Sultanate of Oman
Ministry of Health

# National Acute Respiratory Infection Surveillance Policy

Directorate General of Surveillance & Disease Control
Department of Communicable Diseases

# National Acute Respiratory Infection Surveillance Policy

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# Foreword

The purpose of this document is to provide a framework for Acute Respiratory Infection (ARI) surveillance. It highlights strategies to provide useful information to public health authorities to be used to minimize the burden of respiratory infections, with emphasis on acute respiratory infection that may constitute a public health emergency of international concern.

This document is intended to be used by public health professionals, health care workers, infection control professionals, other professionals involved in patient care and direct care providers. The policy were developed after systematic review of the international as well as regional guidelines, scientific literature and evidence based practice identified from existing relevant guidelines. This policy has been tailored according to the Ministry of Health's vision, need for information, surveillance objectives and resource consideration.

As in many other areas, the knowledge of ARI that may constitute a public health emergency of international concern and modes of transmission of respiratory diseases is evolving rapidly. In addition, case surveillance and contact investigation are critical in defining and identifying changes in the epidemiology of human infections and will continue to inform ARI surveillance recommendations. Modifications to these guidelines will be made, as necessary, as additional information becomes available.

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# Abbreviations and Acronyms

| | |
|---|---|
| AGP | Aerosol generating procedures |
| ARI | Acute respiratory infection |
| BAL | Bronchoalveolar lavage |
| BSC | Biosafety cabinet |
| CPHL | Central Public Health Laboratory |
| DCD | Department of Communicable Disease |
| ET | Endotracheal (swap) |
| GISRS | Global Influenza Surveillance and Response System |
| H5N1 | Avian influenza |
| HCW | Health care worker |
| ICD | International classification of diseases |
| ICU | Intensive Care Unit |
| IHM | Infectious Hazards Managements |
| ILI | Influenza like illness |
| KPI | Key performance indicator |
| MERS-CoV | Middle East respiratory syndrome coronavirus |
| MoH | Ministry of Health |
| M&M | Morbidity and mortality |
| NARI | National acute respiratory infection |
| NAMRU-3 | Naval Medical Research Unit No 3 |
| NIC | National Influenza Centre |
| NP | Nasopharyngeal (swab) |
| OP | Oropharyngeal (swab) |
| PPE | Personal protective equipment |
| RT-PCR | Reverse transcriptase polymerase chain reaction |
| SARI | Severe acute respiratory infection |
| SARI-IS | Severe acute respiratory infection- intensified surveillance |
| SARI-SS | Severe acute respiratory infection- sentinel surveillance |
| SARS | Severe acute respiratory syndrome |
| SOP | Standard operating procedure |
| TPC | Triple Pack containers |
| VTM | Viral transport medium |
| WHO | World Health Organisation |

# 1 Introduction

## 1.1 Historical Background of ARI Surveillance

Emerging respiratory infectious diseases pose a substantial risk for humans due to their extremely high potential to spread from person to person. These diseases can produce high morbidity and mortality.

There have been several incidents of emerging respiratory infectious diseases in the last hundred years, including the influenza pandemic of 1918 known as the "Spanish Flu", the 1957 "Asian Flu" pandemic, the 1968 "Hong Kong Flu" pandemic, the 2003 severe acute respiratory syndrome (SARS), avian influenza (H5N1) pandemic, the influenza A (H1N1) pandemic of 2009-pdm (H1N1) 2009, the Middle East respiratory syndrome coronavirus (MERS-CoV) in the Middle East and H7N9 in China. All of these events demonstrate the importance of having a respiratory disease surveillance system that can detect new pathogens rapidly and provide information to assess the impact on the population and the presence of operational preparedness plans.

Oman started the influenza like illness (ILI) surveillance system in 2001 in collaboration with US Naval Medical Research Unit No 3 (NAMRU-3) in Cairo. Initially, all Omani flu samples were processed and analyzed by NAMRU-3. After collaborative training with NAMRU-3, the Central Public Health Laboratory (CPHL) fully established all necessary procedures in virology laboratory. Since 2006 all samples are being analyzed at the CPHL in Muscat. Initially and based on geographical representation, 5 ILI sentinel sites were selected in this program, Sultan Qaboos Hospital in Salalah, Suwaiq Polyclinic in North Batinah, Barka Polyclinic in South Batinah, Al Khoudh Health Center and Al Amerat Health Center in Muscat. The CPHL has been accredited as a National Influenza Centre (NIC) since March 2009.

In 2008, a system of severe acute respiratory infection (SARI) surveillance was developed in collaboration with NAMRU-3 to strengthen basic surveillance and response capacities and integrate the epidemiological surveillance of acute respiratory infections (ARIs) with laboratory surveillance into one system. The SARI surveillance system was launched in Sohar Hospital in January 2008, Ibra Hospital joined in September 2009, while Sultan Qaboos Hospital in Salalah has participated since December 2009 and subsequently Al Nahdha Hospital in May 2010.

The aims and objectives of the sentinel surveillance system for SARI/ILI were:

- To describe the epidemiology of respiratory pathogens (viral and bacterial) causing severe illness.
- To isolate and characterize influenza viruses and other respiratory viruses and bacteria of public health importance.

- To serve as an early warning system for outbreaks and potential pandemic.

  The Directorate General of Information Technology has developed a computerized system linked to a central data processing unit in the headquarters. This system, named "Nabd Al-Shifa" is an online system and the reports are generated through COGNOS software (IBM) in response to input of the International Classification of Diseases (ICD)-10 code. This system has direct access to patient records and was used for the first time during the 2009 influenza pandemic for capturing real time data on ILIs. In order to serve as an early warning system, the ILI/SARI data has been captured on a weekly basis from the patient record system (Al-Shifa).

  After implementation of the Surveillance Program, several accomplishments and successes were noted as follow:

- Capacity building of regional epidemiologists in terms of monitoring program activities and data management processes.
- Established baseline, alert threshold and monitoring trends of ARI based on ICD-10 through Al-Shifa.
- Gathering and analyzing important information on seasonality of influenza and other respiratory viruses.
- Setting up logistics at the CPHL for sample collection, storage, transport and processing.
- Advanced training in molecular detection of influenza viruses for the CPHL technical staff.
- Capacity building of the CPHL to diagnose influenza using the immuno-fluorescence test, conventional reverse transcriptase polymerase chain reaction (RT-PCR) and real time RT-PCR.
- Capacity building of the CPHL to isolate influenza viruses using the Madin-Darby canine kidney cell line.
- Capacity building of the CPHL to use haemagglutinin and haemagglutination inhibition tests using Turkey red blood cells for typing and subtyping of influenza viruses.

## 1.2 Prospective of National ARI Surveillance

The Ministry of Health in 2015 made the decision to establish a comprehensive surveillance system of ARIs, namely ILIs and SARIs, and to integrate these activities into the National Communicable Diseases Surveillance System through a real time electronic system (e-Notification). The incorporation of respiratory infections surveillance with other health care-based surveillance will efficiently use resources, promote surveillance sustainability and avoid disruption of other important public health programs.

There are essential components of the National Acute Respiratory Infection (NARI) surveillance.

- Monitoring of ILI/SARI activities through systematic data collection (epidemiological and clinical), compilation, analysis and reporting on a real time basis through health centre (outpatient) and hospital (inpatient) based surveillance.
- Identifying circulating viruses among mild cases of ILI in outpatients and identifying the circulating respiratory viruses responsible for acute respiratory illnesses leading to hospital admissions and deaths.
- Providing timely feedback and useful information to public health authorities (policy makers) and physicians on the current epidemiological and virological situation at regional and national levels.
- Monitoring the ILI/SARI trend based on ICD-10 through the Al-Shifa system.

## 1.3 Aims and Objectives of National ARI Surveillance

**Aims**

The overarching goal of NARI surveillance is to minimize the burden of ARIs by providing useful information to public health authorities that enable continuous monitoring of respiratory infections, timely detection and response of epidemics, and planning appropriate infection prevention and control measures.

**Objectives**

The objectives of NARI surveillance are to provide timely and high quality epidemiological, clinical data and viral isolates to perform the following set of functions:

- Establish national baseline levels of activity for ILI/SARI and severe respiratory-related diseases with alert threshold to evaluate the impact and severity of each season and future epidemic events.
- Describe the seasonality of influenza and other viruses, i.e. identifying the start and end of the influenza season.
- Identify and monitor groups at high risk of severe disease and mortality.
- Detect unusual and unexpected events such as real time detection of outbreaks of respiratory or influenza outside the typical season, SARI among health care workers (HCWs), clusters of SARI, vaccine failures, vaccine mismatches or infection with novel influenza viruses.
- Generate NARI data that can serve for studies focused on the estimation of influenza burden or other acute respiratory etiological agents and help decision-makers prioritize resources and plan public health interventions.
- Provide a platform for the evaluation of the effectiveness of prevention and control intervention, e.g. vaccine impacts.

- Provide real time feedback and updates to physicians to support their clinical decisions.
- Identify locally circulating virus types and subtypes and their relationship to global and regional patterns or any emerging respiratory pathogens.
- Assist in developing an understanding of the relationship of virus strains/types to disease severity.
- Provide candidate viruses for vaccine production by sending influenza virus isolates or influenza positive specimens to WHO Influenza Corroborating Centres.
- Identify antiviral drug resistance mutations by nucleotide sequencing of the influenza virus genome for SARI cases.

# 2 National ARI Surveillance

The NARI surveillance system consists of:

- SARI surveillance in inpatient hospital settings.
- ILI sentinel site surveillance in selected outpatient treatment centres (health centres and polyclinics).

## 2.1 SARI Scope of Surveillance

SARI surveillance monitors are persons who have been admitted to hospital for an ARI. The SARI surveillance activity will be conducted in all hospital wards which are dealing with SARI cases such as general medicine, paediatrics, intensive care unit (ICU), etc. Respiratory sampling will be obtained from all those fulfilling the case definition. In addition, mortality associated with SARI will be monitored on a weekly basis.

## 2.2 Surveillance Strategy

To fulfil the surveillance objectives, the following strategy will be applied:

- **SARI-sentinel surveillance (SARI-SS):** for SARI cases in sentinel hospitals.
- **SARI-intensified surveillance (SARI-IS):** for early detection of unusual or unexpected occurrences of SARIs in all hospitals including sentinel sites.

# 3 SARI Sentinel Surveillance

Sentinel surveillance is the most effective way to collect high quality data in a timely manner. A well-designed and representative sentinel surveillance system is less resource- and effort-intensive, more sustainable and generally provides more complete data than universal surveillance.

