



**NATIONAL INSTITUTE FOR
COMMUNICABLE DISEASES**

Division in the National Health Laboratory Service

Influenza

**NICD recommendations for the diagnosis, prevention,
management and public health response**

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6 June 2019	S Walaza	Updated influenza vaccine composition for 2019 influenza season
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		Updated influenza burden estimates

Disclaimer:

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Quick Reference Guide-Influenza

Categories of influenza- Page6

Uncomplicated influenza: ILI (Influenza-like illness) may present with fever, cough, sore throat, coryza, headache, malaise, myalgia, arthralgia and sometimes gastrointestinal symptoms, but without any features of complicated influenza

Complicated influenza: Influenza requiring hospital admission and/or with symptoms and signs of lower respiratory tract infection (hypoxaemia, dyspnoea, tachypnoea, lower chest wall indrawing and inability to feed), central nervous system involvement and/or a significant exacerbation of an underlying medical condition.

Risk groups for severe/complicated influenza disease – Page 6-7

- Pregnant women (including the post-partum period)
- HIV–infected individuals
- Individuals with tuberculosis
- Persons of any age with chronic diseases:
 - Pulmonary diseases (e.g. asthma, COPD)
 - Immunosuppression (e.g. persons on immunosuppressive medication, malignancy)
 - Cardiac diseases (e.g. congestive cardiac failure), except for hypertension
 - Metabolic disorders (e.g. diabetes mellitus)
 - Renal disease
 - Hepatic disease
 - Neurologic and neurodevelopmental conditions
 - Haemoglobinopathies (e.g. sickle cell disease)
- Persons aged ≥65 years
- Persons ≤18 years receiving chronic aspirin therapy
- Persons who are morbidly obese (i.e. BMI ≥40).
- Young children (particularly <2 years of age)

Groups recommended to receive influenza vaccine – Page 12-13

- Individuals (≥ 6 months old) in risk groups for severe influenza
- Healthcare workers
- Anyone wishing to protect themselves against influenza
- **Groups targeted for Department of Health 2019 influenza vaccination campaign-Page 13**
 - Pregnant women at all stages of pregnancy, including the postpartum period
 - HIV-infected individuals
 - Individuals (adults or children) who are at high risk for influenza complications because of underlying medical conditions or who are receiving regular medical care for conditions such as chronic pulmonary disease
 - Persons aged ≥65 years

Recommended inactivated influenza vaccine (IIV) formulation for 2019-Page 12

- an A/Michigan/45/2015 (H1N1)pdm09-like virus
- an A/Switzerland/8060/2017 (H3N2)-like virus;
- a B/Colorado/06/2017/-like virus (B/Victoria/2/87lineage)

Treatment of influenza- Page 9-11

Neuraminidase inhibitors (oseltamivir or zanamivir) recommended for the treatment of any patient with suspected or confirmed influenza who:

- has complicated or severe illness (including all hospitalised patients)
- is at higher risk for influenza complications

Treatment should be started early, ideally within 48 hours of symptom onset.

Dosage of influenza vaccine –Page 14

- Adults 0.5ml IMI single dose
- 3 years - 8 years – 0.5ml IMI 1 or 2 doses*
- 6 months-2 years-0.25ml IMI 1 or 2 doses*

*2 doses should be administered ≥ 1 month apart during 1st year of vaccination, thereafter one dose.

Additional questions from health professionals can be directed to: National Institute for Communicable Diseases (NICD) **Hot line: +27 82 883 9920;** for Laboratory support: NICD, Centre for Respiratory Diseases and Meningitis: **011 386 6390/ 011 386 6392**

1. Introduction

Influenza, commonly known as the “flu”, is an acute infection of the respiratory tract caused by influenza viruses. There are three types of seasonal influenza viruses – A, B and C. Influenza A viruses are further categorized into subtypes. The 2009 pandemic influenza A(H1N1) virus (hereafter referred to as influenza A(H1N1)pdm09) which appeared for the first time in 2009 causing a global influenza pandemic, is now a seasonal influenza virus that co-circulates with other seasonal viruses (namely influenza A(H3N2) and influenza B viruses). Influenza viruses are genetically dynamic and evolve in unpredictable ways. Influenza viruses are further classified into strains based upon antigenic properties. Humoral immunity to influenza viruses is generally thought to be strain-specific and acquired through infection or vaccination. Seasonal influenza epidemics can be caused by new virus strains that are antigenically distinct from previously circulating virus strains to which a population has immunity; this is known as antigenic drift. Uncommonly, a completely new strain of influenza will emerge to which there is little or no existing immunity, this is known as antigenic shift and such novel strains can give rise to influenza pandemics. The 2009 pandemic influenza A(H1N1) virus (hereafter referred to as influenza A(H1N1)pdm09) which appeared for the first time in 2009 causing a global influenza pandemic, is now a seasonal influenza virus that co-circulates with other seasonal viruses (namely influenza A(H3N2) and influenza B viruses).

