Module 2 : Unpacking the differences between influenza vaccines

Exploring the different types of influenza vaccines and understanding who is recommended to receive which vaccine.

About this module

The second module of this course will outline the different influenza vaccines available in Canada including the various types offered and for whom they have been recommended by the National Advisory Committee on Immunization (NACI) and provinces and territories.

This module will explain why these recommendations have been made for different age and risk groups, so Canadians can be informed on the best vaccine for them.

This initiative is supported by Sanofi Canada as part of the Demystifying Vaccine Information, Understanding the Language of Influenza project

Lessons

- Unpacking influenza vaccines – which one is recommended for you and why?
- National Advisory Committee on Immunization (NACI) and provincial and territorial recommendations - is there a difference and why?

Learning Objectives

1. Learners will understand more about the various types of influenza vaccines available and what factors make them different from one another.
2. Learners will understand the recommendations that have been made for different age and risk groups by NACI and provinces and territories and why these recommendations have been made.

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Lesson 1: Unpacking influenza vaccines – which one is recommended for you and why?

Learning Objective 1: Learners will understand more about the various types of influenza vaccines available and what factors make them different from one another.

Types of influenza vaccine technologies

- There are 3 different types of vaccine that are authorized for use in Canada:
  - **Inactive influenza vaccines (IIV)**
  - **Recombinant influenza vaccines (RIV),** and
  - **Live-attenuated influenza vaccines (LAIV)**
- As a reminder, vaccines do not cause infection, and are a tool that works alongside our body's immune system to develop protection against diseases.

Types of influenza vaccines

Inactive influenza vaccines (IIV)

- Are made of killed influenza viruses or parts of these viruses.
- This vaccine is administered by injection.

Recombinant influenza vaccines (RIV)

- Are created synthetically, where scientists obtain the virus' gene that has instructions to make the antigen.
- This vaccine is administered by injection.

Live-attenuated influenza vaccines (LAIV)

- Are made of weakened influenza viruses.
- This vaccine is given as a nasal spray.

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What is valency?

Let's recall what an **antigen** is first:

- Infectious agents have molecules called antigens, which our immune system can recognize and attack.
- Vaccines may protect against different strains of influenza. The number of strains that a vaccine protects against, determines its **valency**. The vaccine will expose our bodies to the antigens of these influenza virus strains.
    - For example, a trivalent vaccine protects against 3 strains of the virus and a quadrivalent vaccine protects against 4 strains of the virus.
- Valency is therefore a sub-category of each of the types of influenza vaccines. It is represented by numerals after the letters in a vaccine's name.
- As a reminder, the flu is caused by 2 main influenza viruses, Influenza A virus and Influenza B virus, and it is important to note that the Influenza B virus has 2 **lineages**, which are groups of viruses that are closely related and have a common viral ancestor.
- In Canada, both the **trivalent** and **quadrivalent vaccines** have been approved for use:
    - Trivalent (3-strain) vaccines contain:
        - 1 influenza A(H1N1) strain
        - 1 influenza A(H3N2) strain, and
        - 1 influenza B strain from one of the two lineages
    - Quadrivalent (4-strain) vaccines contain:
        - The strains in the trivalent vaccine plus an influenza B strain from the other lineage

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What is vaccine formulation?

- Vaccine formulation involves the different parts and processes that make up a vaccine.
- Formulation may describe the:
  - Ingredients used in vaccines, such as an adjuvant, Dosage of a vaccine, and Processes used in creating a vaccine.
- Varying formulations of a vaccine against a disease will offer different types of protection depending on an individual's or population's risk levels and other factors.

Vaccine formulation: Ingredients

- As mentioned, vaccine formulation includes the ingredients used in vaccine.
- An ingredient that is used in some influenza vaccines is an:
  - **Adjuvant:** An adjuvant is an ingredient used in some vaccines that helps create a stronger immune response.
- **Adjuvanted influenza vaccines (-Adj)**
  - This is an example of one type of influenza vaccine classified based on the presence of this ingredient (adjuvant).