## 3.1 SARI Sentinel Sites

Based on global prospects and recommendations for selecting sentinel sites, including feasibility, sustainability and representativeness, the following 3 sites were selected as a SARI surveillance sentinel sites:

- North Batinah Governorate: Sohar Hospital.
- North Sharqiya Governorate: Ibra Hospital.
- Dhofar Governorate: Sultan Qaboos Hospital.

## 3.2 Patient Selection

The SARI sentinel surveillance activity will be conducted in the all hospital wards (general medicine, paediatrics, ICU, etc.) in the selected hospitals. Respiratory sampling will be obtained from **all** those fulfilling the case definition.

## 3.3 SARI Sentinel Surveillance Case Definition

❏ An Acute Respiratory Infection with:

- History of fever or measured fever of ≥38 C° and
- Cough;
- With onset within the last 10 days and
- Requires hospitalization.

## 3.4 SARI Sentinel Surveillance Laboratory Parameters

SARI-SS specimens will be tested at the CPHL according to the following testing scheme using real time RT-PCR (see Annex 6):

1. Influenza A/B/pdm H1N1
2. Influenza A subtyping (seasonal H1, H3, H5 & H7)
3. Influenza B subtyping (B-Yamagata & B-Victoria)

❖ Patient with one or more of SARI-IS triggers should be flagged and proceed as SARI-IS samples. (See SARI-IS case definition and triggers)

❖ 10% of SARI-SS samples will be tested for MERS-CoV.

# 4 SARI Intensified Surveillance

An enhanced nationwide surveillance system can provide an early warning for outbreaks of respiratory diseases with pandemic potential. With the aim to provide HCWs in all hospitals a platform of high suspicion and alert for unusual or unexpected diseases, suspected outbreaks and atypical cases, this strategy of surveillance will be applied.

## 4.1 SARI Intensified Surveillance Sites

The intensified nationwide SARI surveillance activity will be conducted in all wards (general medicine, paediatrics, ICU, etc.) at all hospitals including the SARI-SS sites in terms of samples flagging and proceeding.

## 4.2 Patient Selection

Respiratory sampling will be obtained from **all** those fulfilling the case definition.

## 4.3 SARI Intensified Surveillance Case Definition

All admitted patients with the **acute respiratory symptoms, i.e.** fever ≥38C° and new onset of (or exacerbation of chronic) cough or breathing difficulty.

***And***

**One or more of the following triggers:**

- **Evidence of severe illness progression, i.e.** either radiographic evidence of infiltrates consistent with pneumonia or a diagnosis of acute respiratory distress syndrome or severe ILI which may also include complications such as encephalitis, myocarditis or other severe and life-threatening complications.
- **The patient needs admission to the ICU** or another area of the hospital where critically ill patients are cared for with or without mechanical ventilation.
- **No alternate diagnosis within 72 hours of hospitalization, i.e.** results of preliminary clinical and or laboratory investigations, within 72 hours of hospitalization, cannot ascertain a diagnosis that reasonably explains the illness.
- **One or more of the following exposures/conditions:**
  - A high risk group (pregnant, immunocompromised, chronic condition viz. diabetes mellitus and hypertension.)
  - Residence in or recent travel within <10 days of illness onset to a country where human cases of novel influenza virus or other emerging/re-emerging pathogens have recently been detected or are known to be circulating in animals.
  - Close contact with a confirmed case with emerging/re-emerging pathogens within 10 days prior to onset of symptoms.

- ❍ History of exposure involving direct **health care, laboratory, animal exposure.**
- ❍ Part of **cluster** with similar respiratory symptoms.

**Definitions:**

**Health care exposure** involves HCWs who work in an environment where patients with severe respiratory infections are being cared for, particularly patients in intensive care.

**Laboratory exposure** involves people who work directly with laboratory biological specimens.

**Animal exposure** means workers, dealers or traders of potentially affected animals.
**A "cluster"** is defined as two or more persons with onset of symptoms within the same 14-day period and who are associated with a specific setting, such as a classroom, workplace, household, extended family, hospital, other residential institution, military barracks or recreational camp.

## 4.4 SARI Intensified Surveillance Laboratory Parameters

SARI-IS specimens will be tested at the CPHL according to the following testing scheme using real time RT-PCR (see Annex 7):

- ICU admission: MERS-CoV and the respiratory viral panel which detects the following viruses: influenza A, pdm H1N1, influenza B, rhinovirus, coronavirus NL63, 229E, OC43, HKU1, parainfluenza 1, 2, 3, 4, human metapneumovirus A/B, bocavirus, respiratory syncytial virus A/B, adenovirus, enterovirus, parechovirus and mycoplasma pneumonia). If the sample is positive for influenza A or B, it will be further subtyped.
- Other wards admission: MERS-CoV, influenza typing A/B and subtyping.
- Any negative samples for the above will be tested for atypical bacteria such as chlamydia pneumonia, mycoplasma pneumonia and legionella pneumonia.

# 5 SARI e-Notification Form

The epidemiological and clinical data collected from the patients along with the laboratory request will be entered in the ARI e-notification in SARI form by physician through the Al Shifa system (see Annex 1).The NARI coordinator in the CPHL will enter the results through the Al Shifa system. The regional epidemiologist has to update the outcome of the SARI patients at the time of discharge.

# 6 SARI Sample Collection

All doctors dealing with SARI cases will be responsible for obtaining the required respiratory samples for laboratory testing in accordance with the established procedures. One nasopharyngeal (NP) and one throat (TS) swab together in a viral transport medium (VTM) comprises one set of a sample will be obtained for SARI cases and ET or bronchoalveolar lavage (BAL) (if required). The sample should be obtained and labelled with a special code, stored and transported according to the standard operating procedures (SOPs) (see Annex 2A)

**SARI-SS samples**: Respiratory samples (NP and TS swabs, ET or BAL) will be obtained from SARI-SS cases and should be requested through the e-notification and labelled. These samples will be processed as routine surveillance samples, i.e. within 3 days of receipt unless if a patient has one or more of SARI-IS triggers which will be considered urgent and processed as mentioned below.

**SARI-IS samples**: Respiratory samples (NP and TS swabs, ET or BAL) will be obtained from SARI-IS cases and should be flagged through the e-notification and labelled. These samples will be processed for MERS-CoV urgently within 24 hours of receiving at the CPHL. Samples will be tested for influenza and other respiratory viruses within 3 days of receipt.

# 7 SARI Laboratory Procedures

The respiratory samples will not be processed at the hospital laboratory. They should be transported to the CPHL in cold chain for processing (see Annex 2A).

The head of the hospital laboratory is primarily responsible for ensuring correct labelling and appropriate storage of samples. Similarly, the head of the laboratory should also ensure the samples are sent to the CPHL within the specified time limit (see Annex 2B).

# 8 SARI Surveillance Data Collection and Analysis

**Regional surveillance team**

The regional epidemiologist will extract the epidemiological, clinical and virological data from e-notification and will contact the ARI focal point at hospital in order to get information about the outcome of SARI patients.

The regional epidemiologist will analyze the data and prepare a morbidity and mortality weekly report **that must include**:

- Number of new SARI cases.
- Number of new admitted cases due to other causes.

- Number of SARI deaths.
- Number of death due to other causes.
- Number of sampled SARI cases.
- Proportion of SARI admissions and deaths related to SARI in each region.
- Proportion of sampled admitted SARI cases in each region.
- Proportion of samples that were positive.
- Proportion of positive viruses by type and subtype in each region.
- Line graph describing SARI trend comparing with baseline and alert threshold on the regional level (see Section 16).

**National surveillance team:**

The National ARI team will analyze the data and prepare a morbidity and mortality weekly report **that must include**:

- Number of new SARI cases.
- Number of new admitted cases due to other causes.
- Number of SARI deaths.
- Number of death due to other causes.
- Number of sampled SARI cases.
- Proportion of admission and death related to SARI on the national level.
- Proportion of sampled admitted SARI cases on the national level.
- Proportion of positive viruses by type and subtype on the national level.
- Line graph describing SARI trend comparing to baseline and alert threshold on the national level (see Section 16).

All previous data should be classified based on age, sex, associated co-morbidities, history of vaccination, etc.). The recommended age groupings for reporting are:

- 0 to <2 years.
- 2 to <5 years.
- 5 to <15 years.
- 15 to <50 years.
- 50 to <65 years.
- ≥65 years.

# 9 SARI Personnel and Responsibilities

**Hospital team**

- Doctor from concerned department at hospital will be primarily responsible for patient selection, data submission within ARI e-notification system followed by the collection of samples. Appropriately labelled samples will be sent to the hospital laboratory.
- Regional laboratory coordinator at hospital will ensure the availability of all laboratory supplies such as VTM, specimen collection swabs. Any shortage should be brought to the attention of the CPHL coordinator well in advance so that activities are not stopped. He/she will ensure samples are stored and transported appropriately and in a timely manner to the CPHL (flagged samples should be sent urgently).
- National ARI focal point at hospital will be responsible to review previous 24 hour's admission of patient with respiratory infection to identify those who comply with SARI case definition and missed to notify and insure the completeness of notified cases.

**Regional surveillance team**

- Regional epidemiologist will be responsible for ARI surveillance program in the region. He/she will ensure that all the surveillance activities are conducted according to the policy including supervising the proceeding of samples.
- Regional epidemiologist will contact the ARI focal point (coordinator at hospital level) to investigate the outcome of the SARI patients in terms of mortality.
- Regional epidemiologist will generate the SARI data for the week from e-notification and prepare the SARI weekly morbidity and mortality reports and submit the report to the Department of Communicable Disease (DCD) and concerned parties in the region on a weekly basis.
- Regional epidemiologist will monitor the NARI surveillance performance through KPIs on monthly basis.

**National surveillance team**

✓ **The Lab-coordinator at the CPHL will be responsible for:**

- Supervising the receiving and processing of specimens and reporting of quality results.
- Ensuring the flagged samples are to be processed immediately and the non-flagged samples are treated as routine surveillance samples (see Annex 2B).
- Entering the laboratory results and sending them back to the hospital laboratory, CDC and regional epidemiologist through the Al Shifa System/e-notification.

- Ensuring availability of diagnostic test kits at the CPHL and sample collection equipment for distribution at the regional level.
- Ensuring availability of well-trained staff on sample handling and processing at the CPHL and the training of regional laboratory coordinators on sample collection, storage and transport to the CPHL.

