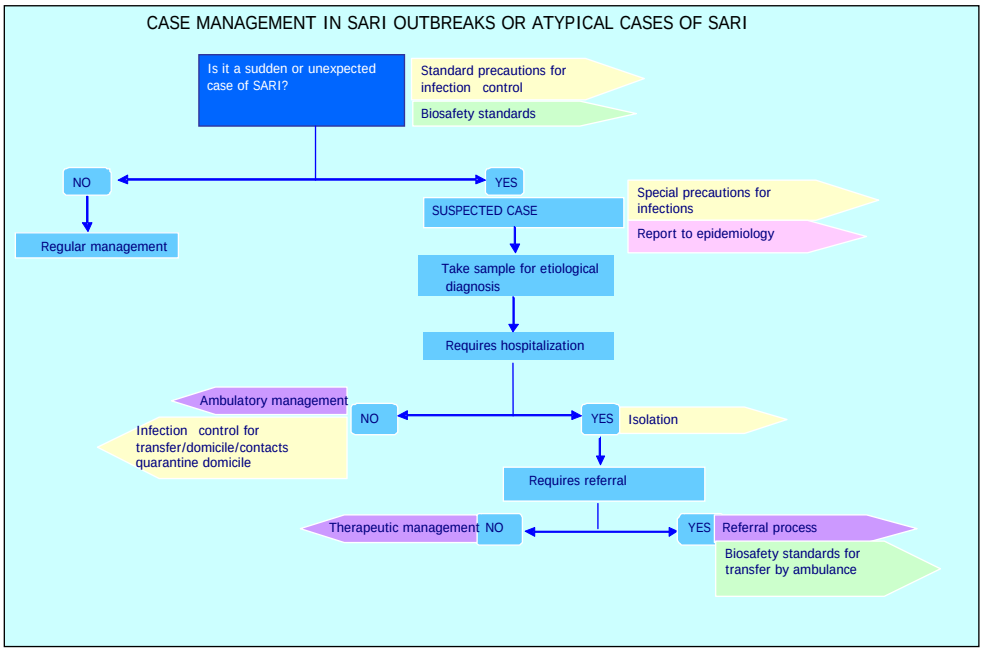
- **Companions:** If they are symptomatic, the companions of the suspected case should be considered to be contacts unless it has been demonstrated otherwise. Therefore, they should be supplied surgical masks for use. Unrestricted movement throughout the facility should be avoided until the Epidemiology Department establishes the guidelines to be followed. The infection control measures should be applied in the waiting rooms.
- **Visiting control:** The cases that have been hospitalized can receive visits from their closest family members. Admission of visitors should be rational and visitors should not be admitted indiscriminately. Visitors should wear a surgical mask and disposable gloves when they enter the patient's room. After visiting the family member, the mask and gloves should be discarded. Visitors should wash their hands before going through the rest of the facility.
- **Isolation rooms or areas:** Ideally the hospitalized cases should be located in individual isolation rooms. However, if the facility does not have such rooms, the patients should be assigned to individual rooms with the optimum resources nearby (e.g., toilet, nursing station). If there are several cases, the patients should be placed in cohorts in rooms or wards that only include these cases and a distance of at least 1 meter should be maintained between patients.

Whether they are in an individual room or a ward, natural or artificial ventilation conditions should ensure air exchange with the door closed.

The rooms or wards should have exclusive equipment (e.g., thermometers, sphygmomanometers, phonendoscopes) that is not shared with other areas that manage another type of patients.

- **Recommendations for health workers:** The health workers assigned to care for these cases should not have respiratory symptoms or fever. In addition, it is recommended that all staff be vaccinated each year with the seasonal influenza vaccine. Insofar as possible, an exclusive group of staff should be assigned to provide care for the suspected case or cases. Special emphasis should be placed on use of biosafety elements and hand washing. In situations with growing outbreaks, the health workers should be screened for febrile syndromes and their temperature should be taken when they enter the health facility.
- **Patient discharge:** The clinical staff of the health facility should also take into account the clinical progress of the patient and the epidemiological variables in order to ensure complete patient recovery and prevent the risk of contagion to other persons. Therefore, the incubation and contagious periods for the different etiologic agents that are capable of producing sudden or unexpected cases of SARS should be considered. For example, for cases of pandemic influenza in patients over 12 years of age it is recommended that infection control measures should be maintained for 7 days after resolution of the symptoms. For cases in patients under 12 years, the measures should be maintained for 21 days.
- **Mental health:** Protection of mental health[8] is an aspect that should not be overlooked when managing cases of respiratory disease with epidemic or pandemic potential since the stress, isolation, and uncertainty can easily lead to conditions that affect the patient's psychological structure and further complicate the cases. Consequently, a health team should be trained to offer psychological support that modulates the patient's condition and contributes to improved self-care as well as precautions to prevent contagion of other persons.

  In order to simplify this situation, a case management algorithm that summarizes the basic components the health facility should prepare and perform is shown below.



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13. VACCINES AND ANTIVIRAL DRUGS

13.1 VACCINES

In the event of a possible influenza pandemic due to a new virus, the directives and guidelines regarding use of the influenza vaccine and antiviral drugs should be known, including general recommendations as well as treatment and prophylaxis.

Availability of vaccines and antiviral drugs would facilitate mitigation of the effects of a pandemic. However, it is accepted that timely availability of the required amounts may be difficult to achieve. Therefore, use and distribution should be based on well-structured analyses and processes that are specific to each region and country.

Seasonal influenza vaccines have been available for over 60 years, especially in developed countries (*1)*. In this period their safety and efficacy have been demonstrated. In populations with risk of severe complications, it is well-known that vaccination reduces hospital admissions and deaths. Therefore, vaccination is the cornerstone of influenza prevention. Since the influenza viruses evolve constantly, vaccines are produced every year. Vaccine composition is based on the most important strains of the virus that have been identified by the worldwide surveillance system. Storage of vaccines as a preparatory measure for a pandemic is not a viable option since vaccine composition depends on the causative virus. It is necessary to wait until the virus emerges and is identified at the beginning of the pandemic. At this time, the vaccine supply will be limited. In some parts of the world vaccines may not be available.

The vaccines for seasonal influenza virus are usually produced by growth of the virus particles in fertilized chick embryos. The period from the time of identification of the strain until the vaccine is available is approximately 6-8 months.

Twice a year, in February for the Northern Hemisphere and in September for the Southern Hemisphere, WHO organizes a consultation with the directors of the collaborating centers and representatives from the national laboratories in order to provide recommendations on the composition of the trivalent vaccine, which contains a

type A/H3N2, type A/H1N1, and type B virus. Since 1972, WHO has recommended 39 changes in the formulation of the influenza vaccine.

The PAHO Technical Advisory Group on Immunization recommends to the countries that they vaccinate against **seasonal influenza** in the risk groups defined by WHO. PAHO also promotes vaccination of children aged between 6 and 23 months. Vaccination of these risk groups has been found to be one of the most cost-effective public health interventions.

Another advantage of more widespread use of the seasonal vaccine is that it will help increase the production capacity required to respond to a pandemic. In principle, the same technology that is available would be used to produce a vaccine against a pandemic strain.

Risk groups defined by WHO in Weekly Epidemiological Bulletin No. 33 of 19 August 2005, by order of priority, in order to reduce incidence of severe forms of disease and premature death:

1. *Residents of facilities for the elderly and disabled*
2. *Elderly persons who do not live in health care facilities but have chronic heart or lung diseases, metabolic diseases, neuropathies, or immunodeficiencies*
3. *All persons over 6 months of age with any of the aforementioned diseases*
4. *Persons older than the national age limit, regardless of other risk factors*
5. *Other groups defined based on data and national capacity, such as the contacts of high-risk persons, pregnant women, health care professionals and other persons responsible for essential social services, and children aged between 6 and 23 months.*

In the event of an **influenza pandemic**, since there are limitations on vaccination of the entire population, the countries could consider vaccination of certain population groups to be a priority. Evolution of the pandemic in each country should be analyzed on an ongoing basis in order to provide for vaccination of the groups that are affected the most. The groups to be considered are:

1. Persons responsible for essential services (in order to prevent interruption of services during the pandemic): health workers in areas of clinical care, essential staff for production of vaccines and drugs, workers from retirement homes and

facilities for chronically ill patients, police, fire department, armed forces, and personnel in charge of other public services.

2. Persons with high risk of influenza-related mortality: residents of facilities for the elderly or the chronically ill, persons over 65 years of age with chronic heart and lung diseases, pregnant women in the second or third trimester of pregnancy, children from 6 to 23 months of age, persons between 6 months and 18 years of age receiving chronic treatment with aspirin, other vulnerable groups such as indigenous communities that live in isolation, as well as others.
3. Persons in close contact with high-risk persons: health workers and retirement home staff, families in daily contact with high-risk persons, and persons in daily contact with children from 0 to 5 months of age.
4. Children of preschool and school age, who are considered to spread disease in the community.
5. Persons without risk factors for complications: This is the largest population group, and it includes adults and healthy children. The main objective is to reduce the demand for medical services, allow individuals to continue their daily activities, and prevent greater social disruption. This decision depends on the availability of the vaccine and the epidemiological situation.

13.2 ANTIVIRAL DRUGS

Although the indication of antiviral drugs for respiratory viral processes and especially influenza has been known for several years, use and prescription of these drugs is not widespread in the countries of Latin America and the Caribbean. The advantage of this situation is that antiviral resistance in the Region will probably not be a major problem when use of these drugs begins. However, on the other hand, it must also be acknowledged that since the medical community is not very familiar with use of these drugs, the process of introduction of use could be complicated.

The antiviral drugs used at present would probably be effective for prophylaxis and treatment of disease caused by a new pandemic virus. However, the reserves would be depleted rapidly in the first part of the pandemic, when the vaccine is not yet available and there is greater demand for an alternative control method. Once they are available, the vaccines will continue to be the primary means of prevention of influenza. However, antiviral drugs will be used in special situations.

Antiviral drugs can be used in prophylaxis or treatment. For treatment, they should be administered as soon as possible (within 48 hours). This is expected to reduce the duration of the disease by one day in healthy adults. In addition, when they are used in prophylaxis, antiviral drugs reduce the risk of developing influenza by 60 to 90%. When they are administered to household contacts, they prevent 80% of the cases of influenza and reduce the severity of the symptoms.

There are two groups:

M2 ion channel inhibitors	Amantadine Rimantadine
Neuraminidase inhibitors	Oseltamivir (Tamiflu ®) Zanamivir (Relenza ®) Peramivir (investigational frug)

At present use of neuraminidase inhibitors for treatment as well as prophylaxis of patients with influenza is recommended.

If possible, antiviral treatment should be introduced within 48 hours after onset of the symptoms. However, it can be considered after this period in persons with severe influenza or high risk of complication.

Oseltamivir has been approved for use in patients over 1 year of age. Zanamivir has been approved for treatment of patients over 7 years of age and prophylaxis in patients over 5 years of age.

For effective prophylaxis, the drug should be administered daily while there is potential exposure to the influenza virus or until post-vaccination immunity is achieved (approximately 2 weeks in adults; over 2 weeks in children).

Some examples of use of antiviral drugs as treatment or prophylaxis in the event of influenza virus activity in the community are as follows:

- Prophylaxis in persons that have been vaccinated within the last two weeks.
- Prophylaxis in unvaccinated and persons with high risk of contagion (health workers, geriatric home staff, social service volunteers that provide patient care).
- Prophylaxis in persons with compromised immune systems or that can not respond to vaccination (HIV patients or patients receiving immunosuppressive treatment)
- Prophylaxis in persons who cannot be vaccinated against influenza due to allergy or another contraindication.
- Treatment of persons with influenza who live with or care for the high-risk population.
- Treatment of high-risk persons with influenza.
- Treatment of persons with influenza with less than 48 hours of evolution of symptoms in order to reduce the duration and severity of the disease.

