

Meeting report

WHO Informal Consultation on Surveillance of RSV on the Global Influenza Surveillance and Response System (GISRS) Platform

25–27 March 2015

**Starling Hotel & Conference Centre,
Geneva, Switzerland**



All rights reserved. Publications of the World Health Organization are available on the WHO website (www.who.int) or can be purchased from WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland (tel.: +41 22 791 3264; fax: +41 22 791 4857; e-mail: bookorders@who.int).

Requests for permission to reproduce or translate WHO publications –whether for sale or for non-commercial distribution– should be addressed to WHO Press through the WHO website (www.who.int/about/licensing/copyright_form/en/index.html).

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use.

Contents

Executive summary	4
1 Introduction	6
2 Understanding of RSV	6
3 National and global objectives for RSV surveillance	8
4 Current RSV surveillance activities and their connection with the GISRS platform	9
5 RSV surveillance operational components	10
6 Next steps and way forward	11
Annex 1 Provisional agenda	12
Annex 2 List of participants.....	16
Annex 3 Declarations of interest	21

Executive summary

Respiratory syncytial virus (RSV) is the leading viral cause of acute lower respiratory tract infections in infants and young children in whom this virus is the cause of the primary infection. Several novel vaccines have shown promising results in clinical trials; therefore, it is important to get a better understanding of RSV epidemiology and the burden of disease it causes, particularly in low- and middle-income countries where the greatest RSV-associated mortality is observed. The WHO-coordinated Global Influenza Surveillance and Response System (GISRS) continuously monitors the global epidemiology of influenza viruses, as well as the antigenic and genetic characteristics of circulating and novel influenza viruses. A number of GISRS laboratories have already included RSV and other respiratory pathogens in their surveillance programme.

To design strategies for coordinated, systematic and global RSV surveillance, the WHO Global Influenza Programme convened an informal consultation with representatives from academia and public health from 25 to 27 March 2015, in Geneva, Switzerland. The meeting included presentations from experts on the clinical presentation of the infection, the epidemiology of RSV, the burden of disease, vaccines under development and in clinical trials, and the RSV surveillance that has been established in several countries. Working groups discussed possible case definitions, sampling strategies, technical aspects of laboratory testing, reporting and analysis of surveillance data.

One primary objective of RSV surveillance is to provide information on the seasonality of RSV epidemics in different parts of the world and shed light on the burden of disease RSV infections cause in different geographical areas and population groups. RSV is one of the most common severe acute respiratory illnesses (ARIs) during the first year of life, and up to one third of serious RSV infections are seen during the first 6 weeks of life. The young age at which many serious infections occur limits the potential use of many sentinel influenza surveillance systems because very young children are underrepresented in these systems. Influenza disease generally occurs later in life.

Since about half of RSV-infected children present without fever, the influenza-like illness case definition – which includes fever and is often used for influenza surveillance – may miss many RSV infections. Thus, a case definition that does not require fever would capture more RSV-infected infants.

Clinical samples commonly collected for the detection of influenza viruses are suitable also for the detection of RSV. Nasopharyngeal aspirates and nasal washes may be the preferred specimens from young children. Many GISRS laboratories use real-time polymerase chain reaction (PCR) techniques for the detection of influenza viruses, and such assay protocols are also available for RSV. When testing samples from young children, detection of RSV by immunofluorescent techniques also provides satisfactory sensitivity. However, for older children, adolescents and adults, this technique is clearly inferior to PCR.

The well-established, internet-based FluNet reporting system for influenza data maintained by the WHO Global Influenza Programme can easily be adapted to integrate RSV data.

The meeting concluded that it is possible to build standardized RSV surveillance systems, and that the existing influenza surveillance system is the most practical platform. The surveillance would provide useful information about the seasonality of RSV epidemics in different geographical regions and associated virological information. To understand fully the burden of disease caused by RSV, special studies beyond routine surveillance are required. Standardized sampling and testing protocols will be evaluated and made available to laboratories and institutions able to participate in RSV surveillance. Institutions with profound experience in RSV diagnostics and surveillance could serve as reference laboratories for RSV. Ideally, one or more of these institutions should have the capacity to provide testing protocols, and eventually reagents or test kits, to laboratories participating in RSV surveillance. The WHO Global Influenza Programme will establish a group of experts that will provide advice on various aspects of RSV surveillance and burden of disease estimates.