✓ **The NARI coordinator at DCD will be responsible for:**

- Monitoring the implementation of the surveillance, data management, epidemiological analysis and preparation of national reports.
- Preparing a national weekly report based on data generated through e-notification system and reports from the regional epidemiological analysis.
- Monitoring, verification and validation of regional weekly report will be conducted on a regular basis.
- Monitoring key performance indicators (KPIs) at national level.
- Revising and updating the national ARI policy according to the latest international recommendation.

# 10 ILI Surveillance

The primary purpose for ILI surveillance of ambulatory cases of ILIs is to:

- Describe the seasonality of influenza and other viruses, i.e. identifying the start and end of the influenza season.
- Isolate and characterize influenza virus strains circulating in the community.
- Share influenza viruses' isolates with the WHO Influenza Collaborating Centers for inclusion in seasonal influenza vaccine at least twice a year.
- Submit circulating influenza strains through 'FluNet' for the Global Influenza Surveillance and Response System (GISRS) database.
- Provide epidemiological link with virological data on ILI.
- Detect, as early as possible, any unusual influenza strains in human populations that could have pandemic potential.

## 10.1 ILI Sites

Based on the following reasons, 2 sentinel sites are involved in this program Salalah Jadidah in Dhofar and North Al Khuweir Health Centre in Muscat, as they are most densely populated governorates in Oman thus ensuring adequate patient volume and variations and these governorates appropriately represent the difference in Oman

geography and climate. Dhofar Governorate is considered a vulnerable area for influenza transmission due to the climate and due to the influx of international visitors during Khareef (rainy season in Salalah).

## 10.2 Patient Selection

The ILI surveillance activity will be conducted in the selected ILI sentinel sites. Respiratory samples will be obtained from a convenient sample of those fulfilling the case definition. The methodology will be designed based on the selected health centre. Respiratory sample (NP/TS) will be collected and sent to the CPHL at cold chain within 48 hours for influenza virus identification and isolation.

## 10.3 ILI Case Definition

The ILI case definition is generally intended for use in outpatient treatment centres.

ILI Case Definition:

An Acute Respiratory Infection with:

- Measured fever of ≥38 C° and
- Cough;
- With onset within the last 10 days.

**Patients with the following criteria should be excluded for the purpose of surveillance:**

- Infants under 1 month of age.
- Children with congenital anomalies.
- Immunocompromised patients.
- Patients with obvious exudative pharyngitis.
- Individuals from the same household with similar symptoms during the same time frame.
- Travel history within the last 7 days.

## 10.4 ILI Surveillance Laboratory Parameters

ILI specimens will be tested at the CPHL will be tested as follow using real time RT-PCR: (see Annex 8).

- Influenza typing A/B.
- Influenza subtyping A/B.

# 11 ILI e-Notification Form

The epidemiological and clinical data collected from the patients along with the laboratory request will be entered in the ARI e-notification by physician through the Al Shifa system (see Annex 1). The NARI coordinator in the CPHL will send the results back to the health centre/polyclinic through the Al Shifa system.

# 12 ILI Sample Collection

Swabs (NP/TS) will be obtained from ILI cases. The doctors will be responsible for obtaining the NPs and TSs for laboratory testing in accordance with the established procedures (see Annex 2A).

One NP and one TS together in a VTM comprises one set of a sample. This sample should be obtained and labelled with a special code, stored and transported according to the SOPs (see Annex 2C).

# 13 ILI Laboratory Procedures

A cryovial should be labelled clearly with a hospital ID sticker. Then a dry polyester fibre-tipped applicator with a plastic or aluminium shaft should be used to swab both the tonsils and the posterior pharynx. The tip of the swab should be placed into the cryovial containing (1.5-2 ml) VTM and the applicator stick broken. The VTM is prepared by the CPHL following guidelines recommended by the WHO Collaborating Centre on Influenza and must be kept at 2-8 °C until used. They should be used immediately after removal from the refrigerator. For ILI sites, the specimens should be stored at 2-8 °C and sent within 24-48 hours in cold chain after collection to the CPHL to maintain virus viability for cell culture.

The success of a viral identification and isolation depend largely on the quality of the specimen collected by the physicians, the handling and storage of the clinical specimen and the transportation conditions. If the specimen is not collected with appropriate swabs (not wooden shaft), handled or transported correctly, the sample will be rejected and not processed (see Annex 2C).

# 14 ILI Data Collection and Analysis

**Regional surveillance team**:

The regional epidemiologist will extract the epidemiological, clinical and virological data from e-notification and will analyze the data and prepare morbidity weekly report which should **include**:

- Total number of new ILI cases.

- Total number of consultations/visits.
- Percentage of the sampled ILI cases.
- Percentage of positive influenza viruses by type and subtype.
- Epidemiological analysis in relation to virological results.
- Line graph describing ILI trend comparing with baseline and alert threshold on the regional level (see Section 16).

**National Surveillance team:**

The National ARI will analyze the data and prepare morbidity weekly report which should **include**:

- Number of ILI samples tested for influenza.
- Percentage of influenza positive samples.
- Types and subtypes of influenza viruses detected.
- Line graph describing ILI trend comparing with baseline and alert threshold on the national level (see section 5).

All previous data should be classified based on age, sex, associated co-morbidities, history of vaccination, etc.). The recommended age groupings for reporting are:

- 0 to <2 years.
- 2 to <5 years.
- 5 to <15 years.
- 15 to <50 years.
- 50 to <65 years.
- ≥65 years.

# 15 ILI Surveillance Personnel and Responsibilities

**Health centre team**

- Doctor from health centre is primarily responsible for submission of data within ARI e-notification system followed by the collection of samples. Appropriately labelled samples will be sent to the health centre laboratory.
- Regional laboratory coordinator in sentinel site will ensure the availability of all laboratory supplies such as VTM, specimen collection swabs and sample stickers. Any shortage should be brought to the attention of the CPHL well in advance so that activities are not stopped. He/she will ensure samples are stored and transported appropriately and in a timely manner to the CPHL.

- National ARI focal point will be responsible to ensure that the entire selected ILI patients comply with the ILI case definition and that patient selection is done according to the proper methodology.

**Regional Surveillance Team**

- Regional epidemiologist should ensure the surveillance-related activities are being conducted at the health centre according to these policies. He/she is also responsible for training of staff on collection procedures and sample handling as well as quality control procedures.
- The regional epidemiologist will generate the ILI data for the week from e-notification and prepare a weekly report. The ILI weekly report should be sent on a weekly basis to the DCD and concerned parties in the region.
- Monitoring KPIs at regional level (see Annex 9).

**National Surveillance team**:

- The laboratory coordinator at the CPHL receives samples and processes them in a timely manner and release the result using the Al Shifa system.
- The National Surveillance coordinator at DCD is responsible overall for monitoring the implementation of the surveillance, data management, epidemiological analysis and preparation of national reports.
- Monitoring KPIs at national level (see Annex 9).

# 16 Monitoring ILI and SARI Trends (ICD-10)

In additional to the NARI surveillance system, the ILI/SARI data from the "Al-Shifa" system through (COGNOS) ICD-10 code will continue be captured on a weekly basis in order to serve as an early warning system.

## 16.1 ILI/SARI Data Source

SARI: The COGNOS software-generated data online from 11 regional hospitals.

ILIs: The COGNOS software-generated data online for 165 (online) out of 212 outpatient health institutions.

## 16.2 Data Analysis

- The SARI rate is calculated as the number of SARI cases divided by the total number of hospital discharges multiplied by 100.
- ILI rate is calculated as the number of ILI cases divided by the total number of visits to the outpatient clinic multiplied by 100.

The baseline is the average level of the previous year's ILI/SARI activities).

The following steps were carried out in order to calculate the national baseline:

- Data on the previous 5 years (June 2010- June 2015) were collected.
- Peak occurrence week for each year were identified (Figure 1).
- Median of weeks of peak occurrence for the 5 years was calculated.
- The curve was aligned with respective peaks on the median week identified before.
- Simple averaging of the weekly data over the years was calculated.

The curve was smoothed using a 4-week running average. (Figure 2)

*Figure 1*

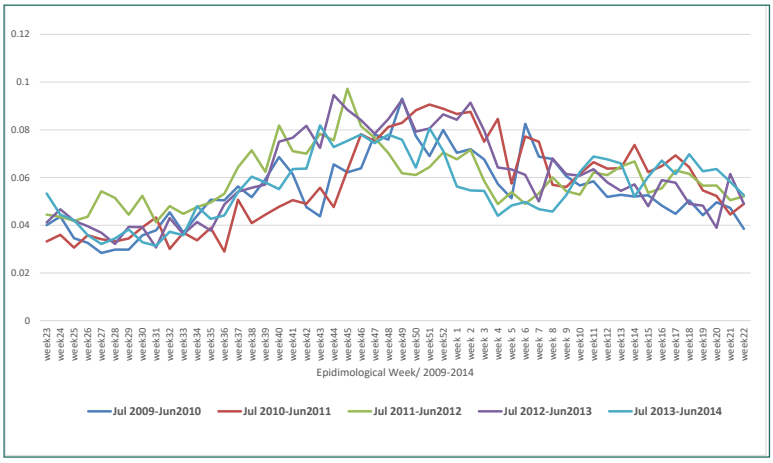
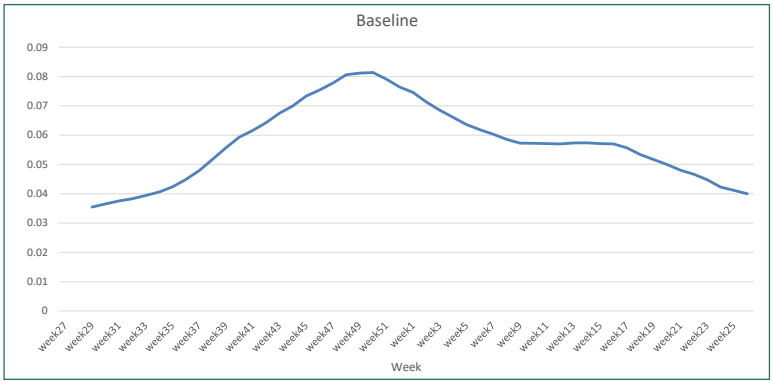



*Figure 2*



**Alert Threshold** is a level above which, varying by time of year, influenza activity is higher than most years.

**Highest and lowest previous seasons**: the highest and lowest seasons, excluding any exceptional events such as a pandemic, was plotted on the curve in the form of the highest previous season and lowest previous season.