2. Epidemiology

Influenza virus infections cause substantial annual morbidity and mortality worldwide including South Africa^[1-4]. Annual influenza epidemics result in an estimated three to five million cases of severe illness, and about 290 000-650 000 deaths globally^[4]. Influenza is an important cause of pneumonia or lower respiratory tract infection (LRTI) and approximately 8-10% of all patients with pneumonia test positive for influenza^[5].

The burden of influenza in sub-Saharan Africa (and specifically in South Africa) is substantial, with some studies suggesting elevated influenza-associated mortality rates compared to other regions^[6, 7]. During the influenza season (usually between May and September) in South African hospitals, approximately 14% of inpatients with lower respiratory tract infection and 25% of patients with influenza-like illness will test polymerase chain reaction (PCR) positive for influenza. In South Africa, it is estimated that approximately 11 800 seasonal influenza-associated deaths occur annually^[8]. In addition an estimated 47 000 episodes of influenza-associated severe acute respiratory illness occur annually of which 22 481 result in hospitalization^[9]. Approximately 5% of these deaths are in children aged <5 years. Among individuals aged ≥5 years, an estimated 50% of influenza-associated deaths are in the elderly and approximately 30% are in HIV-infected individuals^[10]. Pregnant women also constitute an important risk group for influenza-associated mortality. Among an estimated 646 - 1 428 seasonal influenza-associated deaths in women of childbearing age in South Africa in recent years, the majority (~90%) occurred in HIV-infected individuals and the influenza-associated mortality was three-fold higher (Relative risk(RR) 2.8, 95% confidence interval (CI) 1.7 – 3.9) in pregnant compared with non-pregnant women.^[11]

The highest rates of influenza-associated hospitalisation are in those aged ≥ 65 years, HIV-infected individuals and children < 5 years (in particular children < 1 year).^[1, 9, 10, 12, 13] Recent data from South Africa showed that extremes of age (< 6 months [adjusted odds ratio (aOR), 37.6], 6–11 months [aOR, 31.9], 12–23 months [aOR, 22.1], 24–59 months [aOR, 7.1], and ≥ 65 years [aOR, 40.7] compared to those aged 5–24 years), underlying medical conditions (aOR, 4.5), HIV infection (aOR, 4.3) and history of working in mine (aOR, 13.8) were significantly associated with increased risk of influenza associated hospitalization^[14]. Influenza infection may trigger exacerbations of diabetes, pulmonary (e.g. asthma) or cardiovascular disease. For this reason, people with underlying chronic medical conditions are at high risk of influenza complications, often resulting in hospitalisation and even death. Surveillance data from South Africa showed that having underlying illnesses (other than HIV) was a risk for influenza-associated mortality (odds ratio (OR) 2.9, 95% CI 1.2 - 7.3)^[1]. Individuals with tuberculosis may also be at increased risk of influenza-associated death^[15, 16]. The burden of hospitalisations and deaths due to influenza can vary substantially from year to year depending on the transmission and virulence characteristics of the circulating strain(s).

In tropical areas, influenza occurs throughout the year. In temperate areas, influenza is highly seasonal and typically occurs during winter months like in South Africa.

3. Microbiology, pathology and pathogenesis

Human influenza viruses are single-strand RNA viruses that belong to the Orthomyxoviridae family, consisting of the genera influenza A, B, and C viruses. Only influenza A and B viruses cause epidemics in humans. Based on their main antigenic determinants, the haemagglutinin (H or HA) and neuraminidase (N or NA) transmembrane glycoproteins, influenza A viruses are further subdivided into 18 H (H1–H18) and 11 N (N1–N11) subtypes, but only 3 haemagglutinin subtypes (H1, H2 and H3) and two neuraminidase subtypes (N1 and N2) have circulated stably in the human population and are responsible for annual epidemics.

HA and NA are critical for virulence, and are major targets for the neutralizing antibodies of acquired immunity to influenza. The 2009 pandemic influenza A(H1N1) virus (hereafter referred to as influenza A(H1N1)pdm09) which appeared for the first time in 2009 causing a global influenza pandemic, is now a seasonal influenza virus that co-circulates with other seasonal viruses (namely influenza A(H3N2) and influenza B viruses).

