Evolution of a pandemic
A(H1N1) 2009

APRIL 2009 – AUGUST 2010

2nd edition

World Health Organization
Evolution of a pandemic
A(H1N1) 2009

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On Saturday, 25 April, upon the advice of the Emergency Committee called under the rules of the International Health Regulations, the Director-General declared this event a Public Health Emergency of International Concern.


A public health emergency of international concern is an event which is determined to constitute a public health risk to other states through international spread of disease and to potentially require an international response …

http://whqlibdoc.who.int/publications/2008/9789241580410_eng.pdf
WHO Member States with publicly available pandemic preparedness plans at the start of the 2009 (H1N1) pandemic

Overview of key pandemic preparedness indicators

<table>
<thead>
<tr>
<th>Characteristic of pandemic preparedness plans</th>
<th>Number (%)</th>
<th>Characteristic of pandemic preparedness plans</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part of national disaster plans</td>
<td>25 (21)</td>
<td>Communication channels identified</td>
<td>108 (91)</td>
</tr>
<tr>
<td>Sub-national preparedness plan developed</td>
<td>6 (5)</td>
<td>Logistics for antiviral distribution planned</td>
<td>67 (62)</td>
</tr>
<tr>
<td>Pandemic exercise carried out</td>
<td>9 (8)</td>
<td>Planned vaccination prioritized</td>
<td>73 (61)</td>
</tr>
<tr>
<td>Communication and coordination structure outlined</td>
<td>87 (73)</td>
<td>Animal surveillance for influenza</td>
<td>96 (81)</td>
</tr>
<tr>
<td>Country specific triggers</td>
<td>53 (45)</td>
<td>Planned collaboration with WHO</td>
<td>107 (90)</td>
</tr>
</tbody>
</table>

† Plans were excluded based on the study criteria, or they were exclusively aimed at the agriculture sector.
April

24 April
“The Government of Mexico has reported three separate events … surveillance began picking up cases of influenza-like illness starting 18 March … as of 23 April there are … more than 854 cases of pneumonia from the capital. Of those, 59 have died.

“Of the Mexican cases, 18 have been laboratory confirmed … as … Influenza A(H1N1).

“The majority of these (pneumonia) cases have occurred in otherwise healthy young adults.”


27 April
“The [Director-General] has raised the level of influenza pandemic alert … to phase 4 … [and] indicates that the likelihood of a pandemic has increased, but not that a pandemic is inevitable.”


29 April
“Based on assessment … and … expert consultation, [the Director-General] decided to raise the current level of influenza pandemic alert to phase 5. Influenza pandemics must be taken seriously precisely because of their capacity to spread rapidly to every country in the world.”

27 April 2009  Pandemic (H1N1) 2009
Countries, territories and areas with laboratory-confirmed cases and number of deaths as reported to WHO

<table>
<thead>
<tr>
<th>Date</th>
<th>Number confirmed cases</th>
<th>Number countries affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 April</td>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>26</td>
<td>38</td>
<td>2</td>
</tr>
<tr>
<td>27</td>
<td>73</td>
<td>4</td>
</tr>
<tr>
<td>28</td>
<td>105</td>
<td>7</td>
</tr>
<tr>
<td>29</td>
<td>148</td>
<td>9</td>
</tr>
<tr>
<td>30</td>
<td>257</td>
<td>11</td>
</tr>
</tbody>
</table>

Laboratory diagnostic protocol published: 28 April
Phase 5 declared: 29 April

Cumulative deaths
- 1 - 10
- 11 - 50
- 51 - 100
- 101 and more

Number of countries and overseas territories reporting pandemic A influenza (2009) cases by week between April 2009 and August 2010
Immediately following the declaration of Phase 5, WHO initiated the distribution of the 3 million treatment courses of WHO rapid response stockpile of antiviral medicines to 72 countries. At the same time, a number of countries were supplied from regional stocks, resulting in 123 shipments of antivirals between 3 May and 21 May 2009.