In order to define extreme values, standard deviation (SD) of the mean for each week is calculated based on 1.65 SD and a curve based on those values was created (Figure 3). This means that 5% of seasons, 1 out of every 20 would be above the upper limit for the season and 5% would be below (Figure 4).

*Figure 3*

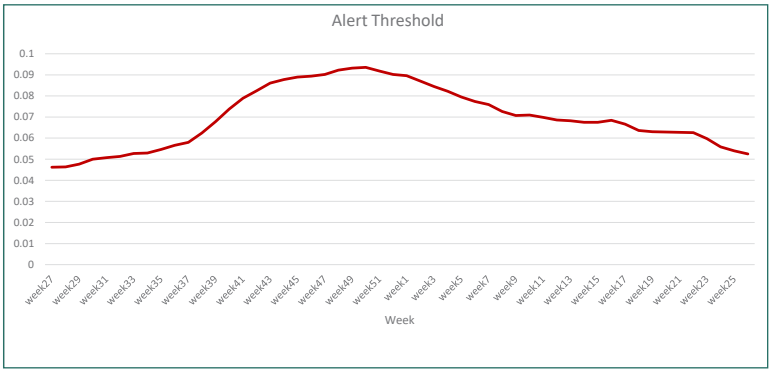
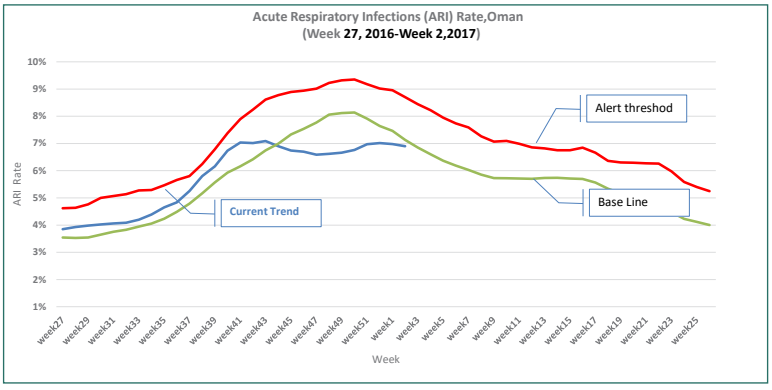



*Figure 4*



## 16.3 Output of Component

The following are the expected outputs on weekly basis:

- Line graph describing the ILI trend on the national/regional level.
- Line graph describing SARI trend on the national/regional level.
- Table demonstrating the distribution of the following by health care setting and by age groups.
    - Number of new ILI cases reported. Number of total outpatient visits.
    - Number of new ARI cases reported. Number of total hospital admissions.

# 17 Global and Regional Reporting Networks

## 17.1 FluNet

The data are provided remotely by NICs to the GISRS. The virological data entered into FluNet are critical for tracking the movement of viruses globally and interpreting the epidemiological data reported through FluID. Oman has been accredited as a NIC since March 2009 and submission of data through FluNet was immediately started on a weekly basis.

## 17.2 FluID

FluID is the WHO system used to share epidemiological data on influenza on a global level. The system complements the existing FluNet reporting network for virological data. FluID is able to accept data on ILI, ARI, SARI, pneumonia and mortality by age group with a consultation and/or population denominator. It allows near real time tracking of respiratory disease trends regionally and globally. These data are combined with influenza virological data from FluNet. Oman started submission of data through FluID in 2011.

## 17.3 EMFLU

EMFLU or Eastern Mediterranean Flu is a regional platform for sharing of epidemiological and virological data on influenza in the WHO Eastern Mediterranean Region. This data collection and sharing tool has been developed in line with activities of Partnership Contribution Plan 2013-2016 under the Pandemic Influenza Preparedness Framework. The platform provides quantitative and qualitative data on trend, spread, intensity and impact of influenza in the Eastern Mediterranean Region.

EMFLU connects existing databases at the country level in the Eastern Mediterranean Region and can also be used to directly enter data at the country level using a web-

based interface. It also complements the WHO's databases of FLuID and FLuNET. The tool is intended to provide useful information for informed decision making regarding influenza prevention and control strategies.

# 18 Infection Control Measures

Prior to any patient interaction, all HCWs have a responsibility to assess the infectious risk posed to themselves and to other patients, visitors and other HCWs. Recommendations for infection prevention and control measures for patients presenting with suspected or confirmed infection or co-infection with ARI in all health care settings include:

- **Standard precautions**
- **Contact and droplet precautions**

Further infection prevention and control information can be found in infection prevention and control guideline.

# 19 KPIs of NARI Surveillance

In order to evaluate the effectiveness and success of the NARI surveillance system at national and regional levels, monitoring of the outcome and the performance of the surveillance activities will be conducted on a regular basis. A number of designed, pre-established and communicated KPIs will be used for this monitoring (see Annex 9).

# Annexes

# 20 List of Annexes

Annex 1: ARI (SARI/ILI e-Notification Forms).

Annex 2: Laboratory SOPs.

A. Sample Collection and Transport for SARI-SS and SARI-IS Cases

B. Sample Handling, Storage and Transport for SARI Specimens

C. Sample Collection and Transport for ILI Surveillance Cases

Annex 3: Algorithm # 1: SARI Sentinel Surveillance

Annex 4: Algorithm # 2: SARI Intensified Surveillance

Annex 5: Algorithm # 3: ILI Sentinel Surveillance

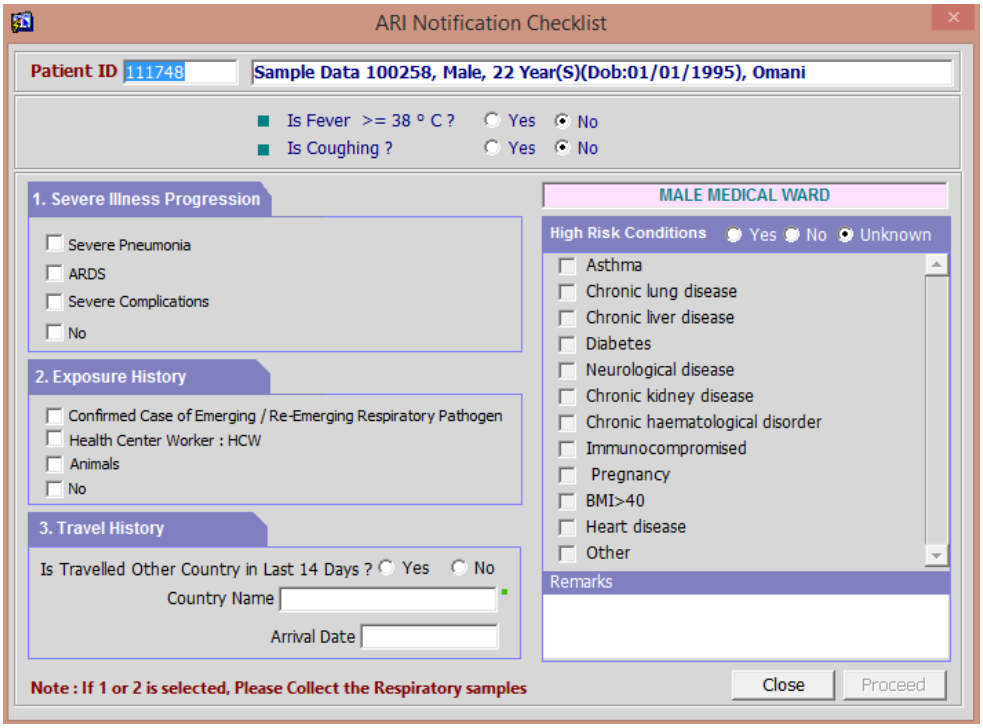
Annex 6: Algorithm # 1: SARI-SS Laboratory Testing Algorithm

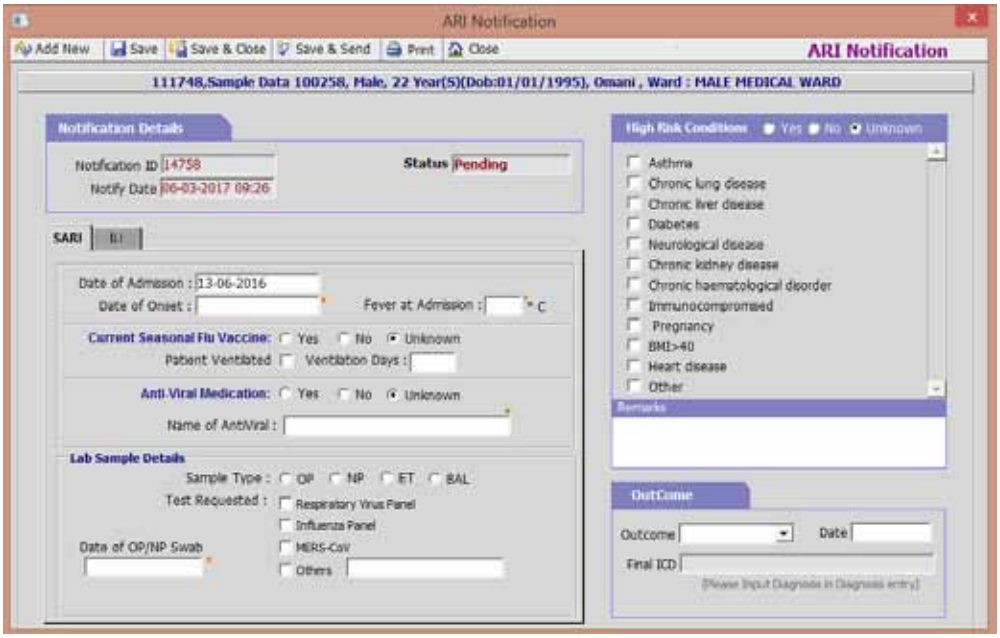
Annex 7: Algorithm # 2: SARI-IS Laboratory Testing Algorithm