1 Introduction

Respiratory syncytial virus (RSV) is an important respiratory pathogen that often causes severe and even fatal infections, particularly in children aged under 6 months. In low- and middle-income countries in particular, RSV infection in those aged under 6 months may be fatal. Several studies have shown that other population groups may be vulnerable to severe RSV infections; for example, pregnant women, immunocompromised individuals and patients with chronic medical conditions. The clinical presentation usually does not differ from that caused by other respiratory pathogens, and RSV often co-circulates with other respiratory viruses including influenza.

Several RSV vaccines are currently being tested, and some of those may be used widely in the foreseeable future. A commercially available neutralizing monoclonal antibody can prevent severe RSV infections in prematurely born infants when given regularly throughout the entire RSV period. Similar products and anti-RSV drugs may soon become available for clinical use.

More precise knowledge about the epidemiology of RSV and its seasonality in different geographical regions, and a better understanding of the burden of disease caused by RSV are needed, to help identify individuals who might profit most from vaccines or antiviral treatment. To acquire this information, a coordinated, global surveillance of RSV needs to be established. The WHO Global Influenza Surveillance and Response System (GISRS) provides a well-established platform on which RSV surveillance could be built.

A WHO informal consultation was held in Geneva, Switzerland, from 25 to 27 March 2015. At the meeting, RSV experts from academia and from public health, as well as representatives from GISRS entities, discussed the needs for global RSV surveillance and deliberated on the requirements of an RSV surveillance system. In the planning phase of this meeting, several teleconferences were held with RSV experts, to identify session topics and discussion items for group work. The expected outcomes of this informal consultation were to:

- develop strategies for RSV surveillance;
- design an operational plan towards implementation of RSV surveillance;
- agree on standardized laboratory protocols for RSV detection;
- find agreement on surveillance protocols and reporting systems; and
- outline functions of a WHO expert group on RSV surveillance.

2 Understanding of RSV

Based on the clinical presentation, it is difficult to distinguish RSV from other respiratory viruses such as human metapneumovirus, parainfluenza and influenza viruses. RSV is the most important respiratory pathogen in children aged under 1 year. Up to 30% of all RSV cases appear in children aged under 6 weeks. Peak hospitalizations occur at about 1 month of age, and RSV-related case-fatality rate is highest in children aged under 2 months. Tachypnoea, cough and wheezing are important signs of RSV infection. Cough is one of the

leading symptoms, but almost half of RSV-infected children present without fever. If fever occurs in small children, it often is followed by lower respiratory tract infection. In young children, adjusted rates for hospitalization are highest for RSV, followed by parainfluenza virus type 3 and influenza. In children aged under 5 years, RSV causes a higher burden of disease than influenza. Risk factors for RSV-related hospitalization are premature birth, chronic lung diseases and congenital heart disease. RSV causes a significant burden of disease both in hospitalized individuals and outpatients, and RSV infection may predispose children to long-term sequelae up to the age of 13 years and even beyond, with wheezing and asthma being the most frequently observed long-term problems. More precise information on the burden of disease caused by RSV will provide a case for vaccine interventions, and enhance awareness at the national and international levels.

A better understanding of RSV epidemiology and seasonality is needed for the timing of preventive interventions. RSV epidemics do not necessarily overlap with the influenza seasons. Intensified surveillance may reveal that the RSV season is longer than currently assumed. In tropical areas, RSV often circulates during the rainy season, whereas south of the equator, RSV mainly occurs during the dry season. However, seasonality can vary even within countries, and in some countries, year-round RSV circulation is observed.

A major obstacle to RSV immunization is the fact that RSV infects early in life. Immune responses are reduced in infancy, and the safety of any vaccine is a major concern. Several different approaches to vaccine manufacturing are underway and some companies may file for marketing authorization in a few years. These vaccine approaches include F protein antigens with a stable and immunogenic structure, parainfluenza or Sendai viruses expressing the RSV F protein, virus-like particles, virosomes and live-attenuated RSV. Maternal immunization has proven feasible as a measure to prevent severe RSV infection in the newborn. High titres of maternally acquired RSV-specific neutralizing antibodies correlate with decreased disease in young infants. However, RSV infections occur in the presence of pre-existing immunity, and re-infections are frequently seen in all age groups.