The following table summarizes the doses indicated for the antiviral drugs available:

Drug	Prophylactic Dose	Treatment Dose	Main Adverse Effect
→ Amantadine	→ Age 1-9 years: 5 mg/kg po bid → Age >9 years: 100 mg po bid	→ Age 1-9 years: 5 mg/kg po → bid → Age >9 years: 100 mg po bid	→ CNS: anxiety, dizziness, difficulties concentration
→ Rimantadine	→ Age 1-10 years: 5 mg/kg po qid → Age >10 years: 100 mg po bid	→ Adults: 100 mg po bid	→ CNS: less common
→ Oseltamivir	→ Age >1 year: 75 mg /day → Children: adjust for weight → (For 7-10 days after exposure)	→ Adults: 75 mg twice daily (up to 150 mg twice daily) → Children > 1 year: adjust for weight → (5 days), up to 10 days →	→ Gastrointestinal: nausea, vomiting. → Should be taken with meals →
→ Zanamivir	→ Children over 5 years: → 10 mg (2 inhalations once a day) → (For 7-10 days after exposure)	→ Over 7 years: → 10 mg (2 inhalations twice a day) → (5 days)	→ Bronchial: spasm → (Other: GI and dizziness)

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PART II – HOSPITAL RESPONSE TO A PANDEMIC

14. ORGANIZATION OF THE RESPONSE TO EMERGENCE OF CASES OF SEVERE ACUTE RESPIRATORY INFECTION (SARI) BY HEALTH FACILITIES

14.1 INTRODUCTION

When one speaks about being prepared, there is an inevitable feeling that there is time to do so. However, time may not be in our favor and this can lead to unexpected adverse circumstances.

There are few occasions in the history of mankind in which there has been such a high level of expectation of an epidemic as there is now for a possible influenza pandemic. At present, when infectious diseases are still the leading cause of death in humans and nearly forty million people live with HIV, why is there a pronounced fear of an influenza pandemic? This is due to the fact that the influenza virus is often fatal. It causes 1-1.5 million deaths each season and in a pandemic its effect may be even greater. It is estimated that if the pandemic was caused by the H5N1 strain, global mortality could be between 180 and 360 million deaths.

SARS is the condition most similar to a potential influenza. However, it does not spread as quickly. After the SARS outbreaks emerged in China, it spread to five countries within 24 hours, and to three to six continents within a matter of months (In five months, 8,000 people were infected and 10% died) (*1*).

The process of preparation and response to a pandemic is very complex. It is linked to several aspects that are related not only to variables regarding disease or fatality, but also to the productivity and sustainability of communities. As a result, its impact and response will occur in multiple sectors and not only in the health sector. National preparedness plans in the national and local areas should include the different segments of society.

In addition to the response of the health services, other extremely important elements such as epidemiological surveillance, population containment measures, and risk communication should be considered.

The inevitable contact between the population that is ill and the health services is one of the major challenges when considering preparation and response to wide-scale care for cases of SARS as could occur in an influenza pandemic.

The estimates of impact on the health services clearly show that there is insufficient installed capacity to provide care for cases in an influenza pandemic. This situation could be more serious in areas that lack the required capacity even in regular conditions.

The clinical course of the infection tends to require complex care. Therefore, it is estimated that there will not be sufficient intensive care units and the mechanical ventilation equipment or staff required for case management will not be available.

At least at the beginning of a pandemic outbreak, when vaccines will probably not be available as a preventive measure, the health facilities will have a higher burden of morbidity and mortality.

In these conditions, there should be sufficient coordination between the health services that must respond to this situation, including the clinical, administrative, logistic, and financial components. In addition, information should be available in order to maintain control of the situation in a complex and adverse scenario.

14.2 ORGANIZATION, COMMAND STRUCTURE, AND COORDINATION

In an emergency situation, it is essential to ensure the concept of control through a visible figure or structure that makes timely and diligent rational decisions based on technical information.

Otherwise, the second disaster could be the lack of control and coordination of the situation in the event of a pandemic. This is this reason why the health facility should provide for a structure that ensures control of actions, decision-making, and the authority to ensure that decisions are implemented with assignment of responsibility to all members.

An influenza pandemic includes several critical elements. It is an emergency that has a major impact. Moreover, it can affect operation of the health facility since it uses the human, material, administrative, and financial resources of the institution.

Adequate coordination with regard to preparation and response for care in the event of a large number of cases requires that the health facility have at least four types of capacity:

Decision-making capacity: Oriented toward active participation of the directors of the organization in order to ensure rapid and effective decision-making.

Logistic capacity: Aimed at ensuring the necessary support so that the operational actions of the health facility can be implemented. All activities such as transport, communications, safety, and other activities should be clearly considered in the structure.

Operational capacity: Refers to ensuring the health facility conducts its activity, particularly its essential functions of provision of services, including the administrative component. The medical and paramedical staff in the facility and the persons responsible for administrative tasks should play an active role in the structure.

External liaison capacity: This is an essential condition for achievement of coordinated actions that directly or indirectly affect the functions of the health facility (e.g., public services, waste disposal, safety, patient referral, wide-scale mortality).

Operational actions

There are two non-exclusive approaches that can be implemented at the health facility: activation of a hospital committee in charge of emergency preparation and response (or creation of such a committee if there is none) and adoption of an incident management system (IMS) structure.

The hospital committee must be developed from the preparatory phase in order to achieve greater consolidation. The IMS could be implemented later on, even without prior preparation, since a methodology has already been established and validated. The key message is that, in either of the two cases, it is always be better to be prepared as soon as possible.

Emergency preparation and response committee

The objective of activation or creation of a committee of this type is to integrate the key referents in the health facility in the implementation of actions that ensure effective operation of human and physical resources in order to provide for patient demand during the epidemic or pandemic outbreak.

The committee should meet at least the following conditions:

a) Invite representatives from each area of the health facility so that it will be a multidisciplinary committee.

b) Have a coordinator who will lead planning, task orientation, and decision-making. Insofar as possible the coordinator should be a director that is close to the management of the facility.

c) Formalize creation of the committee

d) Define duties for each member

e) Meet on a regular basis, preferably monthly. Depending on the phase of the pandemic and the specific circumstances, the frequency of the meetings may be changed or extraordinary meetings may be called.

Depending on the size of the health facility and, therefore, the size of the committee, subcommittees that take on groups of related tasks may be created in order to facilitate operation of the committee.

The committee should conduct at least the following tasks:

1. Designate the composition of the committee

2. Designate a coordinator

3. Define the duties of each member

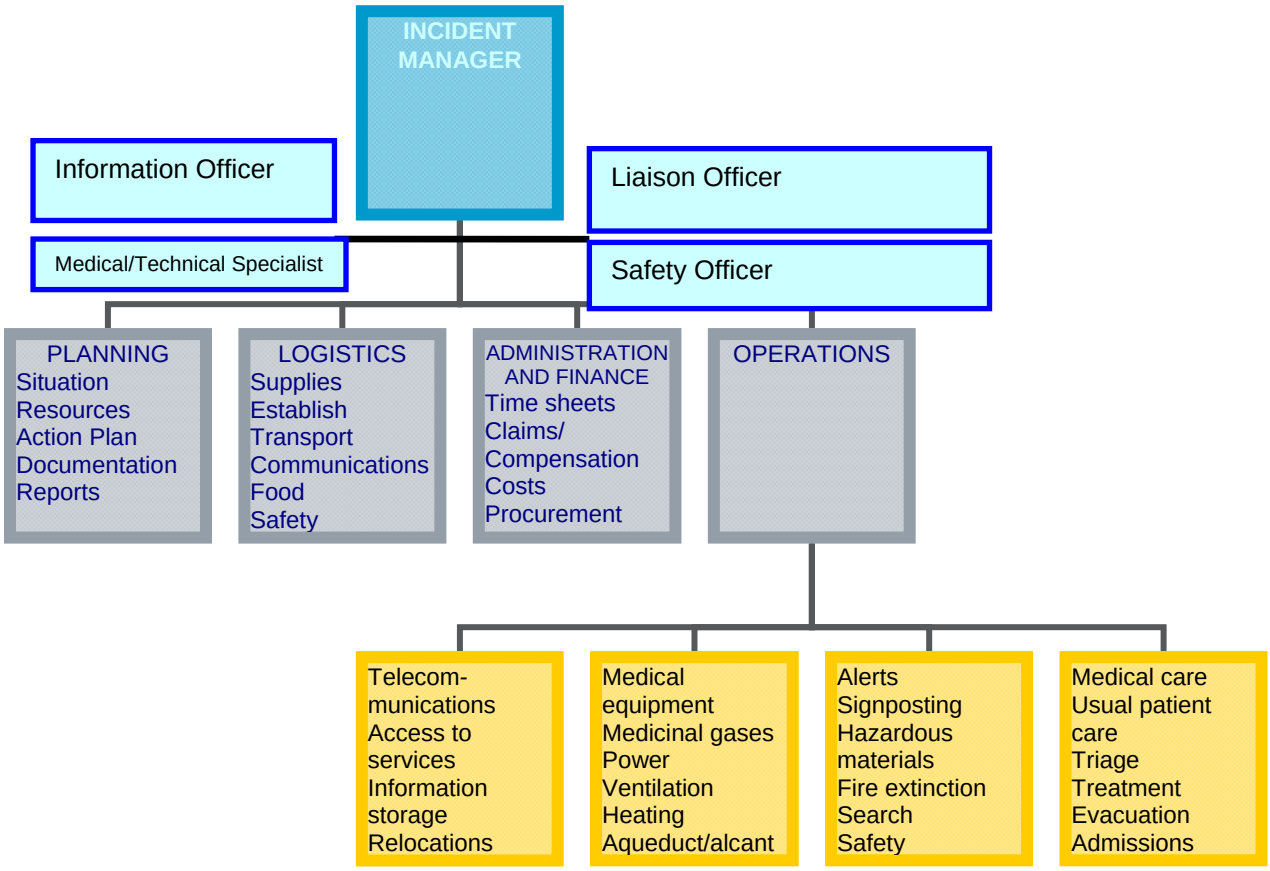
4. Prepare, implement, and follow-up on the hospital preparedness and response plan for cases of severe acute respiratory infection (SARI)

Incident Management System

Incident command (or incident management) is a system of organization and terminology that provides management tools for response and operation in the event of disasters. It was originally designed in the United States for forest fire operations. It has been used successfully in other circumstances that have required a robust response by the health sector with the support of other sectors. It should be an agile structure that is responsible primarily for the response to a crisis situation rather than preparation for this type of situation. Its purpose is to respond to the emergency and return the facilities, in this case the hospitals, to their regular operating status as soon as possible.

The incident management system (IMS) is based on four basic components: operations, logistics, planning, and finance. A coordinator is in charge of administration of each of these components. There is also an incident manager who is in charge of all the IMS tasks that have not been delegated. The manager has four officers (management personnel) who work directly under him:

- Liaison Officer: contact point for external agencies and inter-institutional relations
- Information Officer: responsible for preparation and delivery of information to the media
- Security Officer: in charge of supervising all facilities and operations in order to guarantee safe procedures. It must be highlighted that the safety officer has the authority to immediately halt any procedure, operation, or task that poses a risk for health workers. Therefore, an incident manager should not attempt to perform the duties of the safety officer.
- Medical/Technical Specialist: responsible for advising the incident manager as an expert in the specific area of the incident (e.g., a specialist in entomology/infection control in the event of an influenza pandemic or SARS epidemic, a radiation expert in the event of a case of radiation).



Each of the four main areas (planning, logistics, administration and finance, and operations) should have a leader that coordinates a team of persons. In order to make incident management more effective, it is suggested that this team should include 5 to 7 members.

The IMS is based on a series of forms for practical management of the situation. These are an important guide for preparation of an incident action plan and daily orientation. The forms are also a source of filed information for the financial reports and the reports prepared after the action.

In any case, whether there is a committee or an IMS (ideally both), implementation should be adapted to the conditions, size, and specific characteristics of the health facility.

Finally, it is important to remember that management of a situation such as an influenza pandemic implies external actions. Therefore, liaison with the leading health unit in the town and with other sectors should be considered. Such sectors include the security forces, emergency agencies, humanitarian aid organizations, educational system, media, and public utility companies.