4. Transmission

Influenza viruses are spread from person-to-person. They can be transmitted by exposure to infectious droplets expelled by coughing or sneezing that are then inhaled, or can contaminate hands or other surfaces. The typical incubation period for influenza is 1–4 days (average 2 days). Most persons ill with influenza shed virus (i.e. may be infectious) from a few days before symptoms begin through 5–7 days after illness onset. However, very young children can be infectious for > 10 days after illness onset; adults with severe disease (e.g. viral pneumonia) may also shed virus for > 10 days, and severely immunocompromised persons can shed virus for even longer^[17]. Children have the highest rates of seasonal influenza infection and illness in this group can amplify viral transmission in the community.

5. Clinical presentation and risk factors for influenza

Infection with influenza viruses can give rise to a wide range of clinical presentations, ranging from asymptomatic infection to severe illness and death depending on the characteristics of both the virus and the infected person. In the majority of people, influenza is an uncomplicated illness that is characterised by sudden onset of constitutional and respiratory symptoms such as fever, myalgia, cough, sore throat, rhinitis and headache. Uncomplicated influenza illness resolves after 3-7 days although cough and malaise can persist for >2 weeks. Influenza may be associated with more severe complications including: influenza-associated pneumonia/ LRTI, secondary bacterial or viral infection (including pneumonia, sinusitis and otitis media), multi-organ failure, and exacerbations of underlying illnesses (e.g. pulmonary and cardiac illness). Rare complications include encephalopathy, myocarditis, transverse myelitis, pericarditis and Reye syndrome. For purposes of clinical management, influenza disease can be categorised as follows ^[18]:

- **Uncomplicated influenza:** ILI (Influenza-like illness) may present with fever, cough, sore throat, coryza, headache, malaise, myalgia, arthralgia and sometimes gastrointestinal symptoms, but without any features of complicated influenza.
- **Complicated/severe influenza:** Influenza requiring hospital admission and/or with symptoms and signs of lower respiratory tract infection (hypoxaemia, dyspnoea, taccypnoea, lower chest wall indrawing and inability to feed), central nervous system involvement and/or a significant exacerbation of an underlying medical condition.

5.1 Risk factors for complicated/severe influenza

Certain groups of patients are at higher risk of developing severe or complicated disease following influenza virus infection. However, influenza virus infection can result in severe/complicated illness in previously healthy individuals. Similar to other studies showing increased risk of severe influenza-associated illness in certain individuals, ^[1, 2, 6, 10, 11, 15, 16, 19, 20] a recent study from South Africa has found that younger and older age (< 5 years, in particular children < 1 year, and ≥65 years) and the presence of chronic underlying medical conditions, HIV infection and pregnancy were associated with increased risk of influenza associated-hospitalization^[14]. In addition HIV-infected individuals with severe immunosuppression compared to those with mild immunosuppression had three times increased odds of influenza associated hospitalization ^[14].

Risk groups for severe/complicated influenza disease include:

- Pregnant women (including the post-partum period)
- HIV–infected individuals^[14, 21]
- Individuals with tuberculosis^[15, 16, 22]
- Persons of any age with chronic disease, including:
 - Pulmonary diseases (e.g. asthma, COPD)^[23]
 - Immunosuppression (e.g. persons on immunosuppressive medication, malignancy)
 - Cardiac diseases (e.g. congestive cardiac failure), except for hypertension^[23]
 - Metabolic disorders (e.g. diabetes mellitus)^[24]
 - Renal disease
 - Hepatic disease
 - Certain neurologic and neurodevelopmental conditions, including: disorders of the brain, spinal cord, peripheral nerve, and muscle such as cerebral palsy, epilepsy

(seizure disorders), stroke, mental retardation, moderate to severe developmental delay, muscular dystrophy, or spinal cord injury.

- Haemoglobinopathies (e.g. sickle cell disease)
- Persons aged ≥ 65 years
- Persons ≤ 18 years receiving chronic aspirin therapy
- Persons who are morbidly obese (i.e. BMI ≥ 40)^[25]
- Young children (particularly < 2 years of age)

6. Laboratory Diagnosis

Laboratory testing of uncomplicated illness (patients who fit the ILI case definition) is **NOT** routinely recommended, as it provides no advantage in the management of individual patients. Testing can be considered for the following patients:

- Patients who meet the criteria for complicated or severe influenza, where a laboratory diagnosis will assist in patient management.
- Clusters of cases where a diagnosis of the cause of the outbreak is needed (e.g. within institutions such as healthcare facilities, nursing homes). First 2-3 cases to be tested, thereafter testing not required.