[http://apps.who.int/gb/ebwha/pdf_files/WHA64/A64_10-en.pdf]
High level consultation: new influenza A(H1N1)

Key considerations

Being prepared has made a vital difference: Investment in developing national and regional pandemic preparedness plans over the past five years has paid major dividends.

The International Health Regulations (2005) have been tested for the first time in a public health emergency affecting multiple countries and the experience has shown that Member States are prepared to meet their 2005 commitments.

Success depends on a multi-stakeholder approach: Many preparedness plans emphasize a whole of government approach.

Effective communication is paramount: Real-time exchange of information has been a key feature of the response so far.

Science-based approaches remain the bedrock of the response: The outbreak is at different stages in different countries and continents.

Health systems matter: Many of the countries that have been affected to date stressed the importance of universal access to health care, and the need for strong primary health care.


Key uncertainties

The only thing certain about influenza viruses is that nothing is certain.

It remains uncertain how fast the new influenza A(H1N1) virus will spread throughout the world and whether it will become widely established.

It remains uncertain whether the infectivity and virulence of the new influenza A(H1N1) virus will change over time.

In view of the threat posed by the current outbreak of new influenza A(H1N1), the Director-General of the World Health Organization convened a High-Level Consultation for all Member States at the start of the Sixty-second World Health Assembly.

Keiji Fukuda, Assistant Director-General – Health Security and Environment; Ban Ki-moon, Secretary-General of the United Nations; and Margaret Chan, Director-General of the World Health Organization
Severity assessment

29 May

“… countries may find it useful to assess the specific severity parameters of a pandemic at national and regional level to efficiently target and scale the use of limited resources and interventions …

“… severity may vary from country to country and among different population groups or geographic locales … Severity will likely change as an event unfolds over time … The robustness of a severity assessment will reflect the quality and availability of information about the virus and the people who are susceptible to infection.

“… the impact of a pandemic on a population is a function of 3 determinants: (i) the pandemic virus and its virological and clinical manifestations; (ii) the vulnerability of the population; and (iii) the capacity of the population for response."

Within one month, the virus had spread to much of the world including the temperate regions of the southern hemisphere, where the usual winter influenza transmission season was just starting.
11 June
“The Emergency Committee held its fourth meeting on 11th June 2009.
“The Committee considered available information on transmission of new influenza A(H1N1) in a number of locations in countries in different regions of the World Health Organization, and concluded that the criteria for a pandemic have been met.
“As previously recommended by the Director-General, countries should not close borders or restrict international traffic and trade.
“Countries should assess their specific situation and make a timely transition from focusing national efforts on containment to focusing on mitigation measures, including appropriate non-pharmaceutical interventions.”


World now at the start of 2009 influenza pandemic
“As of today, nearly 30 000 confirmed cases have been reported in 74 countries …
“Further spread is considered inevitable … I have therefore decided to raise the level of influenza pandemic alert from phase 5 to phase 6 …
“Globally, we have good reason to believe that this pandemic, at least in its early days, will be of moderate severity.”

As community transmission became sustained on four continents, countries shifted their monitoring from screening of returning travellers to performing enhanced surveillance in hospitals and clinics. Spread across the southern hemisphere temperate region during the winter of 2009 (June–August) was rapid, and the pandemic virus quickly replaced other influenza viruses that season.
“The Strategic Advisory Group of Experts (SAGE) ... [met] to discuss ... vaccine for the pandemic (H1N1) 2009.

“The experts identified three different objectives that countries could adopt as part of their pandemic vaccination strategy:

- protect the integrity of the health-care system and the country’s critical infrastructure;
- reduce morbidity and mortality; and
- reduce transmission of the pandemic virus within communities.

“Although the severity of the pandemic is currently considered to be moderate with most patients experiencing uncomplicated, self-limited illness, some groups such as pregnant women and persons with asthma and other chronic conditions such as morbid obesity appear to be at increased risk ...