14.3 ETHICAL AND LEGAL ASPECTS

The ethical and legal aspects are elements that theoretically have many variables in common. However, in practice there may be slight differences that separate them or at times they may even be opposed to one another.

In disasters, health workers often have to leave their home and closest relatives in order to provide care at the event, and they may even put their own life at risk. In this situation questions such as the following inevitably arise: Was it his duty? Was it his obligation? If he had not gone, could he have been held liable? What would be the blame? Could there have been justifiable causes? Therefore, it must be considered that it is not easy to provide a single and irrefutable response to any of these questions.

For example, in the case of the SARS epidemic in 2003, there are registries that show that 30% of the cases reported were in health workers, many of whom died (*4*).

In the event of an influenza pandemic, conflicts between "obligations" and "duties" will inevitably arise. Work, family, affective, and civic responsibilities as well as self-care will be considered in the values scale of each person and will determine his behavior to a significant extent. In addition, it is the duty of the individual who provides care to protect himself and others (In this case, this refers to not infecting others or ensuring that other persons are not subject to unnecessary exposure).

In legal matters, each country establishes standards, regulations, or codes on providing health care. These tools can certainly be useful to guide discussions and behavior with regard to the civil and legal responsibility of health care providers. To the extent that health is regarded as a right, this situation will lead to a series of responsibilities for health care

providers, including the State, health system, Social Security system, health facilities, and even the health workers in charge of providing care.

Another key aspect with ethical implications that will occur in an influenza pandemic is management of the high demand for services. It is estimated that there will not be sufficient resources to provide care for all critical cases. Therefore, some type of triage will have to be applied in order to prioritize admission to intensive care units, use of mechanical ventilation(*5*), or the possibility of receiving supplies of products such as vaccines or antiviral drugs. The physicians will clearly face difficult decisions with implications that may extend beyond clinical aspects.

Operational actions

Both the legal and ethical aspects will depend on the specific conditions of the place, the time when they occur, and the persons involved. Consequently, only very general actions that can be considered within the framework of an emergency response plan for epidemic respiratory diseases such as SARI will be mentioned.

The actions that could be considered by the health facility include:

- Discuss the subject and problems with the ethics committee of the health facility or the authority in charge of these functions.
- Review the legal and ethical guidelines for epidemic respiratory diseases established in the national emergency plans, and in the provincial or local plans.
- Seek legal advice on national and local regulations on subjects such as emergency care, patient rights, rights of health care providers, care in the event of disaster, work-related subjects, medical liability, and liability of the facilities.
- Analyze the scale of institutional values for the problems that may occur in an emergency due to epidemic respiratory diseases taking into account factors such as individual freedom, protecting the community from harm, proportionality, reciprocity, transparency, privacy, protecting the community from stigmatization, responsibility to provide care, equity, and solidarity (*7*).

- Seek agreements with workers of the health facility where institutional values and legal regulations are considered in a framework of respect and consideration as persons and health care providers.
- Promote activities that seek to increase awareness and strengthen individual values such as respect, trust, and solidarity.

14.4. TRIAGE

The health facilities may receive a disproportionate demand from patients with SARI that surpasses their response capacity. The facilities will be filled to capacity with patients that have the epidemic infection as well as patients with other conditions, including mild clinical symptoms that they would not usually have visited for. The impact on the emergency departments will be especially significant. The departments will probably have to make additional efforts when implementing mechanisms of classification and prioritizing cases for hospital management.

In an influenza pandemic it is estimated that between 15% and 35% of the population will have symptomatic disease. In addition, 15% of the population admitted to hospitals will require an intensive care unit and 7.5% will require mechanical ventilation (*8*).

Implementation of triage mechanisms should be linked to ensuring care for all patients that request it. Therefore, the services network should be prepared to provide care for hospital cases and also be capable of providing alternatives to ambulatory management through means such as primary care centers or home care. Moreover, depending on the technical potential and sustainability of the system, telephone triage deserves special consideration when regulating demand for health facilities. This could involve channeling cases to a call center, as provided in the National Preparedness and Response Plan for Flu Pandemic in Spain (*9*).

For an emergency situation such as an influenza pandemic, three phases of triage may need to be implemented: an initial phase in order to separate patients with a potentially infectious condition from patients with other conditions; a second triage of patients with respiratory symptoms that may be related to avian influenza or infection with epidemic/pandemic potential from patients with other diseases (e.g., RSV, adenovirus,

parainfluenza, bacterial pneumonia, tuberculosis) in order to identify patients taking into account the case definitions and their immediate destination; and a subsequent phase in order to decide on patient location (e.g., home, hospitalization in a hospital ward, hospitalization in intensive care unit).

Operational actions

- Availability of an area for triage of SARI in a location different from that set aside for the usual triage in the emergency department.
- Take into account that due to the demand for patients, sufficient triage stations equipped with equipment, materials, personal protective equipment, and registration forms will be required.
- Provide adequate signposting for transit of patients and companions in the triage room and between this room and the different departments of the health facility.
- Availability of sufficient trained human resources to conduct the triage process.
- Provide for the mechanism of immediate reporting of suspected or probable cases to the epidemiology department of the health facility.

Tools for implementation

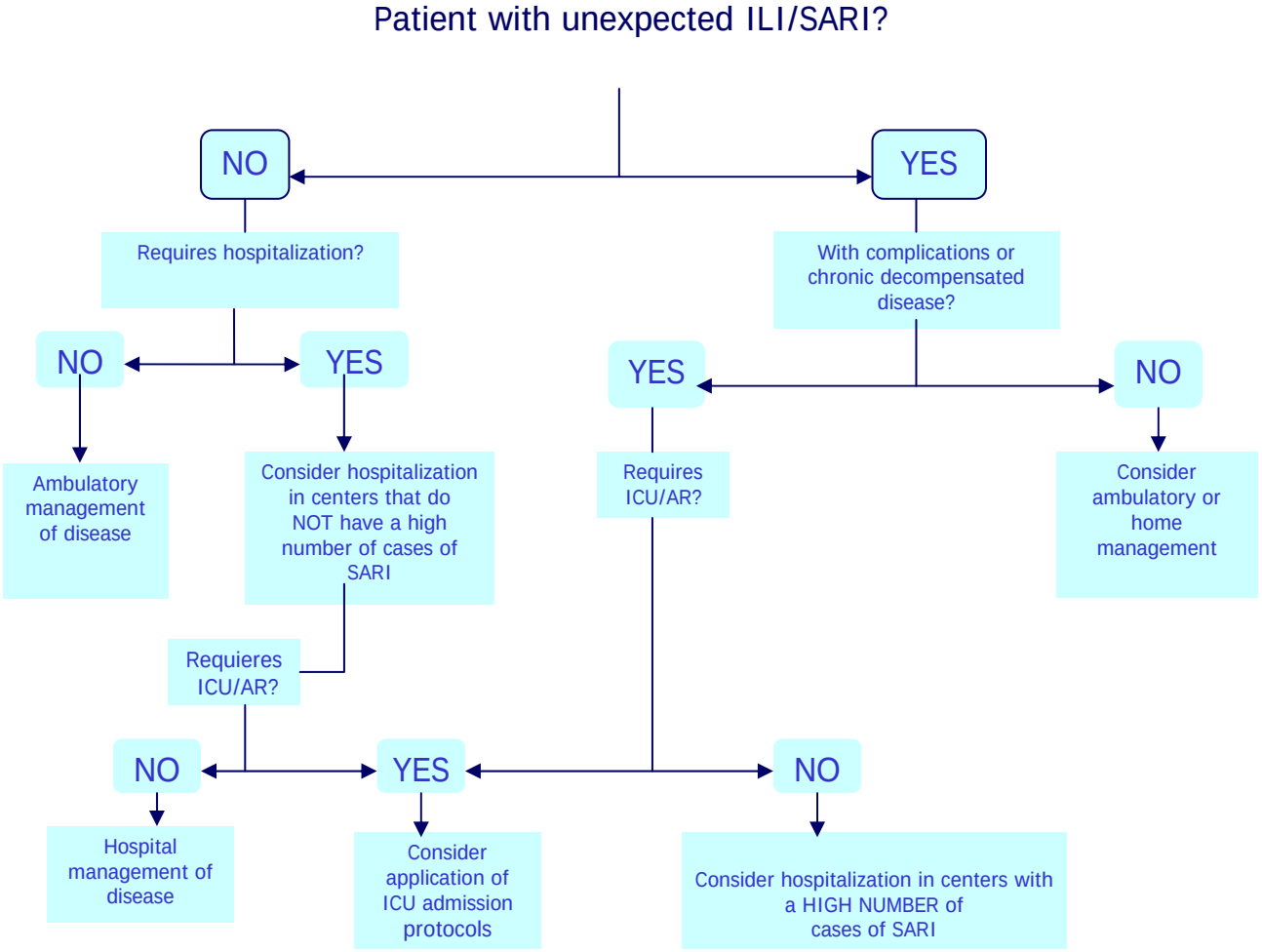
Triage is a measure that is especially useful for infection control and epidemiological follow-up. Specifically, in the pandemic period, it is especially useful for rationalization and organization of the services offered in the event that the response capacity is surpassed.

The health facilities can define the triage protocol they consider to be appropriate. However, this protocol should be used to supplement and not to replace the judgment of the individual clinician.

It is important to mention that some of the systems of classification that are shown in the annexes refer to schemes to determine the severity –possible mortality– of community-acquired pneumonia. They are not necessarily appropriate for influenza-related pneumonia and even less so for pandemic influenza, in which the risk groups may be different. Therefore, they may not be classified properly using the scores mentioned (e.g., possible

increased mortality in young patients, as occurred in 1918, or pregnant women). Finally, it is important to emphasize that the scores shown in the annexes do not replace the clinical criteria. They are only a guide that orients the decision-making process of the clinician.

The approach to initial triage could be simplified in the following diagram:



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2. Desarrollo de Sistemas de Servicios de Emergencias Médicas-Experiencia de los Estados Unidos de América para países en desarrollo, Organización Panamericana de la Salud, Washington, DC, 2003,
3. Recommended modifications and applications of the hospital emergency incident command system for hospital emergency management. Prehospital and disaster medicine 2005; 20 (5): 290-300
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9. Guía Para la Clasificación de Pacientes que Demandan Asistencia ("Triage") Plan Nacional de Preparación y Respuesta ante Pandemia de Gripe, Ministerio de Sanidad y Consumo, España, 2006.

14.5 BED MANAGEMENT

Catastrophes are events that usually demand high levels of hospital capacity. The emergency and hospitalization departments receive maximum demand in any case. In a respiratory epidemic event, there would be special circumstances due to the prolonged duration of the event, the risk of contagion, the severity of disease, the progressive increase in use of resources, and the limited possibilities of receiving external support. In addition to all of the above, it must be added that many health facilities operate regularly at the limit of their capacity, which implies a minimal possibility of capacity for expansion.

Some assumptions show that 45% of the population that contracts pandemic influenza will not require medical care (but will need health information and advice), around 53% will require outpatient care, and approximately 1.5 to 2% will require hospitalization (*1*).

For pandemic influenza the average hospital stay outside the intensive care unit (in the main hospital ward) could be 5 days. In contrast, the ICU stay would last about 10 days. A total of 15% of hospitalized patients would require ICU and 7.5% would require mechanical ventilation. It is estimated that there would be a 3% daily increase in cases that require care (*1*). In countries such as the Netherlands, more dramatic estimates have been made: hospital stay times of up to 14 days, between 10% and 40% of hospitalized patients requiring ICU, and 30% of hospitalized patients could require mechanical ventilation (*2*).

Appropriate and rigorous triage is the first line of containment for a sudden increase in patients. The second line of containment would be the internal reorganization that occurs in the hospitalization departments of the facility. Finally, the availability of inpatient care in areas outside the facility should also be taken into account. It is essential to consider that each hospital bed available should be related to the operational capacity of the hospital with

regard to human resources, medical supplies, and support services (e.g., toilets, food) that would be assigned to each bed.

A recent study in which the experience of SARS in Toronto was related to the possible scenarios of pandemic influenza indicated that with measures restricting non-urgent admissions, the hospital admission capacity to provide care for pandemic cases would only be increased by 12% (*3)*. This study also recommended implementation of additional measures as a higher case rate would lead to an even greater gap.