Important note: Initial treatment decisions should be based on clinical presentation and should NOT be delayed pending laboratory confirmation of influenza.

These recommendations for laboratory testing do not apply to surveillance activities (e.g. Viral Watch, pneumonia surveillance programme), and testing should continue as guided by those individual surveillance programmes.

6.1 Laboratory testing for influenza

The NICD no longer offers routine diagnostic testing, including for influenza, outside of established surveillance programmes at specific sites. Diagnostic capacity to test for influenza viruses has now been established in various National Health Laboratory services (NHLS)- and private-sector laboratories throughout the country. Under special circumstances (e.g outbreak investigation), NICD will provide support for testing. Requests for testing at NICD should be discussed with the doctor on call, through the **NICD Hotline- 0828839920** before samples are collected.

In line with WHO recommendations, molecular diagnostics (real-time multiplex PCR for influenza A and B virus or Gene expert for influenza A and B virus) are currently the method of choice for influenza virus detection. While specificity is high, the sensitivity of currently available rapid-point-of-care or immunofluorescence tests designed for direct detection of influenza A viruses is low (59%-93%) and therefore they are not recommended for diagnostic purposes. A negative Rapid Influenza Diagnostic Test (RIDT) result does NOT exclude influenza and should not preclude starting empiric antiviral treatment where sound indications exist.

6.2 Specimen collection, storage and transportation

Combined nasopharyngeal and oropharyngeal swabs in universal transport medium (UTM) are the preferred specimen for testing. Flocked swabs should be used to collect specimens as they provide a better yield on PCR ^[26]. Dacron or rayon swabs may be used if flocked swabs are not available. Cotton wool budded swabs are not recommended. Once collected, these samples should be transported on ice to the testing laboratory. The specimens must be refrigerated at 4°C if transport is expected to be delayed. If the specimen(s) cannot be shipped within 72 hours of collection, they should be kept frozen at -20°C. Avoid repeated freezing and thawing of specimens.

For specimens submitted to NICD, completed specimen request form (Appendix 1) with patient name, health facility (where appropriate), healthcare worker's name and contact numbers, laboratory name, contact person, telephone, fax number and email address for receipt of results, and clinical details should accompany the sample. [Click here to access the specimen submission form](#)

6.2.1 Additional considerations for sample collection

- Specimens for virus isolation or for detection of viral nucleic acids or antigens should preferably be collected within three days of onset of symptoms, but may be taken up to a week after onset or even later in children, severely ill or immunocompromised patients
- Specimens should preferably be taken prior to commencement of antiviral therapy but can still be taken a few days after initiation, especially in patients who are deteriorating on antiviral treatment. In these cases antiviral resistant infection should be considered and testing for oseltamivir resistant virus may be considered.
- In addition to swabs from the upper respiratory tract, invasive procedures such as bronchoalveolar lavage/ bronchial aspirate or lung biopsy can be performed for the diagnosis of influenza where clinically indicated. Expecterated and induced sputum can also be tested.
- Results of all diagnostic tests for influenza are dependent upon several factors (including specimen type and quality of specimen collection, timing of collection, storage and transport conditions), such that false-negative results may be obtained. When clinical suspicion is high, clinicians can consider repeat/serial testing. Lower respiratory tract specimens may yield the diagnosis when testing of upper respiratory tract specimens is negative. Multiple respiratory tract specimens collected on different days can be tested if influenza infection is strongly suspected.

6.2.2 Procedure for sample collection

A nasopharyngeal specimen (nasopharyngeal swab or aspirate) should be collected. In small children it may be easier and less traumatic to collect an aspirate but both specimen types are acceptable and have similar diagnostic yield^[27].

Nasopharyngeal swabs (NPS)

- Carefully label the vial of UTM with patient identification information and date of specimen collection.

- Gently insert the flocked swab through one nostril beyond the anterior nares along the floor of the nasal cavity, until the pharyngeal wall is reached (swab to reach depth equal to distance from nostril to outer opening of ear).
- Do not use more than minimal force if any obstruction is encountered.
- Rotate the swab three times against the nasopharyngeal wall and then withdraw the swab slowly.
- Place the swab into UTM without touching it, snap off the tip at the marked break point.
- Secure the cap.
- Transport the labelled swab to the laboratory.