“All countries should immunize their health-care workers as a first priority to protect the essential health infrastructure.”

http://www.who.int/csr/disease/swineflu/notes/h1n1_vaccine_20090713/en/index.html
As the case counts increased, the burden on laboratories became overwhelming and countries and territories stopped testing and reporting less severe cases.
Collaborative call to action to reduce impact of pandemic (H1N1) 2009

“WHO, IFRC, UNSIC, OCHA and UNICEF\(^1\) prompted by the humanitarian imperative, will work with partners such as the Red Cross and Red Crescent Societies, NGOs and civil society to support governments and communities to reduce the impact from the pandemic (H1N1) 2009.”


Urgent Needs Identification and Prioritization (UNIP) process

“The donors asked the UN system, WHO and the World Bank to develop a more detailed assessment of what is required [at Member State level] … [The] process targets as a first priority the least developed countries and as a second priority the GAVI\(^2\) eligible countries …

“… the first category of support is to provide antibiotics and antivirals to treat severe illness, and sufficient quantities of vaccine to protect health-care workers and other essential service personnel …

“… the second category of support is to assist countries in strengthening their pandemic readiness …

“… The overarching goal of the UNIP process is to mobilize resources … so as to:

- Limit excess mortality
- Increase societal resilience
- Build on existing capacity.”


\(^1\) IFRC – International Federation of Red Cross and Red Crescent Societies, UNSIC – UN System Influenza Coordination, OCHA – Office for the Coordination of Humanitarian Affairs, UNICEF – United Nations Children’s Fund.

\(^2\) GAVI – the Global Alliance for Vaccines and Immunisation (GAVI).
2 August 2009  **Pandemic (H1N1) 2009**

Countries, territories and areas with laboratory-confirmed cases and number of deaths as reported to WHO

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### Requests for support from least-developed countries for pandemic preparedness

<table>
<thead>
<tr>
<th>Requested area for support</th>
<th>% assessed countries requesting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased supply of personal protective equipment</td>
<td>82</td>
</tr>
<tr>
<td>Technical assistance with strengthening of operational communications</td>
<td>72</td>
</tr>
<tr>
<td>Assistance with the production and dissemination of materials to support community-based communications</td>
<td>69</td>
</tr>
<tr>
<td>Training of health-care workers in infection control and case management</td>
<td>69</td>
</tr>
<tr>
<td>Strengthening whole-of-society readiness</td>
<td>69</td>
</tr>
<tr>
<td>Training of public health workers in pandemic surveillance</td>
<td>54</td>
</tr>
<tr>
<td>Health sector planning, including for mass vaccination campaigns</td>
<td>50</td>
</tr>
</tbody>
</table>

“WHO applauds and welcomes the announcement of donations of pandemic vaccine made today by the United States of America, in concert with Australia, Brazil, France, Italy, New Zealand, Norway, Switzerland, and the United Kingdom.”


“… WHO received pledges of approximately 200 million doses of vaccine, 70 million syringes and US$ 48 million for operations …”

http://www.who.int/csr/disease/swineflu/action/h1n1_vaccine_deployment_final_update_2010_11_10.pdf

“WHO currently estimates worldwide production capacity for pandemic vaccines at approximately 300 million doses per year. “Global manufacturing capacity for influenza vaccines is limited, inadequate and not readily augmented.”

6 September 2009  Pandemic (H1N1) 2009

Countries, territories and areas with laboratory-confirmed cases and number of deaths as reported to WHO

Countries with less capacity for testing reported fewer deaths as only laboratory-confirmed fatalities were reported. Over time, the numbers reported to WHO lagged further and further behind the true picture and other means of monitoring the progress of the pandemic were developed.
Pandemic influenza vaccine production

1. Identification of a new virus significantly different to currently circulating viruses.
2. Preparation of candidate vaccine virus which is able to grow in hen’s eggs.
3. Characterization of the candidate vaccine viruses to verify their similarity to pandemic virus.
4. Preparation of reagents to test the candidate vaccine viruses.
5. Optimization of virus growth conditions for maximum virus production.
6. Production of bulk vaccine using thousands of eggs.
7. Quality control of each batch for sterility, safety and potency.
8. Vaccine is tested, filled, packed and released.