With regard to interventions other than vaccines, the humanized monoclonal antibody Palivizumab has proven moderately effective in preventing RSV disease in high-risk young infants. In the United States of America, this intervention is recommended for premature infants of less than 29 weeks gestational age. However, the need for repeated application of this expensive prophylactic approach has set clear limitations on this intervention. Novel, similar products and three anti-RSV drugs are in clinical evaluation and may help to reduce the burden of RSV within the next few years.

Subtypes A and B of RSV are co-circulating, and these two subtypes can be further divided into several genotypes. These genotypes replace each other in circulation and may thus also contribute to re-infections. Even within different regions of a given country (e.g. Kenya), the two subtypes can circulate at different times. There may be peak activity of one subtype while the other subtype is almost or even completely absent.

3 National and global objectives for RSV surveillance

In many regions, RSV is co-circulating with other respiratory pathogens; also, in the absence of laboratory testing, surveillance may underestimate the burden of disease in the community. Hence, there is a need for standardized case definitions for RSV. Surveillance for influenza-like illness (ILI) and severe acute respiratory illness (SARI) as used for influenza can help to determine the seasonality of RSV and to track genetic diversity among circulating RSV strains. However, ILI case definitions require the presence of fever, or reported fever, for inclusion. Since almost 50% of children have no fever when infected with RSV, surveillance using fever as an inclusion criterion will miss many cases. The acute respiratory illness (ARI) definition does not require fever and thus covers all respiratory pathogens. Hence, ARI might be the preferable case definition for RSV surveillance. An increasing number of countries participating in GISRS are expanding their influenza surveillance to SARI cases. With frequent severe RSV infections in the very young, RSV surveillance should also include SARI patients with or without fever. Any form of RSV surveillance may underestimate RSV mortality, because in low- and middle-income countries in particular more RSV-infected children die at home than in hospitals. Currently, RSV mortality estimates are limited to only a few scientific studies.

Recruiting of RSV surveillance sites is critical. General practitioner offices, paediatricians' offices and hospitals should be represented in an RSV surveillance network, and should cover all age groups and risk groups. Children with the most severe outcome are also the ones with the least access to health-care services. Among the specific risk groups identified are malnourished and immunocompromised individuals, pregnant women, army conscripts, prison inmates, individuals who are HIV-positive or are exposed to HIV, people with Down syndrome, patients with chronic obstructive pulmonary disease or other chronic conditions, native populations, patients in long-term care and older people. These groups may benefit most from vaccination in the future and should therefore be covered by surveillance systems. Surveillance may underestimate the burden of disease in the community, but can nevertheless help to demonstrate that RSV is a health priority.

Various patterns of seasonality have been identified for RSV. Most geographical areas experience annual epidemics, whereas others may experience them only every second year; also, epidemics may vary over time. Surveillance can help to characterize the timing of epidemics from year to year.

Economic analyses will be needed in order to justify and encourage vaccination, once vaccines become available. Such studies can help to determine the extent to which health-care expenses can be avoided by using vaccines. Global surveillance data should be collected before RSV vaccines become widely available, to provide a benchmark.

4 Current RSV surveillance activities and their connection with the GISRS platform

The primary tasks of influenza surveillance are to:

- monitor the evolution and spread of influenza viruses in order to update vaccine composition and recommendations in a timely manner;
- make timely risk assessments; and
- serve as a global alert mechanism when new variants or novel influenza viruses are detected in humans.

GISRS provides almost real-time information about the characteristics of circulating viruses, and compiles epidemiological information. Requirements for RSV surveillance may be different and careful planning is required to determine how relevant RSV surveillance data can be obtained through GISRS without weakening influenza surveillance. Having different surveillance systems for RSV and for influenza may create technical problems, particularly at the surveillance sites where clinical specimens are collected. Short-term and long-term needs for RSV surveillance need to be defined, and local, national and global data are required.

Many national influenza centres (NICs) are already testing their specimens for RSV. Outside peak influenza activity, most sentinel specimens sent for influenza surveillance are influenza negative. Clinicians participating in sentinel influenza surveillance would particularly like to know the etiology of a patient's infection if the patient is influenza negative.

Swabs and aspirates are the most commonly used clinical specimens for the detection of influenza viruses, and such specimens are also appropriate for the detection of RSV. It is commonly recommended that nasopharyngeal aspirates or nasal washes be obtained from infants and young children, because such specimens contain a lot of virus-infected respiratory epithelial cells. For older patients, nasopharyngeal swabs or combined nasal and throat swabs are appropriate. For the detection of RSV, protocols similar to those for influenza can be used for the collection, storage and transport of specimens.