Nasopharyngeal aspirates (NPA)

- Fill 5ml syringe with saline; attach catheter tubing to syringe tip.
- Slowly insert the catheter into one nostril until the pharyngeal wall is reached.
- Quickly inject saline into nostril and then aspirate the recoverable nasopharyngeal specimen.
- Withdraw the catheter under suction, being careful not to touch the tip.
- Inject the aspirated fluid into labelled UTM and transport to the laboratory.

6.2.3 Transport of samples to NICD

For samples that are going to be tested at NICD (see section 6.1 and section 10), specimens should be transported within 24 hours to the Centre for Respiratory Diseases and Meningitis (CRDM) Virology Laboratory, National Institute for Communicable Diseases (NICD), 1 Modderfontein Road, Sandringham, 2131. Please complete specimen submission form: [Click here to access the specimen submission form](#)

7. Clinical management and considerations for treatment of influenza

Influenza is detectable in approximately 7% of children aged < 5yrs hospitalised with pneumonia and 9% of individuals aged ≥5 years hospitalized with pneumonia in South Africa. ^[28, 29] During the influenza season this increases to approximately 20-40% of all people hospitalised for pneumonia. For this reason, influenza must be considered as an important potential cause of community acquired pneumonia (CAP) in all patients during the influenza season and consideration must be given to including oseltamivir as part of empiric treatment where indicated (see section 5.1) and available. Note that because influenza vaccination is not 100% effective, a history of influenza vaccination does not exclude the possibility of influenza infection in patients with compatible clinical features.

7.1 Antiviral therapy

Antiviral medications with activity against influenza are an adjunct to influenza vaccine in the control of influenza. Few patients with influenza require treatment and initiation of treatment should be based on clinical judgment taking into consideration the patient's disease severity and progression, age, underlying medical conditions, likelihood of progressing to severe influenza, and time since onset

of symptoms. When indicated, antiviral treatment should be started as early as possible, ideally within 48 hours of symptom onset, and should not be delayed while awaiting laboratory confirmation. However, antiviral treatment might still be beneficial in patients with severe, complicated or progressive illness, and in hospitalized patients when started more than 48 hours after illness onset. Antiviral therapy is recommended as early as possible for any patient with confirmed or suspected influenza who

- has complicated or severe illness (including all hospitalised patients), or
- has higher risk for influenza complications (see section 5.1).

Antiviral treatment is not indicated for treatment of influenza in persons who do not fall in the risk groups for severe influenza-associated disease and who present with uncomplicated influenza.

Prospective, randomised, controlled clinical trials (RCTs) show that treatment with oseltamivir for uncomplicated influenza illness can reduce the duration of symptoms by approximately 1 day when given within 48 hours of onset of illness^[30-32]. Because of the large sample sizes required, there have not been RCTs conducted specifically to evaluate the effect of oseltamivir against severe outcomes such as hospitalisation or death. Observational data suggest a benefit of oseltamivir treatment against severe outcomes, although these may be subject to several limitations. A meta-analysis of individual patient data reported lower risk of mortality in patients treated with neuraminidase inhibitors compared to those not treated.^[33] A meta-analysis showed a risk reduction in lower respiratory tract complications and in hospital stay in the group that received oseltamivir^[34]. For this reason the South African guidelines continue to recommend the use of neuraminidase inhibitors for the treatment of hospitalised patients with confirmed or suspected influenza who have complicated or severe influenza or are at higher risk for influenza complications (see section 5.1).

7.1.1 Antiviral medication recommended for treatment

Oral oseltamivir (Tamiflu®) and inhaled zanamivir (Relenza®) (limited availability in South Africa) are chemically related antiviral medications that act as neuraminidase inhibitors and have activity against both influenza A and B. These two medications are recommended for use during the 2018 influenza season. Adamantanes (amantadine and rimantadine) are not recommended for use due to high levels of resistance. The standard adult dose and duration of oseltamivir treatment is 75mg twice daily orally for 5 days. Doses for treatment are summarised in Table 1^[35].