The entire process can be completed in approximately 5–6 months.

http://www.who.int/csr/disease/swineflu/notes/h1n1_vaccine_20090806/en/index.html
As school children returned to school, the influenza season started unusually early in much of the temperate regions of the northern hemisphere. For some, it was the earliest influenza season on record since the pandemic of 1968. WHO rolled out a system for regional and global reporting of epidemiological data (FluID) to improve the monitoring of influenza seasonal outbreaks and future pandemics, similar to a system that had been in use in Europe for a number of years.
Intensity of acute respiratory illness in population

The intensity indicator is an estimate of the proportion of the population with acute respiratory disease, covering the spectrum of disease from influenza-like illness to pneumonia.

- **Low or moderate**: a normal or slightly increased proportion of the population is currently affected by respiratory illness.
- **High**: a large proportion of the population is currently affected by respiratory illness.
- **Very high**: a very large proportion of the population is currently affected by respiratory illness.

“As of 8 November 2009, worldwide more than 206 countries and overseas territories or communities have reported laboratory-confirmed cases of pandemic influenza H1N1 2009, including over 6250 deaths.”

By November, public concern over the pandemic had generally declined and there were fewer visits to healthcare providers by the “worried well” and persons with mild illness. However, the numbers of severe cases and deaths were much higher in the northern hemisphere winter season, even in those countries where transmission first occurred in the previous summer.
From 19 April 2009 to 5 December, a total of 82 countries reported ... [virological data]. The total number of specimens ... positive for influenza viruses was ... 351,047. Of these, 258,698 (73.7%) were pandemic H1N1, 8358 (2.4%) were seasonal A(H1), 23,777 (6.8%) were A(H3), 54,162 (15.4%) were A (not subtyped) and 6047 (1.7%) were influenza B.

During December 2009, the percentage of seasonal H1N1 viruses had decreased to 0.2% while the pandemic H1N1 strain had increased to 87% of all viruses tested from countries sharing their virological data.

WHO coordinated the deployment of pandemic (H1N1) 2009 vaccine donated by several countries and vaccine manufacturers

Overview of resource mobilization (millions)

<table>
<thead>
<tr>
<th>RESOURCE</th>
<th>PLEDGED</th>
<th>COMMITTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccines (doses)</td>
<td>200</td>
<td>122,453</td>
</tr>
<tr>
<td>AD syringes</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Safety boxes</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Funding (USD)</td>
<td>57.3</td>
<td>56.3</td>
</tr>
</tbody>
</table>

Sufficient vaccines were pledged to meet at least 10% population coverage of all eligible countries that requested vaccine.

Ninety-seven countries requested vaccine, 87 countries signed agreements with WHO and 82 National Deployment Plans were completed and finalized.
At the January 2010 Executive Board meeting of WHO, the Director-General requested a review of the Organization’s response to the pandemic. The aim of the review was to:

— assess the functioning of the International Health Regulations
— assess the ongoing response to the pandemic
— identify lessons learned for strengthening preparedness and response for future public health emergencies.
“… it was premature to conclude that all parts of the world have experienced peak transmission of the H1N1 pandemic influenza … the Director-General determined that there had been no change in the pandemic phase.”

http://www.who.int/csr/disease/swineflu/7th_meeting_ihr/en/index.html

“The most active areas of transmission continue to be in later peaking areas, particularly northern Africa, South Asia, and East Asia …

“In North Africa, pandemic influenza transmission persists but substantial declines in activity have been observed over the past month across the region …

“In South and Southeast Asia, pandemic influenza virus continues to circulate widely across the region, however, overall activity continues to decrease or remain low in most places …

“In East Asia, pandemic influenza transmission persists across the region; however, overall activity has declined substantially in most places.”