Operational actions

The actions undertaken to implement a strategy of expanding capacity should be based on the correlation between the increased number of beds and the resources required for functionality as well as control of transmission of infection in the facility. Some general measures that should be adapted to the specific characteristics of the health facility if they are considered are described below.

An aspect of vital importance is the availability of environmental ventilation systems that ensure uncontaminated air in the patient care and hospitalization areas. To this end, mechanical ventilation or natural ventilation mechanisms that contribute to infection control should be implemented (*4*).

SITUATION	SUGGESTED MEASURES	EXPECTED SCOPE
There is a discrete tendency of increased demand for beds for SARI patients, but there is availability for care in individual isolation rooms.	Adjust maximum hospital stays for all patients. Promote early discharge strategies in medical and surgical hospitalization services.	Reduce hospital stay to increase relative availability.
The availability of beds for patients with SARI in individual isolation rooms is at the limit of the required demand.	Prepare new individual isolation beds. Prepare shared rooms.	Increase number of isolation beds available.
The demand for beds for patients with SARI surpasses the existing availability of individual or shared	Assign an exclusive ward or area for patients with SARI. Delay care for patients with other diseases that are not	Expand the internal hospitalization capacity for patients with SARI.

isolation rooms.	potentially fatal and do not imply serious adverse consequences as a result of the delay. Refer long-term stay patients to chronic care inpatient units as beds become available. Reconvert beds in elective services (e.g., ambulatory surgical recovery, palliative care) to operational beds for priority services and SARI patients.	
The availability of beds for patients with SARI in the wards is at the limit of the required demand.	Expand and enlarge areas for hospitalization in wards. Refer acute hospitalized patients (e.g., postoperative) to continue care at home as long as care can be provided safely in this environment.	Expand the internal hospitalization capacity for patients with SARI.
The demand for beds for patients with SARI surpasses the current availability in the wards.	Assign an entire floor (or more if necessary) to management of SARI patients. Transfer patients with or without SARI to other health care centers in the services network with availability of beds.	Expand the internal hospitalization capacity for patients with SARI.
The demand for beds for patients with and without SARI clearly surpasses the existing availability in the wards.	Prepare areas that have been closed recently and are reserved for other purposes. Apply triage strategies for admission of patients with and without SARI. Prepare supplementary and unconventional inpatient units (e.g., hotels, schools, auditoriums, field hospitals).	Reach the maximum availability of beds for patients with/without SARI.

References

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2. Genugten M, Scenario analysis of expected number of hospitalizations and deaths due to pandemic influenza en Netherlands, RIVM Report 217617004
3. Schull et al. Surge Capacity Associated with Restrictions on Nonurgent Hospital Utilization and Expected Admissions during an Influenza Pandemic, ACAD EMERG MED. November 2006, vol. 13 No 11
4. Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care, WHO Interim Guidelines, June 2007

14.6 RESOURCE MANAGEMENT

The increase in the number of cases of SARI in an epidemic entails a high demand for use of the existing human and physical resources and supplies of the health facilities. The supplies of personal protective equipment, oxygen therapy devices, and some drugs could be rapidly depleted. The health workers would be overloaded with work and they may also be affected by the disease, as indicated by estimates of the occupational impact of a potential influenza pandemic (*1*). Based on the assumption that there would be patients with different degrees of severity of disease (mild, moderate or high) in an influenza pandemic, it has been estimated that initially only patients with moderate or severe conditions would use the medical resources in the hospitals. Severely ill patients would require intubation, ventilation management, and/or multiple drugs, including use of vasopressors and intravenous fluids. Patients with moderate conditions would require at least drugs and intravenous fluid.

Operational actions

Planning of the resources required to provide for the demand should be based on a standard level that is appropriate and sufficient for the usual requirements. However, for many health facilities, it is probable that the demand would be higher than the existing resources.

The establishment should plan its resources taking into account the potential scenarios for demand such as the expected influenza pandemic case rate (e.g., 35%) or the period that the situation is expected to remain critical (e.g., 8 weeks).

It is recommended that the facility consider the subject from two perspectives:

- Human resources planning
- Planning of need for equipment, materials, and supplies

14.6.1 Human Resources Planning

It may be necessary to review the entire staff in the health facility in order to redistribute tasks and reassign duties.

The key aspects that should be taken into account include the following (*2*):

1. Identification of competency:

Administrative and support staff	Management User service Patient referral
Transport	Patients Samples Waste Medicinal gases Health workers
Training	Health care staff Community education
Infection control and occupational health	Case-finding for staff with illness Development of surveillance programs Implementation of surveillance programs Logistic and psychosocial support for health care personnel
Care for healthy persons	Immunization Prophylaxis
Patient care	Case management

2. Assignment of competencies or roles:

After the competencies have been identified, they can be assigned to the profiles or positions existing in the health facility (e.g., administrators, physicians, nurses, assistants).

3. Estimated activities:

After the competencies have been assigned, the number of activities/day assigned to each profile or position can be determined (e.g., number of outpatient visits in each 8-hour shift). Longer units of time such as weeks or months can also be calculated.

4. Gap analysis:

Based on the activity estimate, the current existing human resources and the resources required to cover the proposed requirements can be determined.

5. Identification of additional resources:

The alternatives to consider include:

- Reassignment of duties of current staff
- Staff use in training (universities)
- Notice to retired staff
- Recruitment of voluntary staff

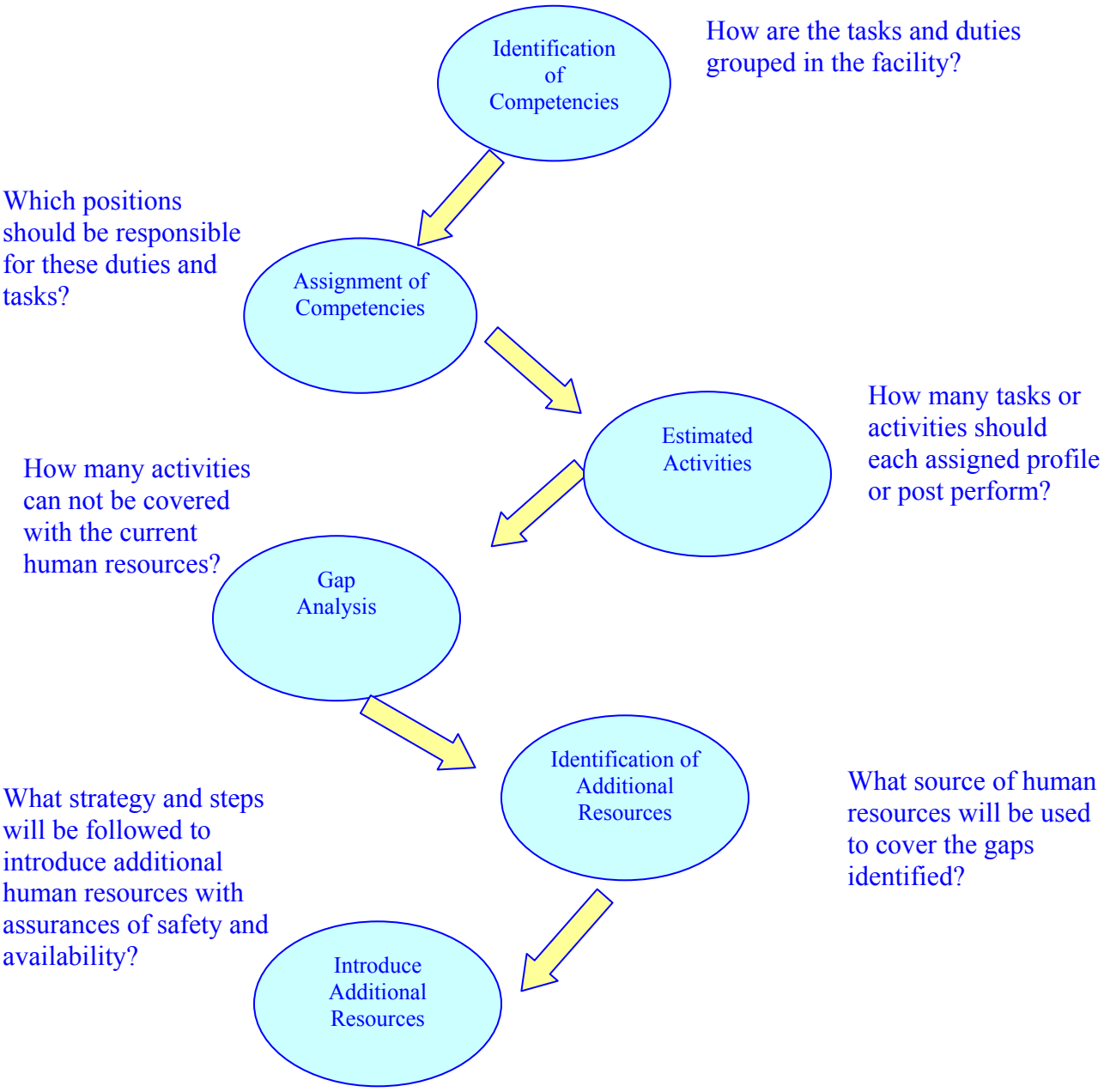
6. Strategy for hiring additional resources.

The following aspects should be taken into account:

- Identification of the activities designated for support
- Legal support
- Protection and safety conditions
- Occupational aspects
- Training and preparation

The process can be summarized in the following diagram:

HUMAN RESOURCES PLANNING



14.6.2 Planning of Equipment, Materials, and Supplies

In order to achieve an objective estimate of the requirements, the installed capacity (including human resources) should be compared to the expected demand in a given period. Consequently, plans can be made for use of medical equipment, drugs, personal protective equipment, and other supplies.

Some of the considerations that the health facility should take into account are shown below:

- Identify the required supplies based on the management guidelines adopted and agreed on with the clinical group. Conduct the same procedure for infection control.
- Define a policy and a strategy to ensure availability of an emergency inventory during the first days of the crisis.
- Define a storage and distribution strategy for supplies and drugs that ensures immediate availability, safety, rational use, and efficient use of space.
- Define a strategy for prompt and effective replacement of supplies by the suppliers that guarantees continuous and ongoing supply for the demand (during each pandemic outbreak).
- Strengthen the preventive and corrective maintenance component for medical equipment and all electromechanical devices that are expected to require increased use.
- Keep comprehensive records of consumption of supplies, medical materials, and drugs.

WHO has proposed a model scenario for calculations in the event of an influenza pandemic (*3*), which is shown below:

Scenario for model calculation[a]	
Recommendations for infection control in routine care of patients with pandemic flu	Standard precautions + precautions against droplets Main points: ▪ strengthen respiratory/cough hygiene ▪ health workers use surgical masks

	when they are in close contact with patients ▪ strengthen hand washing
Recommendations for infection control when conducting aerosol-generating procedures (see Annex A)	The PPE should include a long-sleeved gown, disposable gloves, eye protection (e.g, safety goggles, facial protectors) and respiratory protection.
Population	100 000 persons
Duration of pandemic outbreak	90 days
Duration of the infectious period/days of patient hospitalization	7 days
% of the population that develops clinical symptoms	30% (30,000 persons)
% of persons with symptoms that require care	100% (30,000 persons)
% of persons with symptoms that require hospital care	2% (600, 480 of which are in rooms and 120 in intensive care units)
% of patients with symptoms that receive care at home	98% (29 400 persons)

[a]**Note**: The PPE estimates will change if any of the individual assumptions is changed.