Table 1: Recommended Dosage and Duration of Influenza Antiviral Medications for Treatment

Antiviral Agent	Children	Adults
Oseltamivir (Tamiflu®)	Neonates* <38 weeks postmenstrual age (premature babies): 1mg/kg twice a day for 5 days 38-40 weeks postmenstrual age (term babies): 1.5 mg/kg twice a day for 5 days	75 mg twice daily for 5 days
	Neonates and infants (1 day[†] -12 months) 3mg/kg twice a day for 5 days	
	If ≥ 1 year, dose varies by child’s weight ≤15 kg, the dose is 30 mg twice a day for 5 days >15 to 23 kg, the dose is 45 mg twice a day for 5 days > 23 to 40 kg, the dose is 60 mg twice a day for 5 days >40 kg, the dose is 75 mg twice a day for 5 days	
Zanamivir (Relenza®)	10 mg (2 x 5mg inhalations) twice daily (FDA approved and recommended for use in children 7 yrs or older)	10 mg (2 x 5-mg inhalations) twice daily for 5 days

Sources: Centers for Disease Control and Prevention. Antiviral agents for the treatment and chemoprophylaxis of influenza: recommendations of the Advisory Committee on Immunization Practices (ACIP).

*Current weight-based dosing recommendations are not appropriate for premature infants. Premature infants might have slower clearance of oral oseltamivir because of immature renal function, and doses recommended for full-term infants might lead to very high drug concentrations in this age group. Limited data from the National Institute of Allergy and Infectious Diseases Collaborative Antiviral Study Group provide the basis for dosing preterm infants using their postmenstrual age (gestational age + chronological age). [†]US Food and Drug Administration approves >14 days old; however, experts agree should be used from 1 day ^[36].

Considerations for treatment with inhaled zanamivir

- Treatment with inhaled zanamivir is indicated in patients where oseltamivir-resistant influenza is demonstrated or strongly suspected.
- Zanamivir is only recommended for use in persons aged ≥7 years.
- Zanamivir contains lactose (powder for inhalation) and must NOT be administered by a nebuliser. It may also interfere with ventilator functioning in ventilated patients.

Other issues regarding critical care management of patients with influenza are beyond the scope of this document. A comprehensive review appears in the journal *Critical Care Medicine* 2010 Vol. 38, No. 4(Suppl.) pp e1-e142: H1N1 Novel Influenza: Pandemic Issues for Critical Care Practitioners. Free access is available online at: <http://journals.lww.com/ccmjjournal/toc/2010/04001>

7.2 Other interventions for management

Antibiotic treatment: Antibiotics do not have a specific effect against the influenza virus but in cases of pneumonia, early empiric treatment for community acquired pneumonia is advised because of the high risk of secondary bacterial infection. Since there is increased risk of secondary infection with *S. pneumoniae*, *Staphylococcus aureus* and *Streptococcus pyogenes* co-amoxiclav is a suitable empiric antibiotic.

Oxygen therapy: Monitor oxygen saturation and maintain SaO₂ >90% (92-95% for pregnant women) with nasal cannulae or face mask. High flow oxygen may be required in severe cases.

8. Prevention of influenza

Influenza vaccination is the most effective method for prevention and control of influenza infection available currently. In general, influenza vaccines are most effective among children ≥ 2 years and healthy adults. A meta-analysis including data from years when there was a mismatch between vaccine and circulating strains estimated a pooled vaccine efficacy (VE) of 59% (95% CI: 51-67) in healthy adults.^[37] Previous studies from South Africa have reported influenza VE estimates from 2005 to 2015 which ranged between 46% and 87% when there was a good match and ranged between -14% and 38% when the circulating A(H3N2) strain showed marked genetic drift ^[38, 39]. A randomised controlled trial conducted in South Africa has shown that when pregnant women received the influenza vaccine, their risk of developing influenza was halved, as was the risk to their infants in the first 24 weeks of life ^[40]. The vaccine has been shown not only to be efficacious for prevention of influenza in both mothers and their infants but also safe.^[41-43] Trivalent influenza vaccine has been shown to provide protection in HIV-infected adults without severe immunosuppression ^[44]. Data are unclear as to the effectiveness in HIV-infected children aged <5 years ^[45]. In certain groups, including the elderly, immunocompromised individuals and infants, influenza vaccine is less effective; however, it may reduce the incidence of severe disease, e.g. bronchopneumonia, hospital admission and mortality.

8.1 Influenza vaccination

Because of the changing nature of influenza viruses, WHO monitors the epidemiology of influenza viruses throughout the world. Each year recommendations about strains to be included in the vaccine for the following influenza season are made. Separate recommendations are made for the Southern and Northern Hemisphere vaccines each year^[46].