7 February 2010 Pandemic (H1N1) 2009
Countries, territories and areas with laboratory-confirmed cases and number of deaths as reported to WHO

As of 7 February 2010, worldwide more than 212 countries and overseas territories or communities had reported laboratory confirmed cases of pandemic influenza H1N1 2009, including at least 15 292 deaths.
Monitoring the pandemic: WHO update 90: 8–14 March 2010
Trend of respiratory disease activity compared to previous week

Week 10, March 2010

<table>
<thead>
<tr>
<th>Region</th>
<th>Deaths$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHO Regional Office for Africa (AFRO)</td>
<td>167</td>
</tr>
<tr>
<td>WHO Regional Office for the Americas (AMRO)</td>
<td>At least 7,539</td>
</tr>
<tr>
<td>WHO Regional Office for the Eastern Mediterranean (EMRO)</td>
<td>1,018</td>
</tr>
<tr>
<td>WHO Regional Office for Europe (EURO)</td>
<td>At least 4,388</td>
</tr>
<tr>
<td>WHO Regional Office for South-East Asia (SEARO)</td>
<td>1,633</td>
</tr>
<tr>
<td>WHO Regional Office for the Western Pacific (WPRO)</td>
<td>1,710</td>
</tr>
<tr>
<td>Total$^a$</td>
<td>16,455</td>
</tr>
</tbody>
</table>

$^a$ The reported number of fatal cases is an under representation of the actual numbers as many deaths are never tested or recognized as influenza related.

Pandemic virus continued to circulate in tropical areas of the world, most notably western Africa, between the temperate area winter seasons. Western Africa had been largely spared up to this point.
The IHR Review Committee convenes

“The assessment of the global response to the pandemic H1N1 will be conducted by the International Health Regulations Review Committee (Review Committee on the functioning of the International Health Regulations (2005) in relation to Pandemic (H1N1) 2009), a committee of experts with a broad mix of scientific expertise and practical experience.

“Observers invited to the first meeting include representatives of all States Parties to the IHR (194 countries), United Nations organizations and relevant intergovernmental organizations, and nongovernmental organizations in official relations with WHO.”


From the Director-General’s opening remarks at the first meeting of the Review Committee of the International Health Regulations

“This has been the first influenza pandemic in four decades. This has been the first major test of the functioning of the revised International Health Regulations, which entered into force in 2007.

“As I have said before, this has been the most closely watched and carefully scrutinized pandemic in history. This gives us a vast body of scientific, clinical, and epidemiological data to assess.

“We are seeking lessons, about how the IHR has functioned, about how WHO and the international community responded to the pandemic, that can aid the management of future public health emergencies of international concern.”

During the period between the northern and southern hemisphere winters, most influenza transmission was occurring in tropical areas of the world, primarily in Asia and parts of Africa. The seasonal influenza virus, A(H3N2), reappeared in many areas co-circulating with the pandemic H1N1 virus.
The WHO Global Influenza Surveillance and Response System (GISRS) monitors the evolution of influenza viruses and provides recommendations in areas including laboratory diagnostics, vaccines, antiviral susceptibility and risk assessment.

WHO GISRS also serves as a global alert mechanism for the emergence of influenza viruses with pandemic potential.

Established in 1952, the network currently comprises six WHO Collaborating Centres, four Essential Regulatory Laboratories and 136 institutions in 106 WHO Member States, which are recognized by WHO as National Influenza Centres, in addition to ad hoc groups established to address specific emerging issues.

http://www.who.int/influenza/gisrs_laboratory/en/
16 May 2010  Pandemic (H1N1) 2009
Countries, territories and areas with laboratory-confirmed cases and number of deaths as reported to WHO

Role of GISRS in the pandemic:
1. Development and global distribution of diagnostic assays
2. Monitoring the co-circulation of pandemic and seasonal influenza virus
3. Monitoring the evolution of the 2009 H1N1 pandemic virus: antigenic and genetic characterization
4. Antiviral resistance monitoring
5. Vaccine virus and reagent development
6. Information exchange

Shipments of specimens to WHO Collaborating Centres*

**TO ATLANTA**
From 71 countries, over 15,000 clinical specimens and isolates

**TO MELBOURNE**
From 25 countries, over 5,000 clinical specimens and isolates

**TO TOKYO**
From 7 countries, over 470 clinical specimens and isolates

**TO LONDON**
From 62 countries, over 5,000 clinical specimens and isolates

Throughout the pandemic, WHO supported 320 shipments of specimens through the WHO Shipment Fund project. This project provides shipping services for all National Influenza Centres and other influenza laboratories for sharing their influenza specimens with the GISRS. Under the agreement, the costs incurred by the courier company transporting the specimens are covered by the WHO Shipment Fund Project.