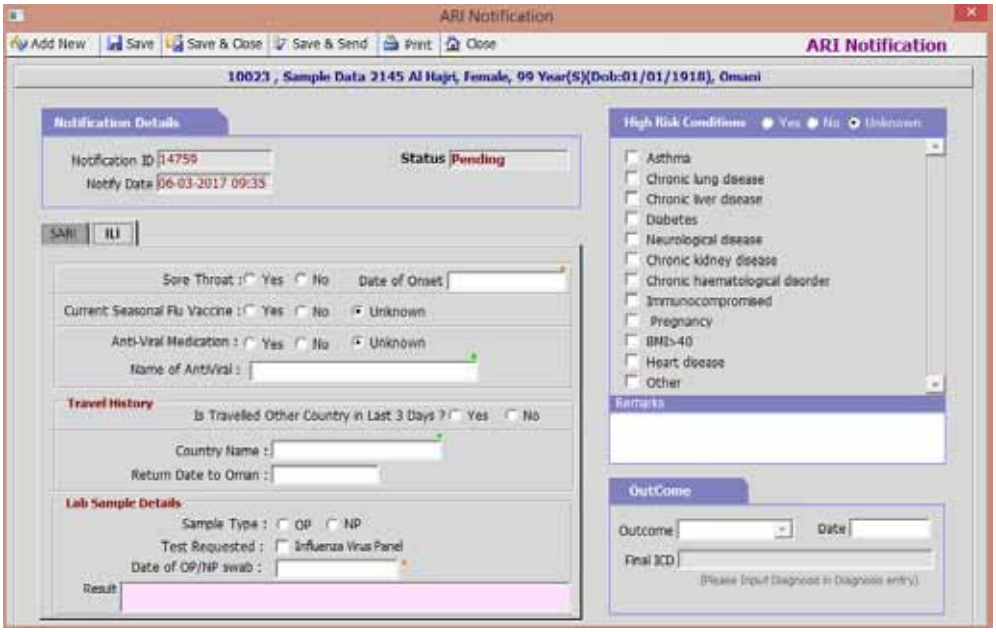
Annex 8: Algorithm # 3: ILI Laboratory Testing Algorithm

Annex 9: KPIs of NARI Surveillance

**Annex 1: ARI (SARI/ILI e-Notification Forms).**




ARI Notification
Add New
Save
Save & Close
Save & Send
Print
Close
ARI Notification
10023 , Sample Data 2145 Al Hajri, Female, 99 Year(S)(Dob:01/01/1918), Omani
Notification Details
Notification ID 14759
Notify Date 06-03-2017 09:35
Status Pending
SARI
ILI
Sore Throat : Yes No Date of Onset
Current Seasonal Flu Vaccine : Yes No Unknown
Anti-Viral Medication : Yes No Unknown
Name of AntiViral :
Travel History
Is Travelled Other Country in Last 3 Days ? Yes No
Country Name :
Return Date to Oman :
Lab Sample Details
Sample Type : OP NP
Test Requested : Influenza Virus Panel
Date of OP/NP swab :
Result
High Risk Conditions Yes No Unknown
Asthma
Chronic lung disease
Chronic liver disease
Diabetes
Neurological disease
Chronic kidney disease
Chronic haematological disorder
Immunocompromised
Pregnancy
BMI>40
Heart disease
Other
Remarks
OutCome
Outcome
Date
Final ICD
(Please Input Diagnosis in Diagnosis entry)

**Annex 2A**

## Sample Collection and Transport for SARI-SS and SARI-IS Cases

**Purpose:**

This SOP describes the procedure for samples collection and transport from wards to hospital laboratory.

**Scope:**

The procedures will be executed by trained physicians after applying case definition and filling the ARI e-notification form.

**Material needed**

The following items are needed for specimen collection; ensure using the recommended type of swabs:

- Full personal protective equipment (PPE) for sample collection and aerosol generating procedures (AGP).
- Hospital ID labels for samples.
- Sterile collection vials containing 2-2.5 ml of VTM.
- Sterile non cotton NP swab.
- Sterile non cotton, plastic TS swab (not wooden shaft).
- Tongue depressors.
- Blood collection tube for serum samples (red top color) only **for MERS-CoV suspected cases.**
- Venipuncture blood collection set, only **for MERS-CoV suspected cases.**

**Notes:**

- The VTM stock should be stored at 2-8$^{o}$C. Keep aliquots stored in the fridge for immediate use, to be replenished when consumed.
- Proper inventory should be in place to prevent unexpected out of stock situations and monitor the expiry dates of the reagents.
- ET or BAL will be only be collected by an experience and well-trained physicians.

**Procedures:**

1. Before collecting NP and TSs, staff should wear a proper PPE which includes gloves, long sleeved gown, mask and eye protection. N95 mask should be worn if MERS-CoV is suspected.

2. Prepare the respiratory and blood sample collection tubes by affixing the ID label.
3. Position the patient securely before performing the procedure.
4. Pass the NP swab through the nasal opening along the floor of the nasal cavity until resistance is felt that indicates contact with the nasopharynx. Rotate the swab while in the nasopharynx to obtain more cells (Figure 1).
5. Collect TS by depressing the tongue and rotating the swab around the pharynx and tonsils (Figure 2).
6. Inoculate both NP and TS swabs immediately into a single VTM tube ensuring completely submersion into the VTM (5 mm below medium surface).
7. Break the plastic probes of the swabs at the break-point and cap the tube immediately and securely.
8. Wipe the tube down with alcohol before placing it in a double plastic bag.

***For MERS-CoV suspected cases***: Change your gloves before collecting 5 ml of blood (3 ml for pediatric patients) in an ethylenediaminetetraacetic acid-containing tube using the aseptic techniques. Place the blood sample in double plastic bags.

9. Send a copy of the case notification form (never place the form in the same bag pocket with the specimen).
10. Transfer samples in person without delay to the laboratory using the most direct route without stopping at another ward or station. Do not use the pneumatic tube system.
11. Transfer the samples inside a re-usable closed plastic bag from the ward to the laboratory to reduce accidents.
12. Hand the sample to the laboratory staff at the reception and notify them if it is a MERS-CoV suspected case. Never leave the sample on the bench without informing the laboratory staff.

Figure 1

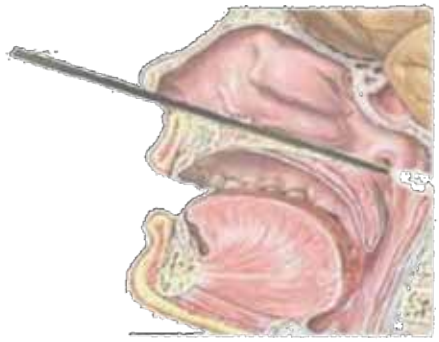
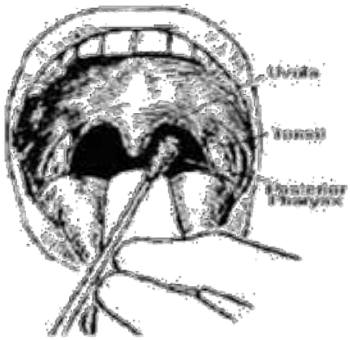


Figure 2



**Annex 2B**

## Sample Handling, Storage and Transport for SARI Specimens

### Purpose

This SOP describes the procedures for handling, storage and transport hospital laboratory to the CPHL.

### Scope

The procedures will be executed by the regional laboratories and the CPHL.

### Material needed

The items and documents to be used are listed below:

- Collected samples from subjects - NP/TS in VTM.
- Closed individual bucket centrifuge with lid.
- Biosafety cabinet (BSC) class II.
- Triple Pack containers (TPC).
- Sample transfer logbooks.

### Procedures

**At the regional hospital:**

1. The respiratory samples should be properly packed and clearly labelled. SARI-IS samples should be placed in a triple pack should be and flagged before storage and transport.
2. Collected blood for suspected MERS-CoV should be centrifuged using a closed bucket centrifuge. The bucket should be only opened inside the BSC II where serum will be separated. Serum sample should be properly packed, flagged and clearly labelled before storage or transport.
3. Samples should be handled inside a BSC II. This includes sample processing and packing into the TPC. The BSC II should be decontaminated prior to specimen preparation with 10% bleach solution (freshly made daily) or commercial alternative followed by 70% ethanol. BSC II must be left on for 30 minutes before specimen preparation.
4. The SARI-IS samples should be stored at 2-8$^{o}$C and transported to the CPHL within 48 hours. Proper labelling of the refrigerator and the container holding the samples is crucial to prevent accidents.
5. Cold chain must be maintained during transport using ice packs.

6. The CPHL should be notified through the hotline (91313316) before transporting the SARI-IS samples. Especially during the weekends and public holidays, as the CPHL needs to arrange for the on-call staff to be around to receive the sample.
7. The distance between the sending laboratory and the CPHL should be covered by the most direct route and in the least possible time. The car driver should be briefed on his responsibility and should first deliver samples to the CPHL and then proceed to do other work.

**At the CPHL**

1. The laboratory staff should record in the logbook the time of samples arrival followed by his/her signature.
2. Samples will be processed following the standard algorithm and reported according to the agreed policy.

**Annex 2C**

## Sample Collection and Transport for ILI Surveillance Cases

**Purpose:**

This SOP describes the procedure for collection and transport of NP and TS samples from the clinic to the laboratory at the health centre.

**Scope:**

The procedures will be executed by trained physician after applying case definition and filling the ARI e-notification form.

**Material needed**

The following items are needed for the collection of respiratory swabs:

- Full PPE for sample collection and AGP.
- Labelled ILI sticker of patient details and ID.
- Sterile collection vials containing 2-2.5 ml of VTM.
- Sterile non cotton NP swab.
- Sterile non cotton, plastic TS swab (not wooden shaft).
- Tongue depressors.

**Notes:**

- The VTM stock should be stored at 2-8$^{o}$C. Keep aliquots stored in the fridge for immediate use to be replenished when consumed.
- Proper inventory should be in place to prevent unexpected out of stock situations and monitor the expiry dates of the reagents.

**Procedures:**

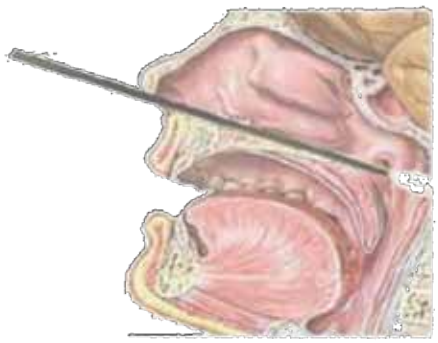
1. Before collecting NP and TSs, staff should wear the proper PPE including gloves, long sleeved gown, eye protection and mask.
2. Prepare the respiratory swabs and affix the ID label.
3. Position the patient securely before performing the procedure.
4. Pass the NP swab through the nasal opening along the floor of the nasal cavity until resistance is felt that indicates contact with the nasopharynx. Rotate the swab while in the nasopharynx to obtain more cells (Figure 1).
5. Collect a TS by depressing the tongue and rotating the swab around the pharynx and tonsils (Figure 1).