8.1.1 Recommended influenza vaccine formulation for 2019

The following strains have been recommended for the trivalent IIV 2019 Southern Hemisphere influenza season:

Egg-based trivalent vaccines

- an A/Michigan/45/2015 (H1N1)pdm09-like virus
- an A/Switzerland/8060/2017 (H3N2)-like virus;
- a B/Colarado/06/2017/-like virus (B/Victoria/2/87 lineage)

Non-egg based vaccines

A(H3N2) component of non-egg based an A/Singapore/INFIMH-16-0019/2016-like virus together with the other vaccine components as indicated above.

These recommendations include a change to the A(H3N2) component of egg-based vaccines and influenza B strains compared with the 2018 Southern hemisphere trivalent IIV. In addition, this year separate recommendations for A(H3N2) component of non-egg and egg-based vaccines was made. The IIV is available in both the public sector (at designated clinics and hospitals) and the private sector (at pharmacies, certain healthcare facilities, etc.), generally from March or April.

8.1.2 Groups recommended for influenza vaccination

Because of limited resources and the fact that not all individuals who fall among the groups at risk for severe influenza disease respond well to influenza vaccination, the National Department of Health is prioritizing certain groups of individuals. The recommendation for groups to be prioritised will be reviewed annually based on available data and resources. The following are among the groups that are prioritised for the targeted public funded influenza vaccination campaign in 2019:

- Pregnant women at all stages of pregnancy, including the postpartum period
- HIV-infected individuals
- Individuals (adults or children ≥ 6 months) who are at high risk for influenza and its complications because of underlying medical conditions and who are receiving regular medical care for conditions such as chronic pulmonary (including tuberculosis) and cardiac diseases, chronic renal diseases, diabetes mellitus and similar metabolic disorders (inherited metabolic disorders and mitochondrial disorders), and individuals who are immunosuppressed.
- Persons aged ≥ 65 years

Other groups that would benefit from influenza vaccination but are not specifically targeted for vaccination by the National Department of health include:

- Healthcare workers*
- Residents of old-age homes, chronic care and rehabilitation institutions
- Persons aged 6 months - ≤ 18 years on long-term aspirin therapy and who therefore might be at risk for experiencing Reye syndrome after influenza virus infection
- Individuals who are morbidly obese (body mass index ≥ 40 kg/m²)
- Adults and children who are family contacts of individuals at high risk of severe influenza
- Any persons wishing to minimise the risk of influenza acquisition, especially in workplace settings where large-scale absenteeism could cause significant economic losses.
- Vaccine is recommended for healthcare workers to protect not only themselves against influenza, but more importantly their patients and vulnerable colleagues.

*In order to improve vaccine coverage among the groups at risk for severe influenza disease, healthcare providers have a key role to play and they should recommend the vaccine and make it accessible for their patients e.g at HIV clinics, antenatal clinics, medical outpatient clinics and oncology clinics. Health workers should also advise/inform patients where influenza vaccines are provided free of charge or provided as part of their annual medical aid benefits.

8.1.3 Contraindications to influenza vaccination

The IIV is an inactivated vaccine, and has a well-established safety record. It is safe for use in pregnancy and in children ≥ 6 months of age. Contraindications to the administration of IIV include:

- A history of severe (anaphylactic) hypersensitivity to any component of the vaccine, including egg protein, or after a previous dose of any influenza vaccine. Anaphylaxis is rare and a careful history will distinguish between anaphylaxis and other allergic reactions. Mild egg protein allergy is not a contraindication to influenza vaccine.
- Infants < 6 months of age.

Precautions

- Persons with moderate illness with or without fever should preferably be immunised after symptoms have resolved.

8.1.4 Influenza vaccine dosage and administration

Influenza vaccine should be given sufficiently early to provide protection for the coming winter. A protective antibody response takes about 2 weeks to develop. The best time to vaccinate is before the influenza season starts, but getting it later will still protect during the rest of the season.

The IIV should be administered intramuscularly (IM) as follows:

- Adults and children 6 years and above: Injection into the upper arm (deltoid)
- Children aged 1 year to <6 years: Injection into the LEFT upper arm
- Infants aged 6 – 11 months: Injection into the LEFT antero-lateral thigh

Table2: Recommended dosage of influenza vaccine

Age Group	Dose	Number of doses
Adults and children 9 years of age and older	Adult dose (0,5ml) IMI	Single dose
Children 3 years through 8 years	Adult dose (0,5ml) IMI	1 or 2 doses [†]
Children 6 months through 2 years	0.25ml (half the adult dose) IMI	1 or 2 doses [†]

*Note: influenza vaccine is not recommended for infants <6 months of age. [†]2 doses should be administered ≥ 1 month apart during 1st year of vaccination, thereafter one dose.