In countries where influenza surveillance is conducted year round, testing these specimens for RSV will provide useful information about the seasonality of RSV in different parts of the world. Local seasonality data is important once preventive measures become available. To obtain more reliable data about the burden of disease caused by RSV, case definitions need to be broadened to include patients without fever. Also, there is a need for the surveillance system to cover children aged under 1 year and other special population groups.

Immunofluorescent staining techniques are still widely used for the detection of RSV, particularly in peripheral laboratories. This technique is fairly sensitive for specimens collected from young children. To reach high sensitivity in all age groups, polymerase chain reaction (PCR) techniques should be applied; this will require specific training of laboratory personnel. Thoroughly evaluated PCR protocols for the detection of RSV are available. Standardized test kits containing reference material provided through the Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, have been used by laboratories in

the Pan American Health Organization (PAHO) region for many years. The CDC also conduct quality assessment programmes for these laboratories.

Obtaining sequence data is a central part of influenza surveillance; however, unless there are additional resources available, genotyping and sequencing of RSV genes should not be a mandatory part of RSV surveillance. The relationship between genotype and pathogenicity is still poorly understood and needs to be the subject of specific studies. PCR protocols are available that allow for the differentiation between RSV A and RSV B. A few specialized laboratories already perform more detailed genetic analyses; however, at present, genotyping is still a research-based activity. Testing for antiviral susceptibility may become important when RSV-specific antiviral drugs are introduced. Detection of virus strains that evade vaccine-induced immunity may also become a necessity in the future.

The WHO Global Influenza Programme has established the electronic, internet-based FluNet and FluID platforms for reporting laboratory and epidemiological data. Both platforms are flexible and can easily be designed to integrate RSV surveillance data.

5 RSV surveillance operational components

Global RSV surveillance based on the GISRS platform can be started on a small scale, including two to three NICs per WHO region. These laboratories should commit to performing RSV surveillance over a period of at least 2–3 years. Standardization of methods used by laboratories piloting RSV surveillance is essential. Pilot testing of RSV surveillance needs to be continuously evaluated, with adjustments made if necessary. Over time, RSV surveillance may need to be further developed, particularly in countries that will implement RSV vaccination. It takes 2–3 years to establish robust surveillance systems. None of the six WHO collaborating centres (CCs) for influenza is conducting RSV work. For RSV surveillance, a different institution needs to be identified, to assume the role of a global reference laboratory. Ideally, three reference laboratories with national and international experience should be available to serve the global community. A global resource hub, which would also regularly conduct external quality assessment, needs to be established. The CDC in Atlanta is evaluating its capacity to provide RSV real-time PCR start-up reagent kits for about 1000 reactions to laboratories participating in this initial phase of RSV surveillance.

In addition to obtaining laboratory results, it is important to gather epidemiological data and patient information. Such information gathering should be smoothly integrated into the influenza surveillance system, to prevent significant additional workload for countries initially participating in RSV surveillance.

Building RSV surveillance into the GISRS platform requires additional resources. The needs for RSV surveillance need to be clearly defined, to convince governments that RSV is an important public health issue and its surveillance requires suitable funding.

Establishing epidemic thresholds in different regions is important for timely allocation of appropriate resources. It also assists in the planning of infection-control strategies.

Beyond surveillance, specific studies are needed to:

- establish a more profound picture of the RSV burden of disease;
- identify special risk groups; and
- once vaccines become available, monitor vaccine trials and establish vaccine efficacy.

Data accumulated from surveillance and from specific studies need to be carefully analyzed, to determine whether the desired information is being obtained.

6 Next steps and way forward

Material for a surveillance guidance strategy is already available for influenza. This material should be used as a base when building RSV surveillance using the GISRS. Experts will need to work on the necessity, practicality and design of special studies, epidemiological and laboratory aspects, data collection, analysis and reporting. Experience from countries already performing RSV surveillance, particularly in the PAHO region, is particularly valuable when involving new countries. In terms of case definitions, these need to be evaluated; also, in addition to ILI and ARI, “SARI without fever” would cover a significant fraction of young children with RSV. An optimal number of specimens tested by each country needs to be determined.

An advisory group will be established that will include experts on clinical issues, laboratory and epidemiological aspects, and data collection. This group will provide advice to WHO and to the countries participating in RSV surveillance. It is envisaged that the group will meet annually and remain in contact through teleconferences and other electronic means. When building RSV surveillance based on GISRS, contacts with other global surveillance networks such as measles and polio should also be intensified, particularly in low-resource settings.