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* The WHO Collaborating Centres are institutions which are designated by the Director-General to carry out activities in support of the Organization’s programmes. Currently there are over 800 WHO Collaborating Centres in more than 80 Member States. [http://www.who.int/collaboratingcentres/en/](http://www.who.int/collaboratingcentres/en/)
The arrival of winter in the southern hemisphere brought a return of influenza. This second season was less severe for some areas but more severe for others. The previously circulating seasonal H1N1 strain was no longer being detected but H3N2 began to be increasingly seen and in some countries of the southern hemisphere it was the most commonly detected virus of the season.
### Regional distribution of pandemic H1N1 vaccine through the WHO Deployment Initiative

<table>
<thead>
<tr>
<th>WHO region</th>
<th>No. of vaccine doses delivered</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHO African Region</td>
<td>32,096,290</td>
</tr>
<tr>
<td>WHO South-East Asia Region</td>
<td>21,090,700</td>
</tr>
<tr>
<td>WHO Region of the Americas</td>
<td>10,025,000</td>
</tr>
<tr>
<td>WHO Western Pacific Region</td>
<td>8,722,800</td>
</tr>
<tr>
<td>WHO Eastern Mediterranean Region</td>
<td>4,354,000</td>
</tr>
<tr>
<td>WHO European Region</td>
<td>1,777,500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>78,066,290</strong></td>
</tr>
</tbody>
</table>

Overall, the WHO Vaccine Deployment Initiative delivered more than 78 million vaccine doses. Almost 70% of all vaccine doses were delivered to the WHO African Region and the WHO South-East Asia Region combined. In the WHO African Region in particular there were high numbers of eligible countries, many of which had dense populations.

[http://whqlibdoc.who.int/publications/2012/9789241564427_eng.pdf](http://whqlibdoc.who.int/publications/2012/9789241564427_eng.pdf)
As the second winter season since the beginning of the pandemic peaked in the southern hemisphere’s temperate countries, H3N2 became the most commonly detected virus in some areas, outnumbering pandemic H1N1 cases. However, H1N1 continued to disproportionately affect younger adults, including some who had no underlying risk factors for severe disease. Many of these countries, notably those in the southern cone of South America, experienced a relatively mild season compared to the previous season when the pandemic virus first appeared.
Declaration of the end of the pandemic

“The world is no longer in phase 6 of influenza pandemic alert. We are now moving into the post-pandemic period. The new H1N1 virus has largely run its course …

“Based on experience with past pandemics, we expect the H1N1 virus to take on the behaviour of a seasonal influenza virus and continue to circulate for some years to come …

“During the pandemic, the H1N1 virus crowded out other influenza viruses to become the dominant virus. This is no longer the case. Many countries are reporting a mix of influenza viruses, again as is typically seen during seasonal epidemics.”


Schematic of the pandemic waves across the hemispheres

15 August 2010 Pandemic (H1N1) 2009
Countries, territories and areas with laboratory-confirmed cases and number of deaths as reported to WHO

Although it was expected that some countries in the northern hemisphere would still see significant numbers of pandemic H1N1 cases in the coming winter, the virus was beginning to settle into a pattern similar to that of seasonal influenza prompting the Director-General to declare an official end to the pandemic on 10 August 2010.
**WHO recommendations for the post-pandemic period**

**Monitoring of respiratory disease activity**
WHO recommends that surveillance during the post-pandemic period include:
- monitoring for unusual events;
- investigating severe or unusual cases, clusters or outbreaks;
- maintaining routine surveillance;
- continuing to use routine channels of data transmission, to transmit data from the routine surveillance of respiratory disease;
- notifying WHO immediately if any of the following changes are detected:
  - sustained transmission of antiviral-resistant H1N1 2009 influenza
  - human cases of infection with any influenza virus not currently circulating in human populations
  - any notable changes in the severity or other epidemiological or clinical characteristics of the H1N1 2009 virus
- monitoring the H1N1 2009 virus for important genetic, antigenic or functional changes.