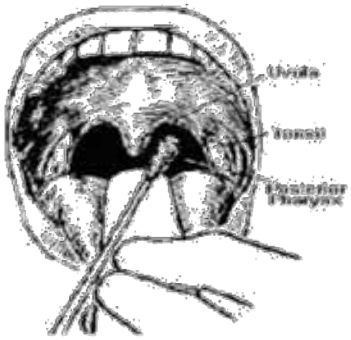
6. Inoculate both NP and TS swabs immediately into a single VTM tube ensuring completely submersion into the VTM (5 mm below medium surface).
7. Break the plastic probes of the swabs at the break-point and cap the tube immediately and securely.
8. Wipe the tube down with alcohol before placing it in a double plastic bag.
9. Send a copy of the case notification form (Never place the form in the same bag pocket with the specimen).
10. Transfer the samples inside proper sample bag from the clinic to the laboratory to reduce accidents. Hand the samples to the laboratory staff.
11. ILI samples should be stored at 2-8$^{o}$C and transported to the CPHL within 48 hours. Cold chain must be maintained during transportation using ice packs.
12. The distance between the sending laboratory and the CPHL should be covered by the most direct route and in the least possible time. The car driver should be briefed on his responsibility and should first deliver samples to the CPHL and then proceed to do other work.

**At the CPHL**

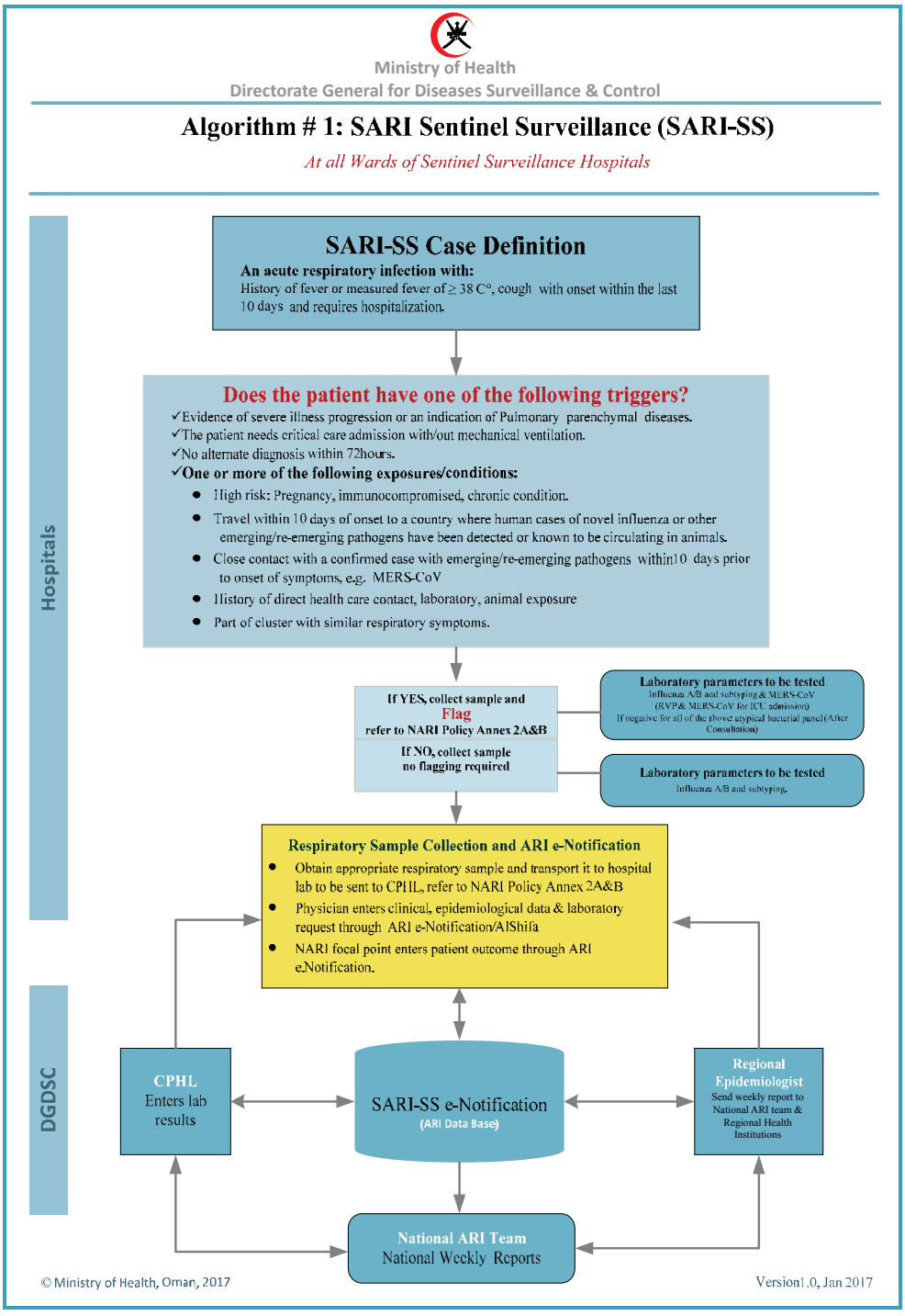
- The laboratory staff should record in the logbook the time of samples arrival followed by his/her signature.
- Samples will be processed following the standard algorithm and reported according to the agreed policy.