Annex 1 Provisional agenda

Day 1

Wednesday, 25 March 2015

Chair: Professor Larry Anderson

08.30 – 08.55	Registration	
09.00 – 09.10	Opening and welcome	Sylvie Briand
09.10 – 09.20	Introduction of scope, purpose and expected outcome	Wenqing Zhang
09.20 – 09.30	Disclosure of interests	
	Selection of chair, session co-chairs and appointment of rapporteur	
	Administrative announcement	
09.30 – 09.45	Introduction of the GISRS platform	Terry Besselaar
Session 1: Understanding of RSV		Session co-chair: Harry Campbell
09.45 – 10.00	Clinical presentation of RSV	Fernando Polack
10.00 – 10.15	Epidemiology of RSV	Eric Simoes
10.15 – 10.30	Burden of disease caused by RSV	James Nokes
10.30 – 11.00	Coffee break and group photo	
11.05 – 11.25	Virology and laboratory surveillance of RSV	Marietjie Venter
	RSV vaccines and other interventions	
11.25 – 11.40	Overview of RSV vaccines	Peter Collins
11.40 – 11.55	Evaluation of RSV vaccines, clinical and virological investigations	Ruth Karron
11.55 – 12.10	Current status and clinical use of monoclonal antibodies	Larry Anderson
12.10 – 12.50	Discussion	
12.50 – 13.50	Lunch break	
13.50 – 14.05	Presentation: Introduction on objectives for surveillance and rationale for sentinel ILI and SARI as a strategy for influenza	Katelijan Vandemaele
14.05 – 14.45	Round table 1: Introduction and discussion: RSV incidence, prevalence, and mortality rates in relation to other respiratory virus infections	Facilitator: Michael Cooper
14.45 – 15.25	Round table 2: Introduction and discussion: Seasonal patterns of RSV infections in different geographic areas	James Nokes
15.25 – 16.05	Round table 3: Introduction and discussion: RSV infection in risk groups	Ruth Karron
16.05 – 16.35	Coffee break	

16.35 – 17.15	Round table 4: Introduction and discussion: Sequence data and genotyping of RSV – global and regional circulation patterns	Rodrigo Fasce
17.15 – 17.30	General discussion	
	<i>Closure of day 1</i>	

Day 2

Thursday, 26 March

Session 3: Current RSV surveillance activities and their connection with the GISRS platform		Session co-chair: Pasi Penttinen
09.00 – 09.10	Summary of day 1	Chair
	Comparing Influenza and RSV on:	
09.10 – 09.30	Case definitions and other perspectives	Susan Gerber
09.30 – 09.45	FluNet and FluID platforms	Julia Fitzner
09.45 – 10.00	Clinical samples and sampling strategy	Tomimasa Sunagawa
10.00 – 10.30	Discussion	
10.30 – 11.00	Coffee break	
11.00 – 11.15	Laboratory implementation of real-time PCR for respiratory syncytial virus (RSV): General considerations and case studies	Teresa Peret
11.15 – 11.45	Experiences from the NICs:	
	– South Africa	Florette Treurnicht
	– Romania	Cristina Tecu
11.45 – 12.00	Combining influenza and RSV surveillance: Experience from the PAHO region	Rakhee Palekar
12.00 – 12.30	Discussion	
12.30 – 13.30	Lunch break	
Session 4: Operational components of RSV surveillance		Session co-chair: Aparna Singh Shah
Round table discussion		
13.30 – 13.45	Introduction:	Facilitator:
	How can RSV surveillance be built on the existing influenza surveillance	Mandeep Chadha
13.45 – 14.00	Establish epidemic thresholds and generate reliable national and international data for ARI including ILI/SARI	Facilitator: Fernando Polack