Model Calculation of PPE Needs in the Health Centers According to the Previous Scenario		
Item	**Assumptions**	**Needs**
Surgical masks for patients admitted		
No. of patients admitted to rooms = 480	Patient that will use mask outside of the isolation room. Assign 1 mask /patient/day for 7 days	3 360
No. of patients in intensive care = 120	Most patients will not be able to use masks. All patients will survive and use masks for 4 days (estimate)	480
Masks for visits		
600 inpatients receive 2 visits/day each. No. of visits/day = 1200. No. of days = 7	1 surgical mask/visit; 2 visits/patient/day for 7 days	8 400
Masks for health workers		
Surgical masks for health workers that care for 600 patients for 7 days	12 admissions of health workers/isolation room/day + 2 aerosol-generating procedures/patient/day	50 400
TOTAL surgical masks		62 640
Other PPE for health workers when they perform aerosol-generating procedures		
Respirators	2/patient/day	8 400
Disposable facial protectors or safety goggles **or** Reusable facial protectors **or** Reusable safety goggles	2/patient/day disposable 2/patient/day reprocessed* 10 times **or** 2/patient/day reprocessed* 50 times	8 400 840 **or** 168
Disposable long-sleeve gowns or cloth robes (not reusable on the same day, washed. e.g, reprocessed up to 50 times)	2/patient/day **or** 2/patient/day	8 400 **or** 168
Gloves Non-sterile, disposable gloves	2 pairs/patient/day	8 400

References:

1. Zhang X, Meltzer MI, Bridges CB FluWorkloss 1.0 A Manual to Assist State and Local Public Health Officials in Estimating the Impact of an Influenza Pandemic on Work Day Loss. CDC, HHS, 2005.
2. HHS, Pandemic Influenza Plan, 2006 (adapted).
3. Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care, WHO Interim Guidelines, June 2007.

14.7 MANAGEMENT OF EXCESS HOSPITAL MORTALITY

Although strictly speaking management of fatalities is the responsibility of local government agencies and it should be considered as such in the procedures in the event of an unusually high volume of bodies, the health facilities, particularly facilities with hospitalization capacity, could receive the first and the highest impact of mortality. It has been estimated that 70% of the deaths in an influenza pandemic will occur in the hospitals.[1] Consequently, the health facilities should make provisions for fatalities based on the expected number with all of the biosafety, logistic, and sociocultural implications that this entails.

Local coordination in management of a large number of corpses is especially important. This should be the responsibility of a local agency, preferably not the hospital director or the health workers, since they are responsible primarily for care of the living.[2]

With regard to the facility, a procedure should be established that considers infection control measures as well as efficient and respectful corpse management.

Operational actions

The facility should define the protocol in accordance with the basic guidelines shown below:

- Follow the guidelines defined in the national and local plans with regard to corpse management in disaster situations.
- Establish liaison with the local agency in charge of fatality management.
- Adopt and provide information on the process for prompt removal of corpses from the isolation area or room:

  - Biosafety precautions
  - Use of PPE (masks, gloves)
  - Use of waterproof hermetic bag for the corpse
- Driving route to the morgue
- Mechanisms for timely delivery of the corpse to the family (use of PPE)
- Special precautions if autopsy is performed
- Identification of alternative strategies for temporary storage:
  - Refrigerated vans/containers
  - Appropriate corpse identification (labeling)
- Comprehensive mortality registry
- Coordination with the local funeral parlors in order to improve the efficiency of the processes and maintain biosafety conditions.

References:

1. Zhang X, Meltzer MI, Bridges CB FluWorkloss 1.0 A Manual to Assist State and Local Public Health Officials in Estimating the Impact of an Influenza Pandemic on Work Day Loss, CDC, HHS, 2005.
2. La gestión de cadáveres en situaciones de desastre: guia práctica para equipos de respuesta. OPS/OMS/CICR, Washington DC, 2006

14.8. OCCUPATIONAL HEALTH

The risk factors that the health workers will be exposed to in the event of an emergency due to epidemic respiratory diseases will not be different from those that are usually present. The difference will probably be evident in the magnitude and intensity of exposure and the potential increase in the number of occupational accidents and occupational diseases, not only from the biological, but also from the ergonomic and psycho-occupational perspective. There are several factors that could explain this hypothesis *a priori*:

1. Increased number of contacts with infected patients
2. Increased number of tasks/day
3. Longer workdays
4. Assignment of new responsibilities
5. Increased contact with critically ill patients
6. Potential limitation of current resources

These are some of the factors that can have an influence. The non-occupational conditions that the worker may have, such as disease or death of family members, change in family and social situation, should also be considered.

Therefore the authority in the health facility that is responsible for workers' health should promote implementation of an internal contingency plan to deal with the situation in order to improve worker protection from higher exposure by seeking to maintain his health and appropriate functionality.

Operational actions

The facility can implement a contingency plan that includes actions such as the following:

- Training on use of personal protective equipment and biosafety measures
- Epidemiological surveillance system for febrile/respiratory syndromes in workers of the facility

- Definition of prophylaxis protocols (vaccines/antiviral drugs)
- Supervision and monitoring of staff travel
- Verification of staff disabilities associated with influenza-like illness
- Psychological and social support for staff
- Special training for additional staff

There are some important factors[1] that should be taken into account when considering the subject of occupational health:

- Timely recognition of health care professionals with SARI is essential in order to limit spread of the infection.
- Health care professionals with SARI should be excluded from work until they recover.
- As a general principle, the health workers that provide care for SARI patients should not care for other patients.
- Health workers with high risk of SARI-related complications should not provide care for infected patients.

References:

1. Pandemic Influenza Guide: Infection Control in Hospitals and Primary Care Guidelines. Department of Health, England, Agency for Health Protection, October 2005 (adapted).

15. RISK COMMUNICATION FOR HEALTH FACILITIES

The objective of this section is to provide basic knowledge of risk communication for health facilities. Some basic concepts will be presented, as well as messages about skills that allow health workers to communicate with several different audiences and involve the general community, particularly when they work in coordination with physicians and other administrators. The purpose of communication is to decrease emotions and negative attitudes that could arise in the event of an epidemic outbreak, using an approach to risk communication that is within the framework of national, subnational, and local actions for pandemic control.

WHO (*1)* prepared standards for communication of epidemic outbreaks that indicate that "the paramount goal for communication of epidemic outbreaks is to communicate with people in a way that promotes, maintains, or recovers trust." Furthermore, the importance of making early announcements, acting with transparency, having knowledge of different audiences, and planning communication strategies is pointed out.

15.1 RISK COMMUNICATION

Risk communication for epidemic outbreaks is a process of exchanging information and opinions between people, groups, and institutions. It usually includes several different messages about the nature of the risk. Furthermore, it allows for expression of concerns, opinions, or reactions related to the messages about risk or the legal and institutional provisions for risk management (*2*). The goal is to communicate with the public in a way that creates, maintains, or reestablishes trust.

Risk communication is implemented when the danger of an epidemic outbreak causes strong feelings of anger. It contributes to people containing their feelings and effectively overcoming the dangers (*3*). Therefore, it is different from public relations or health education activities that are conducted in normal situations.

Risk communication is concentrated in 6 areas:

1. Contents of information: What do we know about the crisis? What do we want the people to know, and how do we communicate effectively?
2. Logistics and resources: How do we really communicate our contents to the hands (and minds) of our audiences?
3. Evaluation of audience: Who do we have to reach? What are these people thinking, and how should this influence what we say?
4. Public participation: How do we make the communication allow audience involvement, and how do we keep them active and not passive?
5. Meta-messages: How much security should or can we provide? How much confidence should or can we demonstrate? How can multiple emotions be addressed?
6. Self-evaluation: How will values, emotions, and political problems influence our crisis communication? What may we be mistaken about? Which are the internal sources of resistance to doing it well and how can we counteract them?

15.2. NATIONAL COMMUNICATION STRATEGY

Most countries have a national preparedness plan for an influenza pandemic that establishes a communications strategy, including actions such as the following when an epidemic outbreak or pandemic begins:

Define the first announcements and when they will be made

Establish the limits of transparency

Define who will be the official spokesperson

Define the communication channels

Obtain support for training activities, preparation of messages, definition of audiences, and selection of communication channels

The communication strategy should be written, approved, and aligned with the National Preparedness Plan for an Influenza Pandemic.

15.3. HEALTH FACILITY COMMUNICATION PLANS

The national communication strategies should provide guidance for development of the communication plans of the health facilities. The activities outlined in these plans tend to be divided into actions that will be conducted before the pandemic, the first actions at the beginning of a pandemic, and the actions to be implemented after the pandemic has been declared and spread internationally. Preparatory activities for the later phases are critical, and sufficient time must be set aside for each of the activities.

Activities prior to the pandemic

Define who will be included in the communications team (including sponsors and health volunteers).

Create or activate chains of command and assign persons responsible for each area.

Establish the information flow during a pandemic and assign persons responsible for each area.

Make known the national communication strategy.

Select a spokesperson and a substitute based on the criteria of credibility, ability to generate confidence, clear speech, time availability. Preferably select a person with a high position in the department such as a hospital director.

Prepare all contact information for the communications team (e.g., address, work and home phone, e-mail, messaging, radio) and keep the information up-to-date and visible.

Estimate and allocate the necessary financial resources.

Prepare the health workers to communicate with the public, students, local authorities, and others during their routine visits.

Identify the target audiences (e.g., health workers, school directors, financial activities, unions, religious organizations, community). Segment the audiences by district or another significant and manageable territorial unit. Identify the significant media.

Record everything the team knows about the different audiences (e.g., how they reacted to previous crises). Determine whether they speak other languages or dialects. Describe their resources (e.g., occupational health resources). For the media, specify whether or not they are associated with the current health system.

Discuss the emotions generated by a crisis and how they have been dealt with previously (e.g., fear, anger, victimization, mistrust, mourning).

Design a basic set of messages. Verify their technical consistency and draft them simply and concisely. Confirm that they are understandable to persons that are not part of the health system.

Prepare action plans that consider the phase of the epidemic, action times, persons responsible, forms of feedback and evaluation.

Confirm that the department action plan is consistent with the general plans of the Ministry of Health. Send the action plan to the Ministry of Health communication offices and obtain feedback.

Review the plan periodically and update it as appropriate.

Emergence of the pandemic: early announcement

At the beginning of a pandemic, the public will want to know about subjects such as the following:

Am I or are we safe?

How will it affect me or my family?

Who or what caused this?

Can it be fixed? If you can not fix it, who or what can?

How can I protect myself or my family in the future?

It is important that health workers familiarize themselves with the pandemic communication strategy in their national preparedness plan, and take into account the following:

People have the right to information that influences their life.

If you wait, the news may become known anyway. If this happens, you may lose trust and credibility.

You can control the accuracy and framework of the information better if you are the first to present it.

It is more likely that there will be time for significant audience participation in decision-making if the information is circulated soon.

Early circulation of the information about a situation may prevent similar situations at other sites.

Less work is needed to circulate the information soon than to respond to the questions, attacks, and mistrust that can arise due to late circulation.

You will be better prepared to gain the trust of the public if you circulate the information promptly.

If you wait, people may feel angry and resentful.

It is more likely that people will overestimate the risk if you withhold the information.

Finally, the following suggestions are provided to guide the communication activities, particularly for the spokespersons, as well as face-to-face encounters with the media and community:

General measures:

Do not over-reassure.

Err on the alarming side.

Acknowledge uncertainty.

Share dilemmas.

Acknowledge opinion diversity.

Face the emotional aspect of the crisis:

Do not diagnose or overplan for the panic.

Do not focus your attention on eliminating all fear.

Do not forget that emotions are different from fear.

Do not ridicule the emotions of the public.

Legitimize the fears of the public.

Tolerate early overreactions.

Recognize your own humanity.

Include the public:

Tell people what you expect and which measures should be taken.

Offer people activities to carry out.

Allow people to choose their own actions.

Ask more about people.

Errors, bad impressions, and partial truths:

Recognize the errors, deficiencies, or improper behavior.

Request often that errors, deficiencies, and improper behavior be excused.

Be explicit about changes in the official opinion, forecast, or policy.

Do not lie or tell half truths.

Focus your attention on sincerity and transparency.

Be careful when making risk comparisons.