**Vaccination**
Vaccination remains important as a means of reducing the morbidity and mortality caused by influenza viruses.

**Clinical management**
Persons suspected of illness from influenza should receive appropriate clinical care.

Conclusions of the Review Committee on the Functioning of the International Health Regulations (2005) in relation to Pandemic (H1N1) 2009

Summary conclusion 1

The IHR helped make the world better prepared to cope with public health emergencies. The core national and local capacities called for in the IHR are not yet fully operational and are not now on a path to timely implementation worldwide.

Summary conclusion 2

WHO performed well in many ways during the pandemic, confronted systemic difficulties and demonstrated some shortcomings. The Committee found no evidence of malfeasance.

Summary conclusion 3

The world is ill-prepared to respond to a severe influenza pandemic or to any similarly global, sustained and threatening public health emergency. Beyond implementation of core public health capacities called for in the IHR, global preparedness can be advanced through research, reliance on a multisectoral approach, strengthened health-care delivery systems, economic development in low- and middle-income countries and improved health status.

http://apps.who.int/ebwha/pdf_files/WHA64/A64_10-en.pdf
WHO provided evidence-based technical guidance to individuals, communities and national authorities on public health topics related to pandemic influenza. Leading scientific and public health experts contributed to the guidelines. A selection is shown here.

Advice on the use of masks in the community setting in Influenza A(H1N1) outbreaks

Availability of a candidate international standard for antibody to A/California/7/2009 (H1N1)v-like viruses

Availability of a candidate reassortant vaccine virus for the novel influenza A(H1N1) vaccine development CBER-RG2

Availability of a candidate reassortant vaccine virus for the novel influenza A(H1N1) vaccine development NIBRG-121

Availability of a candidate reassortant vaccine virus for the novel influenza A(H1N1) vaccine development X-179A

Availability of a candidate reassortant vaccine virus for the novel influenza A(H1N1) vaccine development IDCDC-RG15

Availability of a candidate reassortant vaccine virus for the novel influenza A(H1N1) vaccine development IVR-153

Availability of a new candidate reassortant vaccine virus for pandemic (H1N1) 2009 vaccine development

Availability of a new candidate reassortant vaccine virus for pandemic (H1N1) 2009 virus vaccine development NIBRG-121xp

Availability of four new candidate reassortant vaccine viruses for pandemic (H1N1) 2009 virus vaccine development IDCDC-RG18, IDCDC-RG20, IDCDC-RG22 and NIBRG-122

Availability of two new candidate reassortant vaccine viruses for pandemic (H1N1) 2009 virus vaccine development X-181 and X-181A

Behavioural interventions for reducing the transmission and impact of influenza A(H1N1) virus: a framework for communication strategies

Biocontainment requirements for vaccine production from and quality control of the reassortant candidate vaccine virus CBER-RG2

Biocontainment requirements for vaccine production from and quality control of the reassortant candidate vaccine virus IVR-153

Biocontainment requirements for vaccine production from and quality control of the reassortant candidate vaccine virus IDCDC-RG15, NIBRG-121 and X-179A

Call to action

Case management of Influenza A(H1N1) in air transport

CDC protocol of realtime RTPCR for influenza A(H1N1)

Characteristics of the emergent influenza A(H1N1) viruses and recommendations for vaccine development

Clean hands protect against infection

Clinical management of adult patients with complications of pandemic influenza A(H1N1) 2009 influenza: Emergency guidelines for the management of patients with severe respiratory distress and shock in district hospitals in limited-resource settings

Clinical management of human infection with pandemic (H1N1) 2009: revised guidance

Considerations of influenza A(H1N1) and HIV infection

Consultation on potential risks of pandemic (H1N1) 2009 influenza virus at the human-animal interface

Countries able to perform PCR to diagnose influenza A(H1N1) virus infection in humans