Figure 1

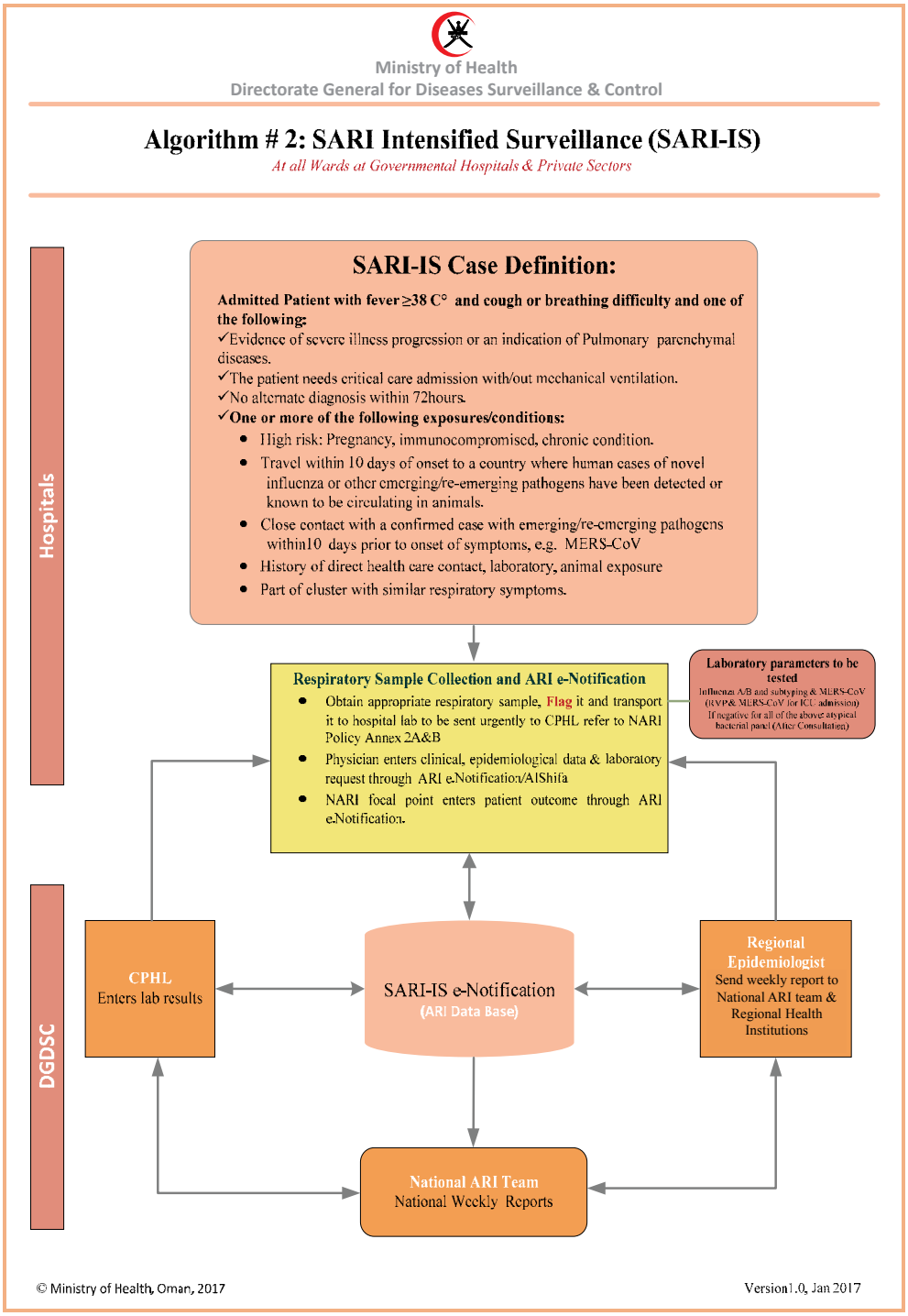




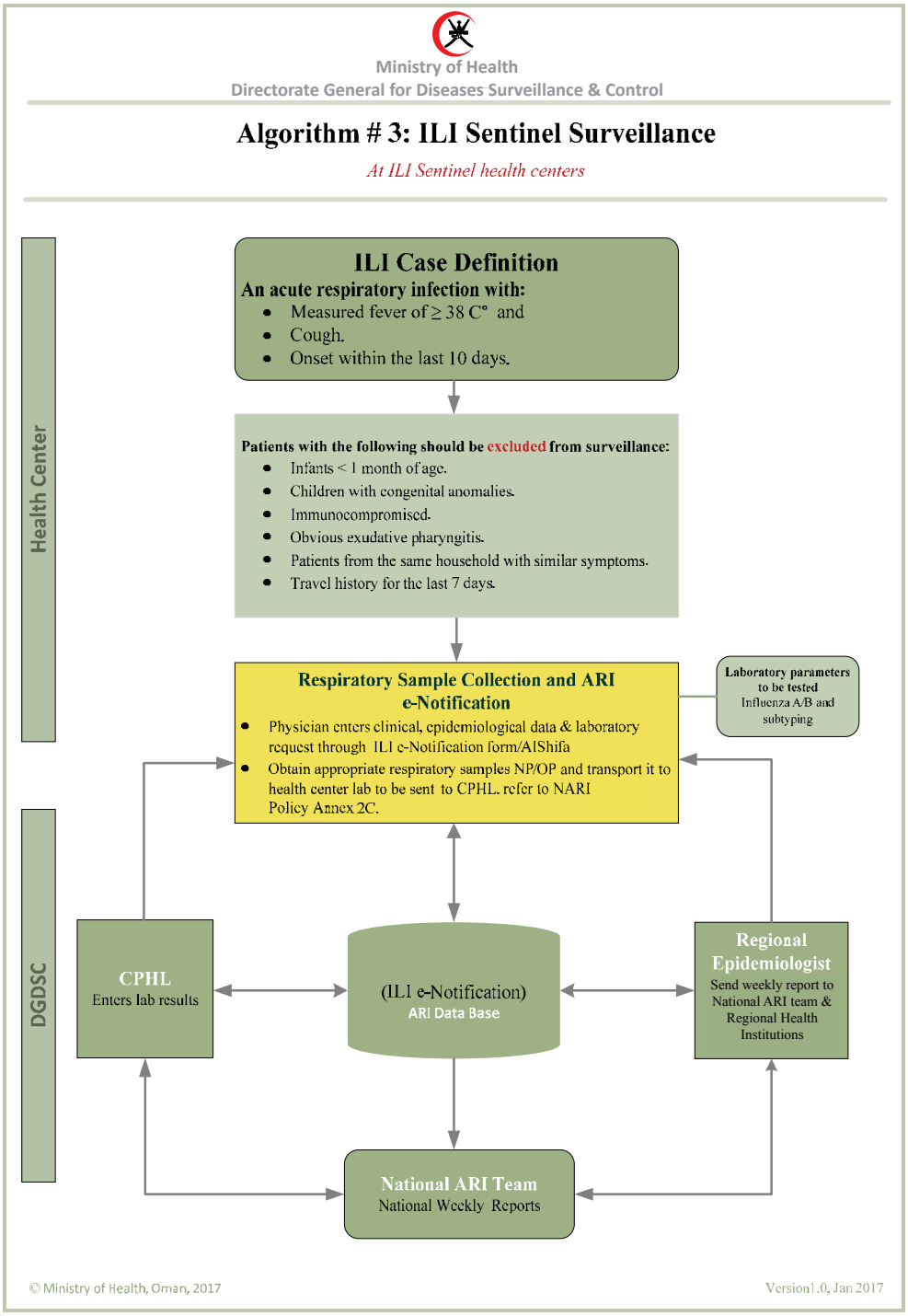
## Annex 3: Algorithm # 1: SARI Sentinel Surveillanc



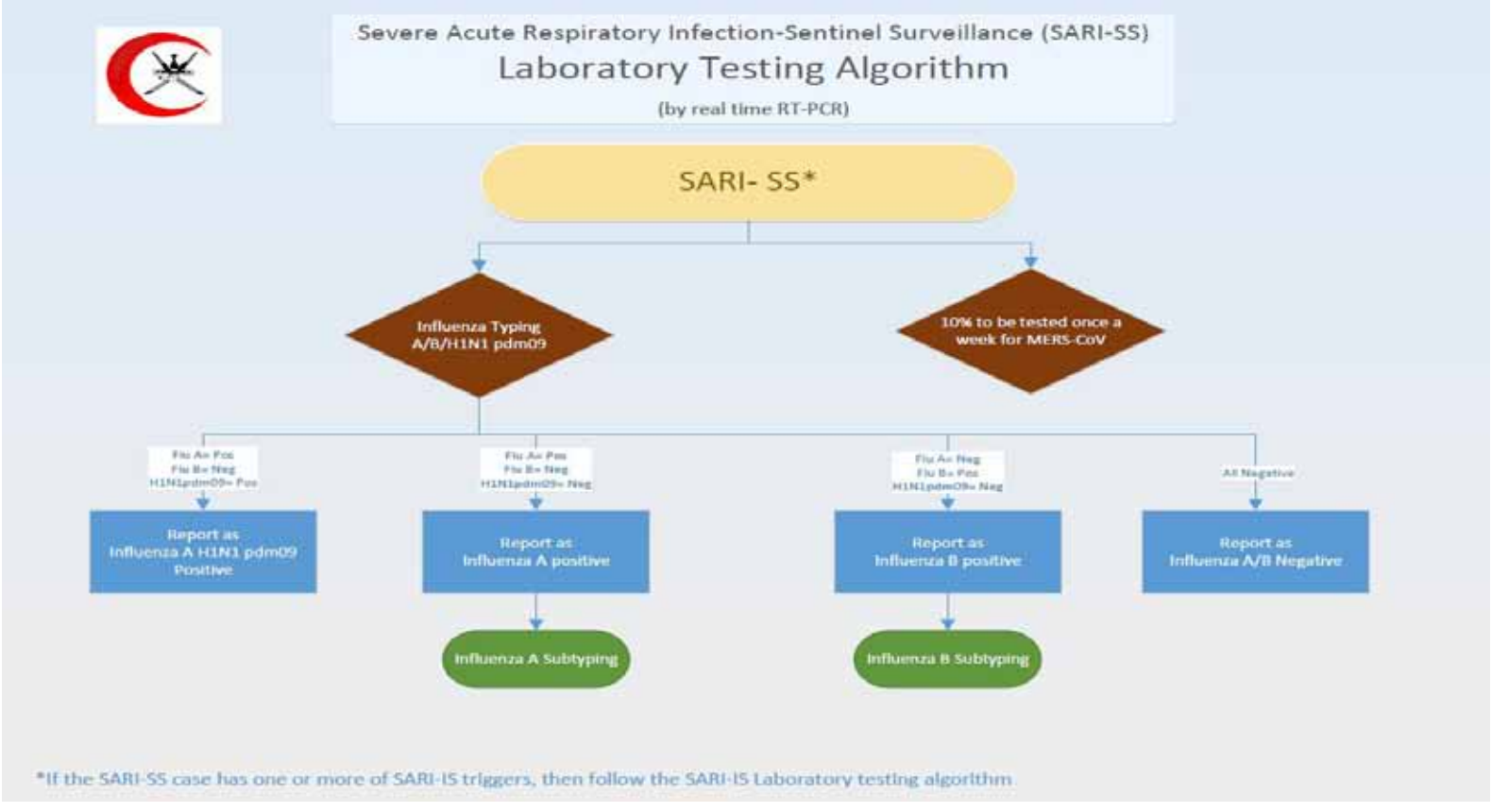
## Annex 4: Algorithm # 2: SARI Intensified Surveillance



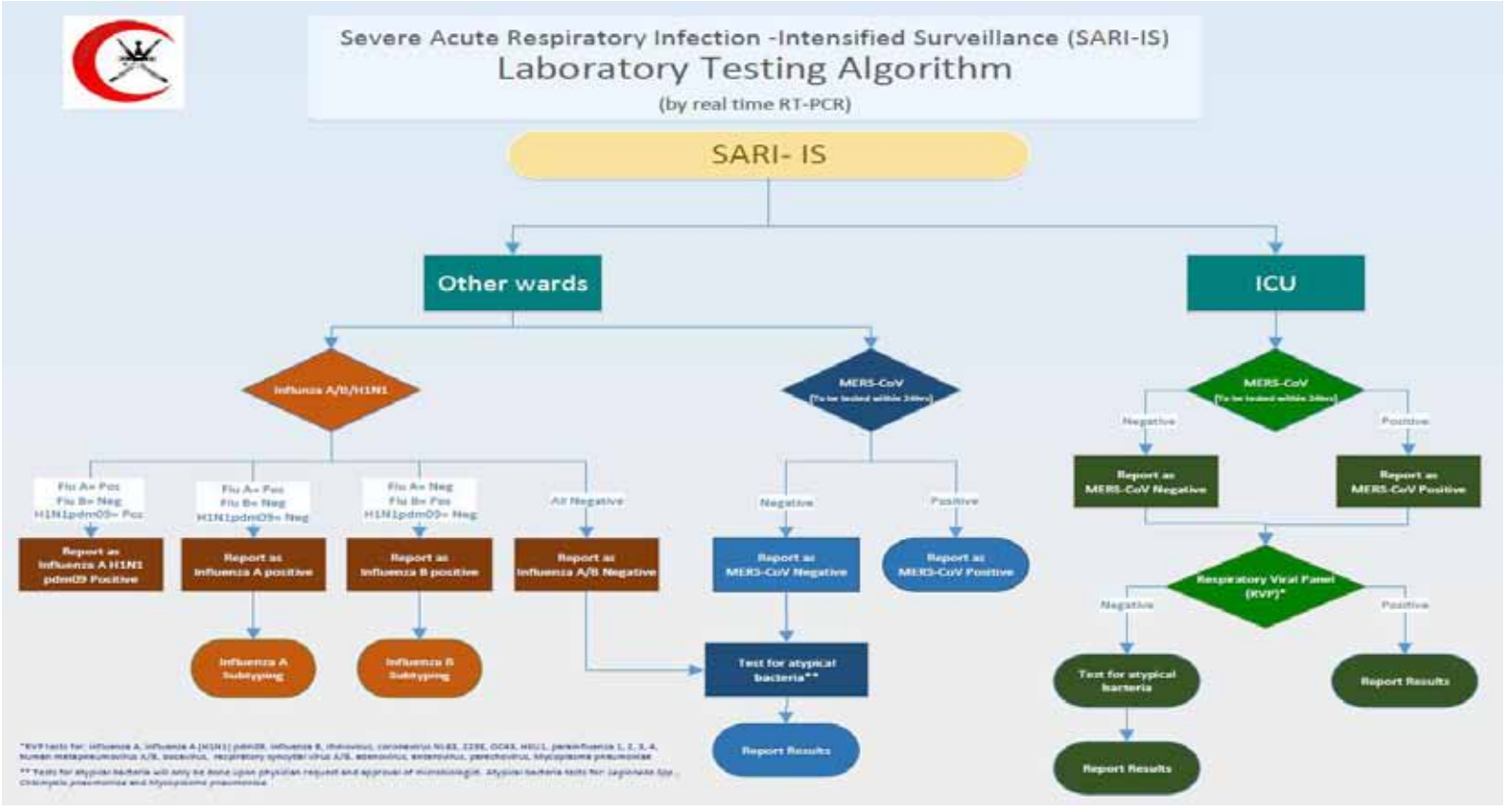
## Annex 5: Algorithm # 3: ILI Sentinel Surveillance