Vaccine Formulation: Dosage

- **Dosage** of a vaccine is the volume or measured amount of a particular vaccine that is intended to be taken at one time. Different **doses** may be recommended at different intervals of time.
  - Varying the dose provides different levels of protection and may be required for individuals with higher risk of disease.
- Influenza vaccines in Canada can therefore be further classified based on their dose, such as:
  - **Standard dose,** or
  - **High dose**

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Vaccine Formulation: Processes

- There are different processes that can be used to create a vaccine, which also determines a vaccine's formulation.
- Cell-based and egg-based vaccines represent two types of processes used for making influenza vaccines.
- **'Cell-based'** refers to how an influenza vaccine is made, where the influenza viruses are grown in cultured cells of mammalian origin.
  - Often the vaccine will have '-cc' at the end of its name to reflect that it is cell-based.
  - Example of an influenza cell-based vaccine:
    - IIV4-cc: quadrivalent mammalian cell culture-based inactivated influenza vaccine.
- **'Egg-based'** also refers to how an influenza vaccine is made and involves growing the influenza virus in chicken eggs.
  - These vaccines will state that they are 'egg-based'.

Vaccine formulation: What is dosage?

- Dosage is therefore also a sub-category of each of the types of influenza vaccines and are represented by a 'dash' followed by its abbreviation.
  - For example, the IIV4-SD vaccine is the standard-dose quadrivalent inactivated influenza vaccine.
- **Standard dose influenza vaccines (-SD)**
  - Vaccine with a baseline measured dose.
- **High dose influenza vaccines (-HD)**
  - Some of these vaccines include 3 to 4 times as much as standard dose vaccines.

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- The inactivated influenza vaccines (IIVs) in Canada can be found in a **standard dose formulation** or in a formulation designed to enhance the immune response in specific age groups, by using a higher dose of antigen or the inclusion of an adjuvant.

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Lesson 2: National Advisory Committee on Immunization (NACI) and provincial and territorial recommendations - is there a difference and why?

Learning Objective 2: Learners will understand the recommendations that have been made for different age and risk groups by NACI and provinces and territories and why these recommendations have been made.

Am I eligible to receive an influenza vaccine?

- NACI recommends individuals 6 months of age and older, who do not have any **contraindication** (a condition that serves as a reason to not take a certain medical treatment because it maybe harmful to the person) to the vaccine, receive annual influenza vaccination.
- NACI strongly recommends many groups to receive the influenza vaccine such as high-risk populations and those who may be more likely to transmit the virus to high-risk groups (i.e. health care workers, care providers and other workers).
- The influenza vaccine is publicly funded by provinces and territories, and you are therefore eligible to be vaccinated free of charge.

What vaccine is right for me? (Based on NACI recommendations)

- With the recent availability of several new influenza vaccines, some of which are designed to enhance **immunogenicity** (ability of a vaccine to provoke an immune response) in specific age groups, the choice is now more complex. Therefore, there are many different types of influenza vaccines available as they have been developed to provide levels of protection that are suitable for different age groups and risk-levels.
- It is highly recommended that individuals belonging to the following high-risk groups, receive their influenza vaccine:
  - Adults 65 years and older
  - Residents of nursing homes or other chronic care facilities

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- Adults and children with chronic health conditions (i.e. diabetes, asthma, immune compromising conditions, etc)
- Indigenous peoples
- All individuals who are pregnant
- All children 6 to 59 months of age

What vaccine is right for me? (Based on NACI recommendations)

- Adults 65 years of age and older are at greater risk of more severe complications from influenza, as influenza-related **mortality** rates increase with age (where mortality is the state of being subject to death). Therefore, the IIV-HD, IIV-Adj, or RIV formulations should be preferentially offered for older adults over the age of 65.
- Individuals who reside in nursing homes or chronic care facilities often have chronic conditions and live in an institutional environment that may help spread influenza. It is highly recommended that individuals belonging to this high-risk group receive their influenza vaccine annually.
- Immunocompromised persons, have an increased risk of **morbidity** (condition of suffering from a disease or medical condition or **co-morbidity**, which is more than one morbidity at a time) and mortality. These individuals, with certain chronic health conditions, either adults or children, are recommended to have the influenza vaccine every year as vaccine effectiveness tends to be lower than in healthy individuals.