8.2 Chemoprophylaxis of influenza

Annual influenza vaccination is the best way to prevent influenza, because vaccination can be given well before influenza virus exposures occur, and can provide safe and effective immunity throughout the influenza season. Antiviral chemoprophylaxis is currently NOT recommended. However, WHO guidelines state that individuals at high risk of severe disease who have been exposed to a patient with influenza may benefit from presumptive treatment with a full twice-daily 5-day course of antivirals, even if they do not show signs and symptoms of infection. Alternatively, such patients can be monitored closely for early signs of possible influenza infection, and given antiviral treatment if they occur. ^[47].

8.3 To prevent transmission of influenza to others, patients should:

- Stay at home until symptoms have resolved (at least 24 hours after fever has defervesced).
- Avoid close contact with others especially those at high risk for severe influenza (see section 5.1 for individuals at risk of severe influenza)
- Avoid close contact such as kissing or sharing drinks
- Cover coughs and sneezes (cover mouth and nose with tissue or cough or sneeze into an elbow).
- Wash hands with soap and water or disinfect with an alcohol-based hand rub regularly
- Limit the number of visitors
- Wipe down surfaces that are frequently touched or shared (doorknobs, remote controls) with a standard household disinfectant

9. Infection prevention and control (IPC) considerations

Human-to-human transmission of influenza viruses occurs either directly or indirectly through close, unprotected contact with large respiratory droplets. The role of smaller droplet nuclei at close-range exposure in transmission of influenza is not known, but may be more important in certain settings (e.g. aerosol-generating procedures associated with increased risk of virus transmission). Therefore, IPC precautions need to be focused on controlling respiratory droplet spread.

Recommended IPC precautions when caring for patients with suspected or confirmed influenza include:

When working in direct contact with patients, Standard and Droplet Precautions should be applied:

- Standard Precautions:
 - Hand hygiene: washing hands with soap and water or the use of an alcohol-based hand rub
 - Use of personal protective equipment (PPE): this includes facial protection (by means of a medical mask and eye-visor/goggles or a face shield) as well as use of a gown and clean gloves.
- Droplet Precautions:
 - Wear a medical mask if working within approximately 1 metre of the patient or upon entering the room/cubicle of a patient on Droplet Precautions
 - Perform hand hygiene before and after patient contact and immediately on removal of a medical mask
- IPC precautions when performing aerosol-generating procedures associated with an increased risk of infection transmission (e.g. aspiration/open suctioning of the respiratory tract, including for the collection of respiratory tract specimens, intubation, resuscitation, bronchoscopy, autopsy):
 - Wear a particulate respirator (e.g. fit-tested N95 respirator), a clean non-sterile long-sleeved gown, and gloves.
 - Perform hand hygiene before and after patient contact and after PPE removal
- IPC precautions for patients who are mechanically ventilated or undergoing respiratory therapy:
 - Mechanically ventilated patients: Standard and Droplet Precautions (but when aerosol-generating procedures are performed, particulate respirators need to be worn).
 - Chest physiotherapy: Standard and Droplet Precautions. A medical mask should be worn by the patient if possible.
- Nebulisation: Standard and Droplet Precautions

10. Public Health Response to Influenza

Influenza epidemics occur each year during the winter season. Vaccination of high risk groups and individuals wishing to protect themselves against influenza is recommended prior to the expected start of the annual influenza season. No public health response is required in response to isolated cases of influenza or outbreaks of mild disease especially in the influenza season.

10.1 Outbreaks should be investigated in the following circumstances:

- A cluster of two or more cases of severe respiratory illness (requiring hospitalisation)
- An outbreak in a closed community e.g. care home, school, healthcare facility, where individuals in the community are at substantial increased risk of severe disease, or the outbreak is causing substantial disruption.

10.1.1 During an outbreak in a closed or semi-closed community the following measures should be considered:

- Isolation of residents of closed settings for the duration of the infectious period (five days after symptom onset)
- Cohorting of patients (that is, in separate hospital bays or on separate floors of a residential home, dormitories) may be necessary
- Residential homes may need to be closed to new admissions until the outbreak is controlled
- Care must be taken when discharging a patient from a ward with a known influenza outbreak to a care home, or vice versa
- Full or partial school closures are not generally recommended on public health grounds, although it is recognized that they may be considered on logistical grounds by the school
- Administer the current season's influenza vaccine to unvaccinated residents and health care personnel. It is important to note though that because influenza spreads fast it is possible that it will be widespread by the time an outbreak is identified and therefore vaccination may not be effective.

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