Gene sequences of the reassortant candidate vaccine viruses for the novel influenza A(H1N1)
Global surveillance during an influenza pandemic

Human infection with pandemic (H1N1) 2009 virus: updated interim WHO guidance on global surveillance

Infection prevention and control in health care for confirmed or suspected cases of pandemic (H1N1) 2009 and influenza-like illnesses

Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care

Reducing excess mortality from common illnesses during an influenza pandemic

Preliminary review of D222G amino acid substitution in the haemagglutinin of pandemic influenza A(H1N1) 2009 viruses

Protocol for antiviral susceptibility testing by pyrosequencing

Recommendations of the Strategic Advisory Group of Experts (SAGE) on Influenza A(H1N1) vaccines

Reducing transmission of pandemic (H1N1) 2009 in school settings

Safe transport of pandemic influenza A(H1N1) 2009 virus cultures, isolates and patient specimens as Biological Substance, Category B

Sequencing primers and protocol

Statement from WHO Global Advisory Committee on Vaccine Safety about the safety profile of pandemic influenza A(H1N1) 2009 vaccines

Summary of available potency testing reagents for Pandemic (H1N1) 2009 virus vaccines

Sequence report of a High-Level Consultation: new influenza A(H1N1)

Surveillance recommendations for Member States in the post-pandemic period

Update of WHO biosafety risk assessment and guidelines for the production and quality control of human influenza pandemic vaccines

Viral gene sequences to assist update diagnostics for influenza A(H1N1)

Viral gene sequences to assist update diagnostics for influenza A(H1N1) – GenBank accession numbers

WHO Guidelines for Pharmacological Management of Pandemic (H1N1) 2009 Influenza and other Influenza Viruses

WHO information for laboratory diagnosis of pandemic (H1N1) 2009 virus in humans – revised

WHO interim technical advice for case management of pandemic (H1N1) 2009 on ships

WHO recommendations on influenza A(H1N1) vaccines

WHO Technical Consultation on the Severity of Disease Caused by the new influenza A
12 April – An outbreak of influenza-like illness in Veracruz, Mexico reported
http://apps.who.int/gb/ebwha/pdf_files/WHA64/A64_10-en.pdf

14 April – CDC determines that a USA specimen is swine influenza A
http://apps.who.int/gb/ebwha/pdf_files/WHA64/A64_10-en.pdf

17 April – CDC determines that another USA specimen is swine influenza A (H1N1) virus
http://apps.who.int/gb/ebwha/pdf_files/WHA64/A64_10-en.pdf

25 April – Public Health Emergency of International Concern declared

27 April – Phase 4 declared

28 April – Laboratory diagnostic protocol published

29 April – Phase 5 declared

2 May – Diagnostic kits made globally available

3 May – Director-General announces deployment of oseltamivir to 72 least-developed countries
http://www.who.int/mediacentre/swineflu_presstranscript_2009_05_02.pdf

5 May – WHO dispatches 2.4 million courses of antivirals to 72 countries
http://apps.who.int/gb/ebwha/pdf_files/WHA64/A64_10-en.pdf

18 May – High-level consultation convened

21 May – Clinical management of pandemic influenza guidance published

26 May – Vaccine strain recommendation

27 May – Vaccine reassortants available

11 June – Phase 6 declared

24 June – WHO Consultation on schools and mass gatherings

6 July – Urgent needs identification and prioritization process commenced

13 July – Target groups for vaccination decided by SAGE
http://www.who.int/csr/disease/swineflu/notes/h1n1_vaccine_20090713/en/index.html

17 August – Call to action

17 September – Donations of vaccines announced

17 November – Convening of the Public Health Research Agenda for Influenza
http://www.who.int/influenza/resources/research/en/

7 January – WHO deployment of donated H1N1 vaccine
http://www.euro.who.int/influenza/AH1N1/20100108_1

21 January – Executive Board decision to convene the IHR/Pandemic review

12 April – IHR review committee convenes
http://www.who.int/ihr/review_committee/en/index.html

10 August – Declaration of post pandemic

21 January – Executive Board decision to convene the IHR/Pandemic review