References:

1 Normas de comunicación de brotes epidémicos de la OMS, 2006
2 HHS, Administration of Mental Health Services and Substance Abuse
3 Sandman P, Lanard J. Crisis Communication I: How Bad Is It? How Sure Are You? Available from: http://psandman.com/handouts/sand12a.pdf

ANNEX 1. SEVEN STRATEGIC ACTIONS FOR APPLICATION OF THE IHR

	Strategic action	Objective
	GLOBAL PARTNERSHIPS	
1	Foster global partnerships	WHO, all countries and all relevant sectors (e.g. health, agriculture, travel, trade, education, defence) are aware of the new rules and collaborate to provide the best available technical support and, where needed, mobilize the necessary resources for effective implementation of IHR (2005).
	STRENGTH NATIONAL CAPACITY	
2	Strengthen national disease surveillance, prevention, control and response systems	Each country assesses its national resources in disease surveillance and response and develops national action plans to implement and meet IHR (2005) requirements, thus permitting rapid detection and response to the risk of international disease spread
3	Strengthen public health security in travel and transport	The risk of international spread of disease is minimized through effective permanent public health measures and response capacity at designated airports, ports, and ground crossings in all countries
	PREVENT AND RESPOND TO INTERNATIONAL PUBLIC HEALTH EMERGENCIES	
4	Strengthen WHO global alert and response systems	Timely and effective coordinated response to international public health risks and public health emergencies of international concern
5	Strengthen the management of specific risks	Systematic international and national management of the risks known to threaten international health security, such as influenza, meningitis, yellow fever, SARS, poliomyelitis, food contamination, chemical and radioactive substances.
	LEGAL ISSUES AND MONITORING	
6	Sustain rights, obligations and procedures	New legal mechanisms as set out in the Regulations are fully developed and upheld; all professions involved in implementing IHR (2005) have a clear understanding of and sustain the new rights, obligations, and procedures
7	Conduct studies and monitor progress	Indicators are identified and collected regularly to monitor and evaluate IHR (2005) implementation at national and international levels. WHO Secretariat reports on progress to the World Health Assembly. Specific studies are proposed to facilitate and improve implementation of the Regulations

Strategic actions 2-5 are key because they call for significantly strengthened national and global efforts.

ANNEX 2. DECISION-MAKING INSTRUMENT FOR EVALUATION AND REPORTING OF EVENTS THAT MAY BE A PUBLIC HEALTH EMERGENCY OF INTERNATIONAL CONCERN

Events detected by the national surveillance system (see Annex 1)

A sudden or unexpected case of any of the following diseases that can have serious repercussions for public health and, therefore, must be reported. [a,b]

- Smallpox
- Poliomyelitis associated with wild poliovirus
- Human flu caused by a new subtype of virus
- Severe acute respiratory syndrome (SARS)

The algorithm will be used for all events with potential of becoming a public health problem of international concern, including events with causes of unknown origin or related to diseases other than those listed in the boxes on the left and the right.

The algorithm will always be used for events related to the following diseases (it has been demonstrated that they can have serious repercussions for public health and can spread internationally rapidly).

- Cholera
- Pneumonic plague
- Yellow fever
- Viral hemorrhagic fevers (Ebola, Lassa, Marburg)
- West Nile Virus
- Other diseases of special national or regional importance (e.g., dengue, Rift Valley fever, and meningococcal disease)

Does the event have a serious public health repercussion?
Yes / No

Is it a sudden or unexpected event?
Yes / No

Is there a significant risk of international spread?
Yes / No

Is there a significant risk of restrictions on travel or international trade?

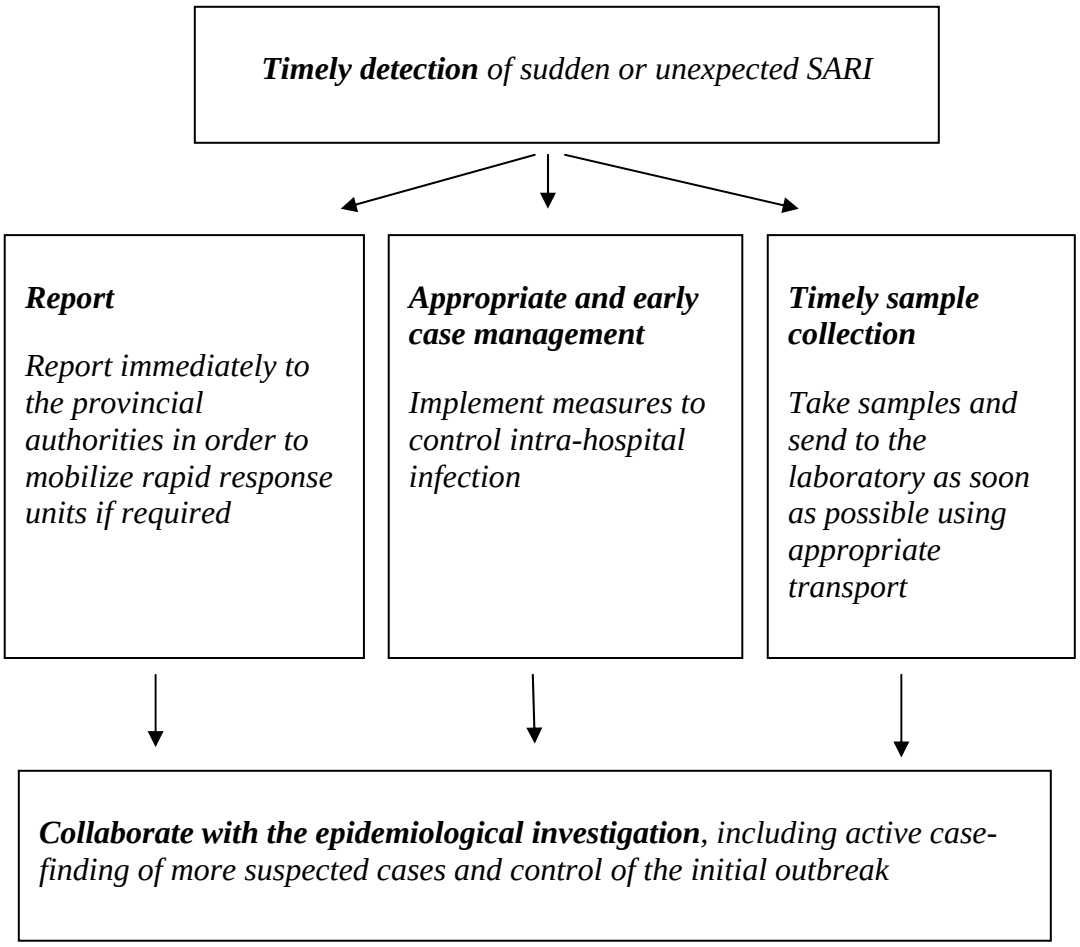
Not reported at this time. New evaluation if additional information is available

THE EVENT WILL BE REPORTED TO WHO IN ACCORDANCE WITH INTERNATIONAL HEALTH REGULATIONS

[a]According to the case definitions established by WHO

[b]This list of diseases will be used exclusively for the purposes of this regulation.

ANNEX 2. EPIDEMIOLOGICAL SURVEILLANCE ALGORITHM



ANNEX 3. CALCULATING THE PERCENTAGE OF SARI CASES IN THE HEALTH FACILITY

In order to determine the epidemiological curve or pattern of cases of SARI in the population that seeks care at or visits a specific health facility, the weekly percentages of cases of SARI in a single health facility should be calculated and analyzed by age group.[5]

This will facilitate identification of an elevation or increase in the number of cases above the usual levels for the facility during a given time period compared to the number of cases found in previous years. This could indicate a SARI outbreak, which may have been caused by a virus with pandemic potential.

Percentage of SARI-related hospital admissions	$\frac{\textbf{Number of SARI cases hospitalized weekly}}{\textbf{Total number of weekly hospital admissions}}$
Percentage of SARI-related hospital admissions by age group	$\frac{\textbf{Number of SARI cases hospitalized weekly by age group}}{\textbf{Total number of weekly hospital admissions}}$
Percentage of SARI-related deaths	$\frac{\textbf{Number of weekly SARI-related deaths}}{\textbf{Total number of weekly deaths}}$
Percentage of SARI-related deaths by age group	$\frac{\textbf{Number of weekly SARI-related deaths by age group}}{\textbf{Total number of weekly deaths}}$

[5] If the population coverage or population assigned to the health facility is known, the epidemiological rates can be calculated.

ANNEX 4. WEEKLY SARI AND SARI-RELATED MORTALITY CASE REPORT FORMS

Pan American Health Organization
Regional Office of the World Health Organization

CDC
SAFER • HEALTHIER • PEOPLE™

Formulario de Recolección Semanal para Casos de Infección Respiratoria Aguda Grave (IRAG)

Servicio de Salud, Departamento de Salud, Región		**Semana Epidemiológica #**	
Hospital Centinela		**Fecha de Notificación**	

Definición de IRAG: **Persona con fiebre súbita (sobre 38°C) y tos o dolor de garganta, disnea o dificultad para respirar y necesidad de internamiento en el hospital**

	Número de Visitas															
	Total		**Menos de 6 meses**		**6–23 meses**		**2-4 años**		**5-14 años**		**15-49 años**		**50-64 años**		**Más de 65 años**	
	Visitas Totales	***# IRAG***	Visitas Totales	# IRAG	Visitas Totales	# IRAG	Visitas Totales	# IRAG	Visitas Totales	# IRAG	Visitas Totales	# IRAG	Visitas Totales	# IRAG	Visitas Totales	# ETI
Lunes																
Martes																
Miércoles																
Jueves																
Viernes																
Sábado																
Domingo																
Total por semana																
Población																
Tasa de incidencia (por 100,000)																

Coordinador de vigilancia		**Firma:**	

Severe Acute Respiratory Infection (SARI) Weekly Case Report Form

Health Unit, Health Department, Region

Sentinel Hospital

Epidemiological week no.

Date reported

SARI case-finding: person with sudden fever (over 38ºC) and cough or sore throat, dyspnea or breathing difficulty, and need for hospitalization

Number of Visits

Total / Less than 6 months / 6-23 months / 2-4 years / 5-14 years / 15-49 years / 50-49 years / 50-64 years / Over 65 years

Total visits / Cases SARI

Monday / Tuesday / Wednesday / Thursday / Friday / Saturday / Sunday

Total weekly

Population

Incidence rate (per 100,000)

Surveillance coordinator

Signature

Weekly Hospital Deaths Case Report Form

Health Unit, Health Department, Region		**Epidemiological week no.**	
Sentinel Hospital		**Date reported**	

Surveillance of Severe Acute Respiratory Infection (SARI)-Related Mortality

	Total		Less than 6 months		6–23 months		2-4 years		5-14 years		15-49 years		50-64 years		Over 65 years	
	Total deaths	*SARI*	*Total deaths*	*SARI-related deaths*	*Total deaths*	*SARI-related deaths*	*Total deaths*	*SARI-related deaths*	*Total deaths*	*SARI-related deaths*	*Total deaths*	*SARI-related deaths*	*Total deaths*	*SARI-related deaths*	*Total deaths*	*SARI-related deaths*
Monday																
Tuesday																
Wednesday																
Thursday																
Friday																
Saturday																
Sunday																
Weekly total																
Population																
Incidence rate (per 100,000)																

Surveillance Coordinator			**Signature:**

ANNEX 5. SARI CASE REPORT FORM. GENERIC PROTOCOL FOR INFLUENZA SURVEILLANCE

Clinical Epidemiological Registry of Sudden or Unexpected SARI

Physician: .... **Address:** .... **City/Town:** .... **Province:** .... **Tel:** .... **Fax:** .... **E-mail:**	**Recipient Laboratory:** ....

Case identification number: (......................)..

First and last name...

Date of birth: ....../....../...... Age: .... Sex:....................

Date of onset of disease: ....../....../....... Epidemiological week number: ......

Date sample taken: ....../....../.........................

Influenza vaccine: Yes ☐ No ☐ Date of vaccination: ...../........./..........