14.00 – 14.15	Characterize the seasonality of RSV infections in different geographical areas and population groups	Facilitator: Eric Simoes
14.15 – 14.30	Identify additional risk groups besides the very young children and the elderly	Facilitator: Ruth Karron
14.30 – 14.45	Estimate burden of disease studies in different risk groups	Facilitator: Harry Campbell
14.45 – 15.00	The needs and role for reference laboratories	Facilitator: Teresa Peret
15.00 – 15.30	Coffee break	
15.30 – 17.30	Operational components (working groups)	
Working group 1	Case definitions, sentinel surveillance	Facilitator: Karen Nahapetyan Rapporteur: Susan Gerber
Working group 2	Types of specimens, transport, testing algorithms, reagents, external quality assurance (EQA), reference laboratories	Facilitator: Talat Mokhtari-Azad Rapporteur: Teresa Peret
Working group 3	Data collection and reporting mechanisms	Facilitator: Paul Horwood Rapporteur: Michael Cooper
17.00 – 17.30	Introduction to WHO Operational Plan for RSV surveillance	Iris Hasibra
	Closure of day 2	

Day 3

Friday, 27 March

Session 5: RSV surveillance operational components (continued)

Session co-chair:
Michael Cooper

Summary and discussion from the working groups

09.00 – 09.30	Working group 1 – Case definitions, sentinel surveillance: Summary and discussion
09.30 – 10.00	Working group 2 – Types of specimens, transport, testing algorithms, reagents, external quality assurance (EQA), reference laboratories: Summary and discussion
10.00 – 10.30	Working group 3 – Data collection and reporting mechanisms: Summary and discussion
10.30 – 11.00	Coffee break
11.00 – 12.30	Operational Plan for RSV surveillance (working groups)

Working group 1 Surveillance protocol

Working group 2 Laboratory methodologies

Working group 3 A global network for RSV surveillance

Facilitator:
Florette Treurnicht

Rapporteur:
James Nokes

Facilitator:
Brunhilde Schweiger

Rapporteur:
Marilda Siqueira

Facilitator:
Larry Anderson

Rapporteur:
Sonnie Kim

12.30 – 13.30 *Lunch break*

Summary and discussion from the working groups

13.30 – 13.50 **Working group 1:** Surveillance protocol

13.50 – 14.10 **Working group 2:** Laboratory methodologies

14.10 – 14.30 **Working group 3:** A global network for RSV surveillance

14.30 – 15.00 *Coffee break*

Session 6: Next steps and way forward

Session co-chair:
Wenqing Zhang

15.00 – 16.00 Way forward

Closure of the meeting

Annex 2 List of participants

Dr Hanan Al Kindi

Central Public Health Laboratories
Muscat
Oman

Professor Larry J. Anderson

Emory University School of Medicine
Atlanta
United States of America (USA)

Dr Darmaa Badarch

National Center for Communicable Disases (NCCD)
Ulaanbaatar
Mongolia

Dr Elsa G. Baumeister

INEI-ANLIS “Carlos G. Malbrán”
Buenos Aires
Argentina

Dr Judy A. Beeler

Center for Biologics Evaluation and Research
Food and Drug Administration
Silver Spring
USA

Dr Harry Campbell

Centre for Population Health Sciences
The University of Edinburgh
Edinburgh
United Kingdom

Dr Mandeep Chadha

National Institute of Virology
Pune
India

Dr Peter Collins

National Institute of Allergy and Infectious Diseases (NIAID)
Bethesda
USA

Dr Michael Cooper

Armed Forces Health Surveillance Center (AFHSC)
Silver Spring
USA

Dr Rodrigo Fasce

Instituto de Salud Publica de Chile
Santiago
Chile

Dr Susan I. Gerber

National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention
Atlanta
USA

Dr Paul Horwood

Institut Pasteur in Cambodia
Phnom Penh
Cambodia

Dr Jude Jayamaha

Medical Research Institute
Colombo
Sri Lanka

Dr Hervé Kadjo

Institut Pasteur de Côte d'Ivoire
Abidjan
Côte d'Ivoire

Professor Ruth Karron

Johns Hopkins University
Baltimore
USA

Dr Sonnie Kim

National Institute of Allergy and Infectious Diseases (NIAID)
5601 Fishers Lane Room 8E12
Rockville, MD 20852
USA

Dr Kendall Krause

Bill & Melinda Gates Foundation
Seattle
USA

Dr Stephen Lindstrom

Influenza Division
Centers for Disease Control and Prevention
Atlanta
USA

Professor Talat Mokhtari-Azad

Tehran University of Medical Sciences
Tehran
Islamic Republic of Iran

Professor James Nokes

KEMRI-Wellcome Trust Research Programme
Kilifi
Kenya

Dr Pasi Penttinen

European Centre for Disease Prevention and Control (ECDC)
Stockholm
Sweden

Dr Teresa P. C. Peret

Gastroenteritis and Respiratory Viruses Laboratory Branch
Centers for Disease Control and Prevention (CDC)
Atlanta
USA