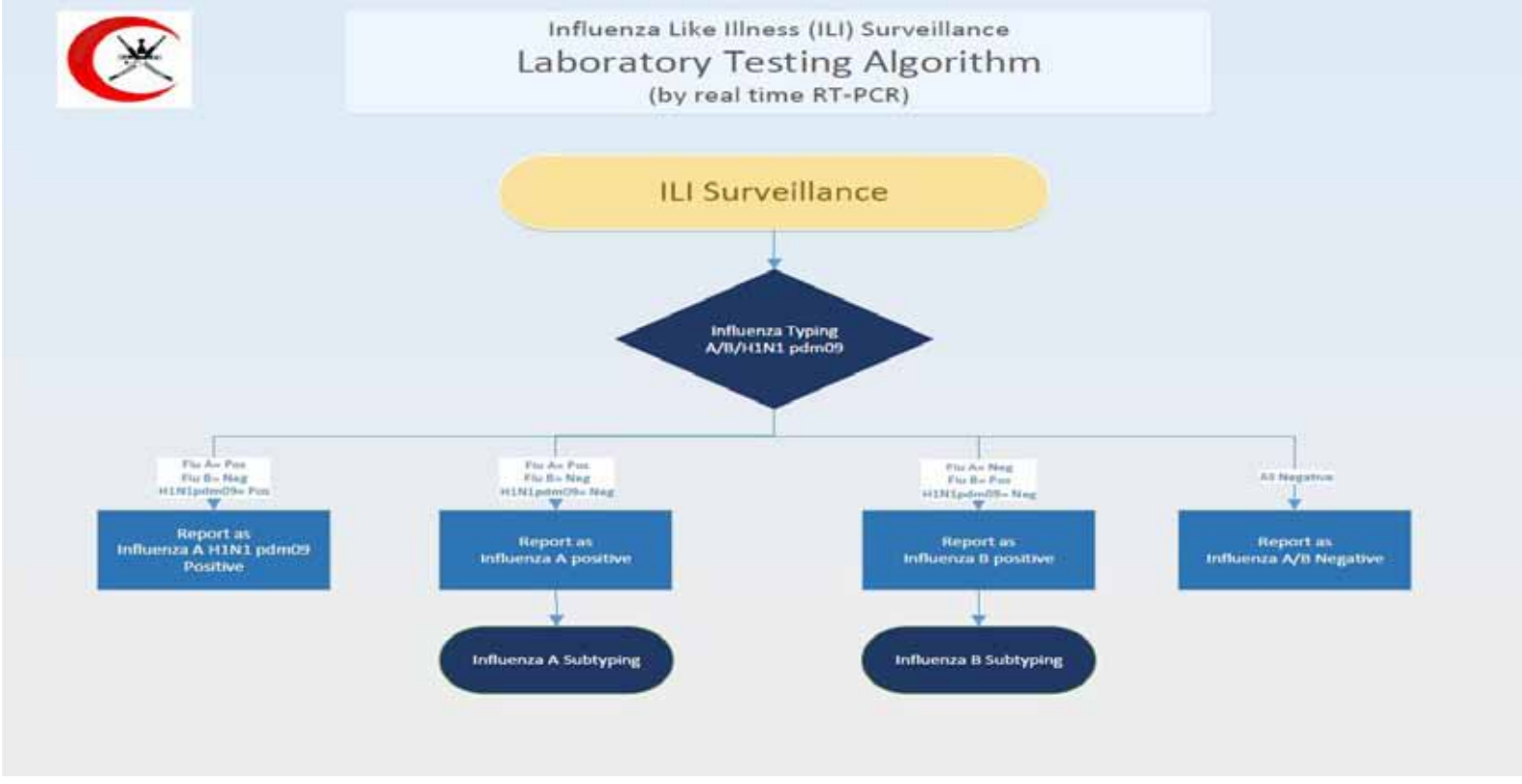
## Annex 6: Algorithm # 1: SARI-SS Laboratory Testing Algorithm



## Annex 7: Algorithm # 2: SARI-IS Laboratory Testing Algorithm



## Annex 8: Algorithm # 3: ILI Laboratory Testing Algorithm



# Annex 9: KPIs of NARI Surveillance

| | Indicators | Parameter | Region performance | Target |
|---|---|---|---|---|
| | **SARI Sentinel Sites** | | | |
| 1. | Adherence to SARI-SS case definition | (Number of cases defined as SARI at the sentinel sites actually fit case definition/ total number of cases defined as SARI-SS at these sites) X100 | | 100% |
| 2. | Completeness of epidemiological data collected from SARI-SS cases | (Number of e-notification forms with complete epidemiological data/ number of notified SARI cases) X100 | | 100% |
| 3. | Coverage of SARI-SS sampling at sentinel sites | (Number of sampled SARI- SS cases /total number of SARI cases) X100 | | 80-100% |
| 4. | Timelessness of SARI-SS patients sampling | Median interval in hours between identification SARI-SS case and sampling | | 24hr |
| 5. | Timelessness of sending SARI-SS samples to CPHL | Median interval in hours between sampling SARI-SS case and sending the sample to CPHL | | 48hr |
| 6. | Percentage of receiving SARI-SS samples at CPHL | (Number of samples received in CPHL/ number of samples sent by regional hospital) X100 | | 100% |
| 7. | Timelessness of obtaining SARI-SS laboratory results | Median interval in days between receiving the sample and obtaining the results from CPHL | | 3 days |
| 8. | Percentage of SARI-SS samples received and processed (exclude rejected) | (Number of processed sample on time /total number of received samples received at CPHL) X100 | | 100% |
| 9. | Quality of the SARI-SS sample received by the CPHL | (Number of quality sample received/total number of samples received to CPHL) X100 | | 95% |
| 10. | Random testing of SARI-SS cases for MERS-CoV | Number of SARI-SS tested for MERS-CoV/ number of samples received from SARI-SS X100 | | 10% |
| 11. | Completeness of SARI-SS cases outcome | Number of e-notification forms with complete outcome data/ total number of received SARI e-forms X100 | | 100% |
| | **Intensified SARI surveillance** | | | |
| 12. | Adherence to Triggers for SARI-IS surveillance | Number of cases included in SARI-IS surveillance at all hospitals fitting with triggers set for sampling/ total number of cases included in the SARI-IS at these hospitals X100 | | 100% |
| 13. | Completeness of epidemiological data collected from SARI-IS cases. | Number of e-notification forms with complete epidemiological data/ number of notified SARI-IS cases X100 | | 100% |
| 14. | Coverage of SARI-IS sampling. | Number of sampled SARI-IS cases/total number of SARI-IS cases X100 | | 80-100% |
| 15. | Timelessness of SARI-IS patients sampling | Median interval in hours between identification as SARI-IS case and sampling | | 24hr |
| 16. | Timelessness of sending SARI-IS samples to CPHL | Median interval in hours between sampling SARI case and sending the sample to CPHL | | 48hr |
| 17. | Percentage of receiving SARI-IS samples at CPHL | Number of samples received in CPHL/ number of samples sent by regional hospital X100 | | 100% |
| 18. | Timelessness of obtaining SARI-IS laboratory results (MERS-CoV) | Median interval in hours between receiving the sample and obtaining the results from CPHL (MERS-CoV) | | 24hour |
| 19. | Timelessness of obtaining SARI-IS laboratory results (Other respiratory viruses) | Median interval in days between receiving the sample and obtaining the results from CPHL (other respiratory viruses) | | 3 days |
| 20. | Percentage of SARI-IS samples received and processed (exclude rejected) | Number of processed sample on time /total number of samples received at CPHLX100 | | 100% |
| 21. | Quality of the SARI-IS sample received by the CPHL | Number of quality sample received/total number of samples received to CPHLX100 | | 95% |
| 22. | Completeness of SARI-IS cases outcome | Number of e-notification forms with complete outcome data/ total number of received SARI e-forms X100 | | 100% |
| | **ILI Surveillance** | | | |
| 1. | Adherence to the ILI case definition | Number of cases defined as ILI at the sentinel site actually fit case definition/ total number of ILI X100 | | 100% |
| 2. | Coverage of ILI sampling at sentinel sites | Number of sampled ILI patients per week | | 10 samples |
| 3. | Completeness of epidemiological data collected from ILI cases at sentinel sites | Number of e-notification forms with complete epidemiological data/ number of sampled ILI casesX100 | | 100% |
| 4. | Timelessness of sending ILI samples to CPHL | Median interval in hours between sampling ILI case and sending the sample to CPHL | | 48hour |
| 5. | Percentage receiving ILI samples at CPHL | Number of processed sample on time /total number of samples received at CPHLX100 | | 100% |
| 6. | Quality of the ILI sample received by the CPHL | Number of quality sample received/total number of samples received to CPHLX100 | | 95% |
| 7. | Percentage of ILI samples received and processed | Number of processed sample /total number of received samples received at CPHLX100 | | 100% |
| | **NARI (SARI/ILI) Surveillance** | | | |
| 8. | Timeliness of submitting regional M&M report | Number of submitted weekly Morbidity and Mortality (M&M) report on time in each region per week | | 1 |
| 9. | Completeness of Regional M&M report | Number of complete weekly M&M report/ total number of M&M submitted report in each region X100 | | 100% |
| 10. | Timeliness of submitting national M&M report | Number of national submitted M&M report on time per week | | 1 |
| 11. | Completeness of national M&M report | Number of completeness weekly M&M report/ total number of M&M submitted report X100 | | 100% |
| 12. | Sharing and submitting epidemiological data into global reporting network | Median interval in weeks between subsequence submissions of epidemiological data to global network. | | 2-3 |
| 13. | Sharing and submission the virological results into the global reporting network | Median interval in weeks between subsequence submissions of virological data to global network. | | 2 |
| 14. | Participation in proficiency test for influenza once a year | Number of CPHL participation in proficiency test for influenza per year | | 1 |
| 15. | Influenza EQAP annual score | Number of result match between CPHL and international reference laboratory/ total samples send for EQAP X100 | | 90-100% |
| 16. | Sharing viruses' isolates or influenza positive specimens to WHO influenza collaborating centers for the production influenza vaccine | Number of sharing viruses' isolates or influenza positive specimens to WHO influenza collaborating centers per year on time | | 2-4 |