Clinical characteristics

	Yes	No
Fever >38ºC		
Rhinorrhea		
Pharyngitis		
Conjunctivitis		
Otitis		
Bronchitis		
Bronchiolitis		
Pneumonia		
Cough		
Dyspnea		

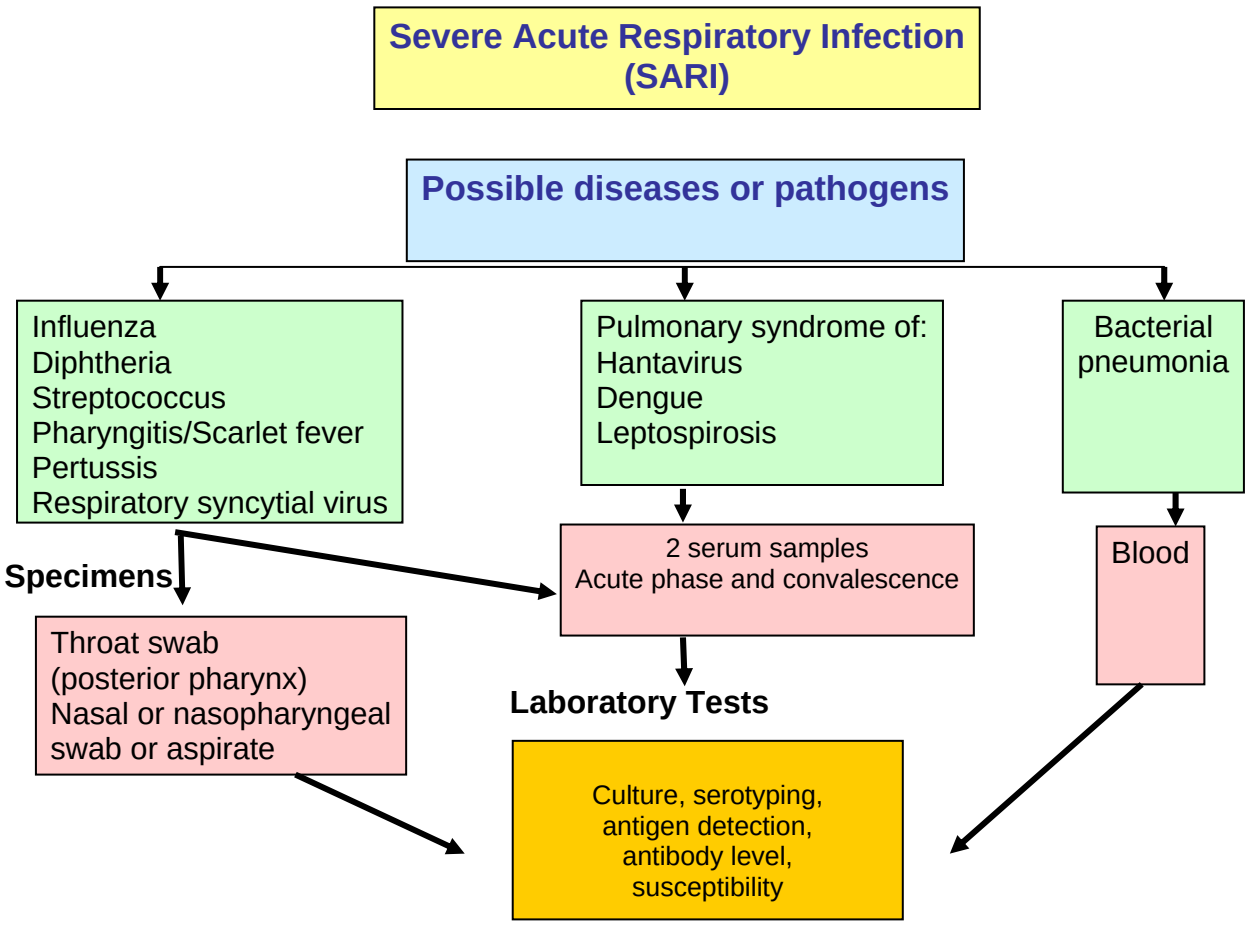
	Yes	No
Adenopathies		
Asthenia		
Headache		
Myalgia		
Vomiting		
Diarrhea		
Rash		
Sporadic case		
Onset of symptoms during the outbreak		

Comments: …….

Treatment: Antiviral drugs Yes ☐ No ☐ Type:...... … … … … … ….

Antibiotics Yes ☐ No ☐ Type:

ANNEX 6. DIFFERENTIAL DIAGNOSIS OF SARI AND DIAGNOSTIC SPECIMENS



Source: Adaptation of guidelines for collection of clinical specimens during field investigation of outbreaks. WHO/CDS/CSR/EDC/2000.4

ANNEX 7. RESPIRATORY TRACT SAMPLING TECHNIQUES

Nasal swab

- Insert a dry polyester or Dacron swab into the nostril, parallel to the palate, using a rotating motion. Apply pressure on the walls of the nasal septum in order to collect as many cells as possible.
- Insert the swab into the tube that contains the transport medium:
    - If a **commercial medium** is used, place the swab in the transport tube and press on or apply pressure to the padding on the bottom of the tube in order to release the medium.
    - If a **laboratory-prepared medium** is used, break off the stick from the swab so that only the part adhered to the swab remains in the tube. Close the tube with the cap. The swabs should always be kept moist during shipping.

Throat swab

- Use a swab to brush the tonsils and the back of the pharynx. Then insert the swab into the transport medium as indicated in the previous section.
- If a laboratory-prepared medium is used, both swabs (nasal and pharyngeal) can be sent in the same transport medium.

Nasopharyngeal aspirate

- **Materials**
    - Nasopharyngeal aspiration kit
    - Test tube rack
    - Cold-storage units
    - Vacuum pump
    - Container with disinfectant solution
- **Method**
    - Open the envelope that contains the aspiration kit and connect the end of the tube with smaller diameter to the aspiration tube.
    - Connect the end with larger diameter to the vacuum pump.
    - Insert the nasogastric tube into the nostril of the patient.
    - Remove the tube with a gentle rotating motion. Then repeat the procedure in the other nostril.
    - Aspirate a volume of approximately 8-10 mL of cold buffer solution at pH 7.2 through the collector tube in order to collect all of the secretions.
    - Change the cap of the sample collection tube and identify it with the patient data.
    - Send the sample to the laboratory immediately with the sample shipment form. Make sure that it is kept in the ice bath until it reaches the laboratory.

Source: PAHO/CDC Generic Protocol for Influenza Surveillance

ANNEX 8. PACKING THE SAMPLES FOR TRANSPORT

→ Keep the samples at a temperature of 4ºC.

→ Fill a refrigerator with packs of ice or coolants.

→ Keep the samples in double packing if dry ice is used.

Include a detailed list of the samples with identification numbers and instructions for the laboratory.

Packing the samples for transport

Use three layers of packing.

The first layer should have passed the filtration test.

Use absorbent material in all of the layers.

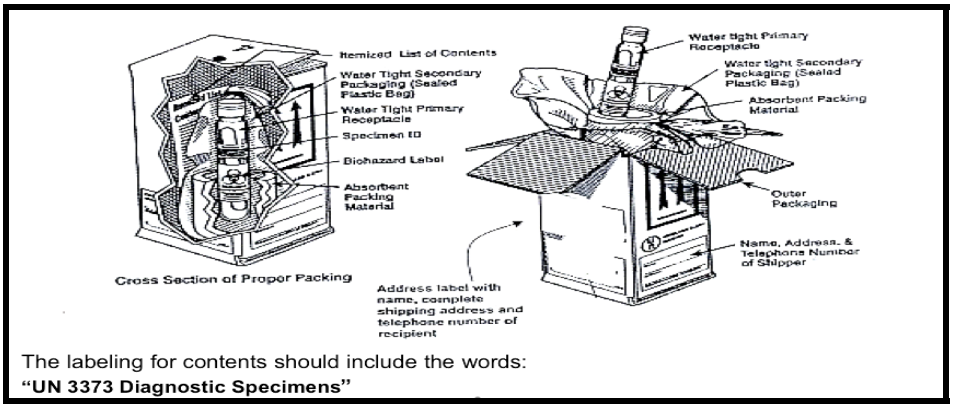
Do not place more than 500 mL in the packing.

Transport of samples

Take into account the WHO guidelines for safe transport of infectious substances and diagnostic samples. Follow the local standards for transport of infectious materials.

Coordinate with the laboratory.

Transport of samples from the health facility to the laboratory



Handling infectious material in the health facility

Always use personal protective equipment. Emphasize the importance of hand washing.

Be careful with the sharps.

Handle all of the samples as if they were infected.

ANNEX 9. FORM FOR MONITORING HEALTH WORKERS FOR CASE-FINDING OF INFLUENZA-LIKE ILLNESSES IN HEALTH WORKERS EXPOSED TO PATIENTS WITH SUDDEN OR UNEXPECTED SARI[6]

Name: _____ Home phone: _____

Job: _____ Workplace:_____

Date(s) of exposure (List all dates. Use the back of the sheet if required): ____/____/_____ ____/____/_____

Type of contact with patient with serious respiratory infection of potential concern, the patient environment, or the virus:

_____

Was the following personal protective equipment (PPE) used?

PPE	Yes	No	Do not know
Gown	☐	☐	☐
Gloves	☐	☐	☐
Particle respirator	☐	☐	☐
Surgical mask	☐	☐	☐
Eye protection	☐	☐	☐
Other (Please specify)	☐	☐	☐

List any non-occupational exposure (i.e., exposure to birds or persons with febrile severe acute respiratory disease):

_____

Take your temperate twice daily, in the morning (AM) and the afternoon (PM), for 10 days after providing care for a patient infected with an acute respiratory disease of potential concern (including 10 days after the last exposure) and monitor onset of any of the following symptoms of influenza-like illness (ILI), including:

- fever >38 °C
- cough
- sudden onset of respiratory disease
- sore throat
- arthralgia
- myalgia o prostration
- gastrointestinal symptoms (e.g, diarrhea, vomiting, abdominal pain)

If any symptom of ILI occurs, limit your interaction with others immediately. Do not visit public areas and report to _____in _____

Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Date ____/____/_____	Date ____/____/_____	Date ____/____/_____	Date ____/____/_____	Date ____/____/_____
Temperature AM: _____	Temperature AM: _____	Temperature AM: _____	Temperature AM: _____	Temperature AM: _____
Temperature PM: _____	Temperature PM: _____	Temperature PM: _____	Temperature PM: _____	Temperature PM: _____
Symptoms of ILI: No ____ Yes ___	Symptoms of ILI: No ___ Yes ___	Symptoms of ILI: No ___ Yes ____	Symptoms of ILI: No ___ Yes ____	Symptoms of ILI: No ___ Yes ____
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
Date ____/____/_____	Date ____/____/_____	Date ____/____/_____	Date ____/____/_____	Date ____/____/_____
Temperature AM: _____	Temperature AM: _____	Temperature AM: _____	Temperature AM: _____	Temperature AM: _____
Temperature PM: _____	Temperature PM: _____	Temperature PM: _____	Temperature PM: _____	Temperature PM: _____
Symptoms of ILI: No ____ Yes ___	Symptoms of ILI: No ___ Yes ____	Symptoms of ILI: No ___ Yes ____	Symptoms of ILI: No ___ Yes ____	Symptoms of ILI: No ___ Yes ____

[6]Prevention and control of acute respiratory diseases with epidemic and pandemic potential during health care. Provisional WHO guidelines. June 2007 (WHO/CDS/EPR/2007.6).

ANNEX 10: TRIAGE

TRIAGE SCALES

PATIENT CLASSIFICATION CRITERIA BY COLOR (*1*)

Type of Patient	Referral	Treatment
Healthy, no respiratory symptoms	Home	Biosafety measures
Respiratory symptoms not compatible with influenza	Home	Symptomatic and biosafety measures
Influenza-like symptoms, without pulmonary complications and without additional chronic disease	Strict home isolation	Symptomatic and biosafety measures
Clinical symptoms of influenza without pulmonary complications and/or controlled chronic disease	Care and isolation center[a]	Symptomatic and antiviral
Clinical symptoms of influenza with pulmonary complications and/or chronic decompensated disease	Permanent or field hospital medical unit	Compensaction of chronic disease and complications
Death due to suspected or confirmed clinical symptoms of influenza	Forensic medical unit	

[a]Units located in alternative treatment centers (e.g., gymnasiums, hotels, schools) with capacity for outpatient care of exclusive cases of influenza-like illness.