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What vaccine is right for me? (Based on NACI recommendations)

The following influenza vaccines are recommended by NACI for Canadians that are **18-59 years of age**:

- **IIV-SD:** standard-dose inactivated influenza vaccine
- **IIV-cc:** mammalian cell culture-based inactivated influenza vaccine
- **RIV:** recombinant influenza vaccine
- **LAIV:** live attenuated influenza vaccines

(These influenza vaccines should be used in adults without contraindications to the vaccines. The IIV or RIV should be used instead of LAIV for adults with certain chronic health conditions, healthcare workers, or pregnant persons. NACI notes that both quadrivalent and trivalent formulations are clinically safe, and effective.)

What vaccine is right for me? (Based on NACI recommendations)

The following influenza vaccines are recommended for Canadians that are **60-64 years of age:**

- **IIV-SD:** standard-dose inactivated influenza vaccine
- **IIV-cc:** mammalian cell culture-based inactivated influenza vaccine
- **RIV:** recombinant influenza vaccine

(These influenza vaccines should be used in adults that are 60-64 years of age, who do not have contraindications
to the vaccines. NACI notes that both quadrivalent and trivalent formulations are clinically safe, and effective.)

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What vaccine is right for me? (Based on NACI recommendations)

The following influenza vaccines are recommended by NACI for Canadians that are **65 years of age and older:**

- **IIV-Adj**: adjuvanted inactivated influenza vaccine
- **IIV-SD:** standard-dose inactivated influenza vaccine
- **IIV-HD:** high-dose inactivated influenza vaccine
- **IIV-cc:** mammalian cell culture-based inactivated influenza vaccine
- **RIV:** recombinant influenza vaccine

(It is important to note that if available, the IIV-HD, IIV-Adj, or RIV should be preferentially offered, when available, over other influenza vaccines for adults 65 years of age and older. If a preferred product is not available, any of the available age-appropriate influenza vaccines should be used. NACI notes that both quadrivalent and trivalent formulations are clinically safe, and effective.)

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What vaccine is right for me? (Based on NACI recommendations)

Age-appropriate adult vaccine recommendations summarized by age group:

18-59 years	60-64 years	65 years and older
IIV-SD: standard-dose inactivated influenza vaccine	**IIV-SD**: standard-dose inactivated influenza vaccine	**IIV-Adj**: adjuvanted inactivated influenza vaccine *
IIV-cc: mammalian cell culture-based inactivated influenza vaccine	**IIV-cc**: mammalian cell culture-based inactivated influenza vaccine	**IIV-SD**: standard-dose inactivated influenza vaccine
RIV: recombinant influenza vaccine	**RIV**: recombinant influenza vaccine	**IIV-HD**: high-dose inactivated influenza vaccine *
LAIV: live attenuated influenza vaccines		**IIV-cc**: mammalian cell culture-based inactivated influenza vaccine
		RIV: recombinant influenza vaccine *

(*should be preferentially recommended)

Why are there so many types of flu vaccines available?

- To provide different levels of immunogenicity, as antibody response after vaccination depends on age, prior and subsequent exposure to antigens, and presence of immunocompromising conditions. Some groups of individuals will not have as robust of an immune response and therefore will require different doses of a vaccine to ensure protection against the disease.
- The effectiveness of a vaccine can vary between flu seasons and by influenza vaccine strain type and subtype. This means that influenza vaccine effectiveness depends on how well the vaccine strains match with the influenza viruses that are circulating in a flu season. The different vaccines available account for different valencies or number of strains of the influenza virus.
- Vaccines are developed to consider factors such as immunogenicity and effectiveness across varied ages and health statuses. As a result, there are many types of influenza vaccines that have combinations of different doses and valencies to ensure different levels of protection can be effectively provided.

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What vaccine is right for me and available in the province or territory I live in?

- Provinces and territories in Canada all have their own immunization plans and programs, with their own recommendations and coverage for influenza vaccination.
- It is important to know that NACI's guidance helps provinces and territories plan their vaccination programs. Provinces and territories consider NACI's advice and their regions' unique circumstances when making decisions on their programs.
- For more information specific to a province or territory, it is helpful to consult the respective government and public health websites.
- It is also important and helpful to consult healthcare providers on which vaccine is most suitable for you based on age and overall health.

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