Dr Fernando P. Polack

Vanderbilt University
Nashville
USA

Dr Brunhilde Schweiger

Robert Koch-Institute
Berlin
Germany

Professor Eric Simoes

Children's Hospital Colorado
Aurora
USA

Dr Marilda Siqueira

Instituto Oswaldo Cruz
Rio de Janeiro
Brazil

Dr Tomimasa Sunagawa

National Institute of Infectious Diseases
Tokyo
Japan

Dr Kathleen Tatti

Gastroenteritis and Respiratory Viruses Laboratory Branch
Centers for Disease Control and Prevention (CDC)
Atlanta
USA

Dr Cristina Tecu

Cantacuzino Institute
Bucharest
Romania

Dr Almiro Tivane

Instituto Nacional de Saúde
Maputo
Mozambique

Dr Florette Treurnicht

National Institute for Communicable Diseases
Sandringham
South Africa

Professor Marietjie Venter

US Centers for Disease Control and Prevention
Pretoria
South Africa

Dr Niteen Wairagkar

Bill & Melinda Gates Foundation
Seattle
USA

Dr Weigong Zhou

Influenza Division
Centers for Disease Control and Prevention
Atlanta
USA

Dr Thedi Ziegler

Turku
Finland

WHO Secretariat

Name	Department
Terry Besselaar	WHO/HQ/HSE/PED/GIP
Sylvie Briand	WHO/HQ/HSE/PED
Hien Doan	WHO/HQ/HSE/PED/GIP
Julia Fitzner	WHO/HQ/HSE/PED/GIP
Keiji Fukuda	WHO/HQ/HSE
Christian Fuster	WHO/HQ/HSE/PED/GIP
Iris Hasibra	WHO/HQ/HSE/PED/GIP
Maja Lièvre	WHO/HQ/HSE/PED/GIP
Karen Nahapetyan	WHO/EM/RGO/DCD
Rakhee Palekar	WHO/AMRO/CHA
V. Sathiyamoorthy	HQ/FWC/IVB/IVR
Aparna Singh Shah	WHO/SE/RGO/CDS/BLT
Katelijn Vandemaele	WHO/HQ/HSE/PED/GIP
Wenqing Zhang	WHO/HQ/HSE/PED/GIP

Annex 3 Declarations of interest

The WHO Informal Consultation on Surveillance of RSV on the Global Influenza Surveillance and Response System (GISRS) Platform, 25–27 March 2015 was organized by the Global Influenza Programme of WHO, with participation from WHO collaborating centres on influenza, National Influenza Centres and global experts on RSV.

In accordance with WHO policy, all the WHO expert group members completed the WHO form for Declaration of Interests for WHO Experts before being invited to the meeting. These declarations were evaluated by the WHO Secretariat prior to the meeting. At the start of the meeting, the interests declared by the expert members were disclosed to all consultation participants.

The participants declared the following personal current or recent (within the last 4 years) financial or other interests relevant to the subject of work:

Institution	Representative	Personal
AFHSC, Maryland	Michael Cooper	None
CDC, Atlanta	Susan Gerber	None
CDC, Atlanta	Teresa Peret	None
ECDC, Stockholm	Pasi Penttinen	None
Emory University, Atlanta	Larry J. Anderson	None
FIOCRUZ, Rio de Janeiro	Marilda Siqueira	None
Instituto de Salud Publica, Santiago	Rodrigo Fasce	None
John Hopkins University, Baltimore	Ruth A. Karron	None
KEMRI-Wellcome Trust, Kenya	James D. Nokes	None
National Institute of Virology, Pune	Mandeep Chadha	None
NIAID/NIH, Bethesda	Peter L. Collins	None
NICD, Sandringham	Florette Treurnicht	None
NIID, Tokyo	Tomimasa Sunagawa	None
Robert Koch Institut, Berlin	Brunhilde Schweiger	None
Tehran University of Medical Sciences, Tehran	Talat Mokhtari-Azad	None
Children's Hospital Colorado, Aurora	Eric Simoes	None
University of Edinburgh, Edinburgh	Harry Campbell	None
University of Turku, Turku	Theodor Ziegler	None
US-CDC, Pretoria	Marietjie Venter	None
Vanderbilt University, Nashville	Fernando P. Polack	None