The ***United States Influenza Pandemic Preparedness Plan and Response*** includes other methodologies for defining the immediate destination of the patient, which are described below (*2*):

For adults

• The preliminary IDSA-ATS guidelines recommend the use of severity scores or scales such as the Pneumonia Severity Index (PSI) or PORT Score and the CURB-65 System in order to determine which patients can be safely treated as outpatients.

For Children

• The current guidelines provide indicators for hospitalization of children with community-acquired pneumonia. For infants the indications include temperature >38.5ºC, RR >70 breaths/minute, thoracic retraction (inspiration), nasal inflammation, hypoxia, cyanosis, intermittent apnea, snoring, and poor diet. The indications for hospitalization of older children include temperature >38.5ºC, RR

>50 breaths/min, thoracic retraction, nasal inflammation, hypoxia, cyanosis, snoring, and signs of dehydration.

As with pandemic influenza, the decision to hospitalize for community-acquired post-influenza bacterial pneumonia during the pandemic period will be based on clinical assessment of the patient by the physician, as well as the availability of hospital resources and staff. Although unstable patients will be considered high priority, patients with conditions that entail high risk of complications also require special care. Home management with follow-up may be appropriate for young children with satisfactory appearance that only have fever.

Risk groups for influenza complications

The Advisory Committee on Immunization Practices (ACIP) currently recognizes the following groups as those with highest risk for complications of seasonal influenza (e.g., hospitalization, death) compared to healthy older children and young adults (*3)*.

- Persons aged > 65 years
- Residents of nursing homes and other chronic care facilities that house persons of any age with chronic medical conditions.
- Adults and children with chronic disorders of the pulmonary or cardiovascular systems, including asthma.
- Adults and children who have required regular medical follow-up or hospitalization during the previous year due to chronic metabolic diseases (including diabetes mellitus), renal dysfunction, or immunosuppression (including immunosuppression that is caused by medication or by human immunodeficiency virus [HIV]).
- Children and adolescents (aged 6 months to 18 years) who are receiving long-term aspirin therapy and, therefore, are at risk of Reyes syndrome.
- Pregnant women
- All children aged < 2 years
- All persons with conditions that can affect respiratory function or respiratory secretion management, or can increase the risk of aspiration.

CALCULATION OF THE PNEUMONIA SEVERITY INDEX (PORT SCORE)

Characteristic of Patient	Points Assigned
Demographic Factor	
Age	
Male	Age
Female	Age –10
Resident of nursing home or similar institution	+10
Comorbid disease	
Neoplastic disease	+30
Hepatic disease	+20
Congestive heart failure	+10
Cerebrovascular disease	+10
Kidney disease	+10
Physical examination findings	
Altered mental status	+20
Respiratory rate > 30 breaths/min	+20
Systolic blood pressure <90 mm Hg	+20
Temperature <35ºC or >40ºC	+15
Pulse > 125 bpm	+10
Laboratory and/or X-ray findings	
Arterial pH <7.35	+30
Blood urea nitrogen >30 mg/dL	+20
Sodium <130 mmol/L	+20
Glucose >250 mg/dL	+10
Hematocrit <30%	+10
Hypoxemia	+10
Pulse oximetry <90%	
Arterial blood gas <60 mm Hg	
Pleural effusion in baseline X-ray	+10

RISK CLASSIFICATION ACCORDING TO PNEUMONIA SEVERITY INDEX (PSI)

PSI risk class	Characteristics and points	Recommended treatment site
I	Age >50 years + no morbid conditions, vital signs within normal range, normal mental status	Outpatient
II	<70	Outpatient
III	71–90	Outpatient/Brief admission
IV	91–130	Inpatient
V	>130	Inpatient

CURB-65 SCORING SYSTEM

Characteristic	Points
Confusion[a]	+1
Urea >7 mmol/L (20 mg/dL)	+1
Respiratory rate >30 breaths/min	+1
Blood pressure (systolic <90 or diastolic <60 mm Hg)	+1
Age >65 years	+1

[a] Based on specific mental assessment or person, time, or place disorientation

Patient score	Recommended treatment site
0 – 1	Outpatient
2	Hospital room admission
3 – 5	Hospital room or ICU admission

CRITICAL CARE TRIAGE PROTOCOL

Another critical point is insufficient availability of the ventilators and intensive care units that will be required for care of serious cases of SARI. The decision-making process can be complex when there are too many cases with similar needs but insufficient capacity to treat them. In these cases, more objective mechanisms of prioritization must be used that allow the clinician to make a decision in critical situations based on scientific evidence.

The protocol that is presented is only one form of addressing the problem. There should be a consensus between the clinicians and the administrators of the health facility that will define the guidelines on this subject in the final analysis. The protocol is based on an adaptation of the Sequential Organ Failure Assessment (SOFA) score (*4*).

TOOL USED TO ASSIGN PRIORITIES IN THE TRIAGE PROTOCOL FOR ASSESSMENT OF PATIENTS THAT REQUIRE INTENSIVE CARE IN AN INFLUENZA PANDEMIC (*5*)

Initial assessment

Triage code	Criteria	Action or priority
Blue	Exclusion criteria met or SOFA score >11[a]	Manage medically Provide palliative care as needed Discharge from critical care
Red	SOFA score ≤7 or single-organ failure	High priority
Yellows	SOFA score 8-11	Intermediate priority
Green	No significant organ failure	Referral or discharge from critical care Reassess if needed

[a]If the patient meets the exclusion criteria or the SOFA score is >11 at any time from the initial assessment until 48 hours later, change the triage code to blue and proceed as indicated.

48-hour assessment

Triage code	Criteria	Action or priority
Blue	Exclusion criteria met or SOFA score stable 8–11 with no change	Provide palliative care if needed Discharge from critical care
Red	SOFA score ≤ 11 and decreasing	High priority
Yellow	SOFA score stable at <8 with no change	Intermediate priority
Green	No longer dependent on ventilator	Discharge from critical care

120-hour assessment

Triage code	Criteria	Action or priority
Blue	Exclusion criteria met or SOFA score >11 or SOFA score < 8 with no change[b]	Provide palliative care Discharge from critical care
Red	SOFA score <11 and decreasing progressively	High priority
Yellow	SOFA score < 8 with minimal decrease	Intermediate priority
Green	No longer dependent on ventilator	Discharge from critical care

Instructions for Application of Triage Protocol[c]

1. Assess whether the patient meets the inclusion criteria
   - If yes, proceed to step 2.
   - If no, reassess the patient later to determine whether clinical status has deteriorated.
2. Assess whether the patient meets the exclusion criteria
   - If no, proceed to Step 3
   - If yes, assign blue triage code. Do not transfer the patient to critical care. Continue current level of care or provide palliative care as needed.
3. Proceed with application of the protocol (initial assessment).

[b] If the patient meets the exclusion criteria or the SOFA score is >11 at any time between 48 and 120 hours after the initial assessment, change the triage code to blue and proceed as indicated.

[c] The authors suggest that this protocol be applied in all patients that could require critical care, whether or not they have symptoms of influenza.

Inclusion Criteria

The patient must have one of the following:

A. Criteria for invasive ventilatory support
- Refractory hypoxemia (SPO_2 < 90% with no ventilatory mask or FiO_2 > 0.85
- Refractory acidosis (pH < 7.2)
- Clinical evidence of imminent respiratory failure
- Inability to protect or maintain airway

B. Hypotension (systolic pressure < 90 mm HG or relative hypotension) with clinical evidence of shock (altered state of consciousness, decreased urine output, or other evidence of end-organ failure) refractory to volume resuscitation requiring vasopressor or inotropic support that cannot be managed in a ward setting.

Exclusion Criteria

The patient is excluded from admission or transfer to a critical care unit if any of the following criteria are met:

A. Severe trauma
B. Severe burn with one of the following criteria:
- Age > 60 years
- 40% of body surface area affected
- Inhalation injury

C. Cardiac arrest
- unwitnessed cardiac arrest
- witnessed cardiac arrest that does not respond to defibrillation or pacemaker
- recurrent cardiac arrest

D. Serious cognitive impairment
E. Advanced untreatable neuromuscular disease
F. Metastatic malignant disease
G. Advanced and irreversible immune compromise
H. Severe and irreversible neurological condition or event
I. End-stage organ failure that meets the following criteria:

- Heart
  New York Heart Association (NYHA) class III or IV heart failure

- Lungs
  COPD with FEV_1 < 25% predicted, baseline PaO_2 < 55 mm Hg or secondary pulmonary hypertension

  Cystic fibrosis with post-bronchodilatation FEV_1 > 30% or PaO_2 < 55 mm Hg

Pulmonary fibrosis with VC or TLC < 60% predicted, PaO2 < 55 mm Hg or secondary pulmonary hypertension

Primary pulmonary hypertension with NYHA class III or IV heart failure, right atrial pressure > 10 mm Hg or mean pulmonary artery pressure 50 mm Hg

- Liver
  Child-Pugh score ≥7

J. Age over 85 years

Sequential Organ Failure Assessment (SOFA) Score

	Score				
Variable	0	1	2	3	4
PaO_2/FIO_2 mm Hg	>400	≤400	≤300	≤200	≤100
Platelet count x 10^6/L	>150	≤150	≤100	≤50	≤20
Bilirubin levels, mg/dL (μmol/L)	<1.2 (<20)	1.2-1.9 (20-32)	2.0-5.9 (33-100)	6.0-11.9 (101-203)	>12 (>203)
Hypotension[a]	None	MABP <70	Dop ≤ 5	Dop >5 Epi ≤ 0.1 Norepi≤ 0.1	Dop > 15 Epi > 0.1 Norepi > 0.1
Glasgow coma score	15	13-14	10-12	6-9	<6
Creatinine level, mg/dL (μmol/L)	<1.2 (<106)	1.2-1.9 (106-168)	2.0-3.4 (169-300)	3.5-4.9 (301-433)	>5 (>434)

PaO_2= Partial pressure of arterial oxygen
FIO_2= Fraction of inspired oxygen
MABP= Mean arterial pressure in mm Hg
[a]Dop (dopamine), Epi (epinephrine), Norepi (norepinephrine) doses in μg/kg /minute

NYHA Functional Classification of Heart Failure

This system relates patient symptoms and everyday activities

Class	Patient symptoms
Class I (mild)	No limitation of physical activity. Ordinary physical activity does not cause fatigue, palpitation, or dyspnea.
Class II (mild)	Slight limitation of physical activity. Comfortable at rest, but ordinary activities can cause fatigue, palpitation, or dyspnea.
Class III(moderate)	Marked limitation of physical activity. Comfortable at rest, but minimal ordinary activity causes fatigue, palpitation, or dyspnea.
Class IV (severe)	Unable to perform any physical activity without discomfort. Symptoms of heart failure at rest. Any physical activity increases the

	discomfort

Child-Pugh Score

The scale uses five clinical measures of liver disease, each of which established a score from 1 to 3, with 3 as the most abnormal.

Measure	1 point	2 points	3 points	Unit of measurement
Total bilirubin	<34 (<2)	34–50 (2-3)	>50 (>3)	μmol/l (mg/dL)
Serum albumin	>35	28–35	<28	g/L
INR	<1.7	1.71–2.20	> 2.20	No unit
Ascites	None	Responds to medication	Refractory	No unit
Hepatic encephalopathy	None	Grade I-II (or responds to medication)	Grade III-IV (or refractory)	No unit

Interpretation

Points	Class	1 yr survival probability	2 yr survival probability
5-6	A	100%	85%
7-9	B	81%	57%
10-15	C	45%	35%

References:

1. Plan Nacional de Preparación y Respuesta a una Pandemia de Influenza, Manual Operativo, Secretaría de Salud Mexico, 2005.
2. HHS, Pandemic Influenza Plan, 2006.
3. Prevention and Control of Influenza. Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2005; 54:1-40. Available from: http:// www.cdc.gov/mmwr/pdf/rr/rr54e713.pdf.
4. Ferrerira FL, Bota DP, Bross A., et al. Serial evaluation of the SOFA score to predict outcome in critically ill patients. JAMA 2001;286:1754-8.
5. Michael Christian et al. Development of triage protocol for critical care during an influenza pandemic, CMAJ 2006; 175(11):10.