ESN
EUROPEAN SPECIALIST NURSES ORGANISATION

Module 2

EUROPEAN NURSE

Information and Communication Guide

ON VACCINES

The European Specialist Nurses Organisation (ESNO) is a non-profit organisation with the goal to facilitate and provide an effective framework for communication and co-operation between the European Specialist Nurses Organisations and its constituent members. ESNO represents the mutual interests and benefits of these organisations to the wider European community in the interest of the public health. Members of ESNO consist of individual European specialist nurses member organizations and associates, both institutional and individual.

The organisation focusses on enhancing the capacity and capability of specialists nurses to deliver hight quality healthcare by raising and harmonise specialist nursing education standards and actively contribute to health themes and threats, providing the best possible expertise, both national and in European cross border context.

A publication from the European Specialist Nurses Organisation April 2021 - www.esno.org

CONTENTS

Vaccination

1 Introduction

To the reader of this Module 2 on Vaccination.

This is both an update and an extension of the first edition of the Information and Communication guide on Vaccines. In the time of a global pandemic, there is so much changing where vaccines are concerned. This includes discussions of the availability and efficacy of the COVID-19 vaccines, as well as debates on other vaccines, and it's important to keep up-to-date.

Over the centuries, we have seen how disruptive infection diseases can be to the society, and we have also seen how vaccines have made a significant contribution to fighting disease and protecting individuals and families. With the onset of the COVID-19 pandemic in 2019, we have seen once again how dangerous infections can be and how vital is the role of vaccination.

The goal of this information and communication guide is to increase knowledge, understanding and skills around the topic of vaccination. There is so much information on vaccines circulating at the moment, ranging from non-expert opinions to scientific research. This fragmentation of information does not help good communication between nurses, with other healthcare providers and especially to the European public and patients. This guide cannot cover everything. Instead, we hope to provide nurses with the best possible information to equip them to practice their profession to the best of their ability, and trigger curiosity to find out more. The information is collected from the best and most credible sources, enriched with examples and pointers for further reading. The guide is created for nurses but we also advise this to all professionals related to education such as teachers, carers and daycare centers staff.

The module sits alongside Module 1 on microbes and medications, Module 3 on AMR and Stewardship and Module 4 on Infection Prevention Control. It touches on COVID-19 in general terms as things are still changing. There will be further updates in the revised version of Module 1 (Microbes and Medication), published in the second part of 2021.

Thank you very much for taking your valuable time to read this guide.

Ber Oomen

Project lead European Nurses guide

→ Back to top

2 Principles of vaccination

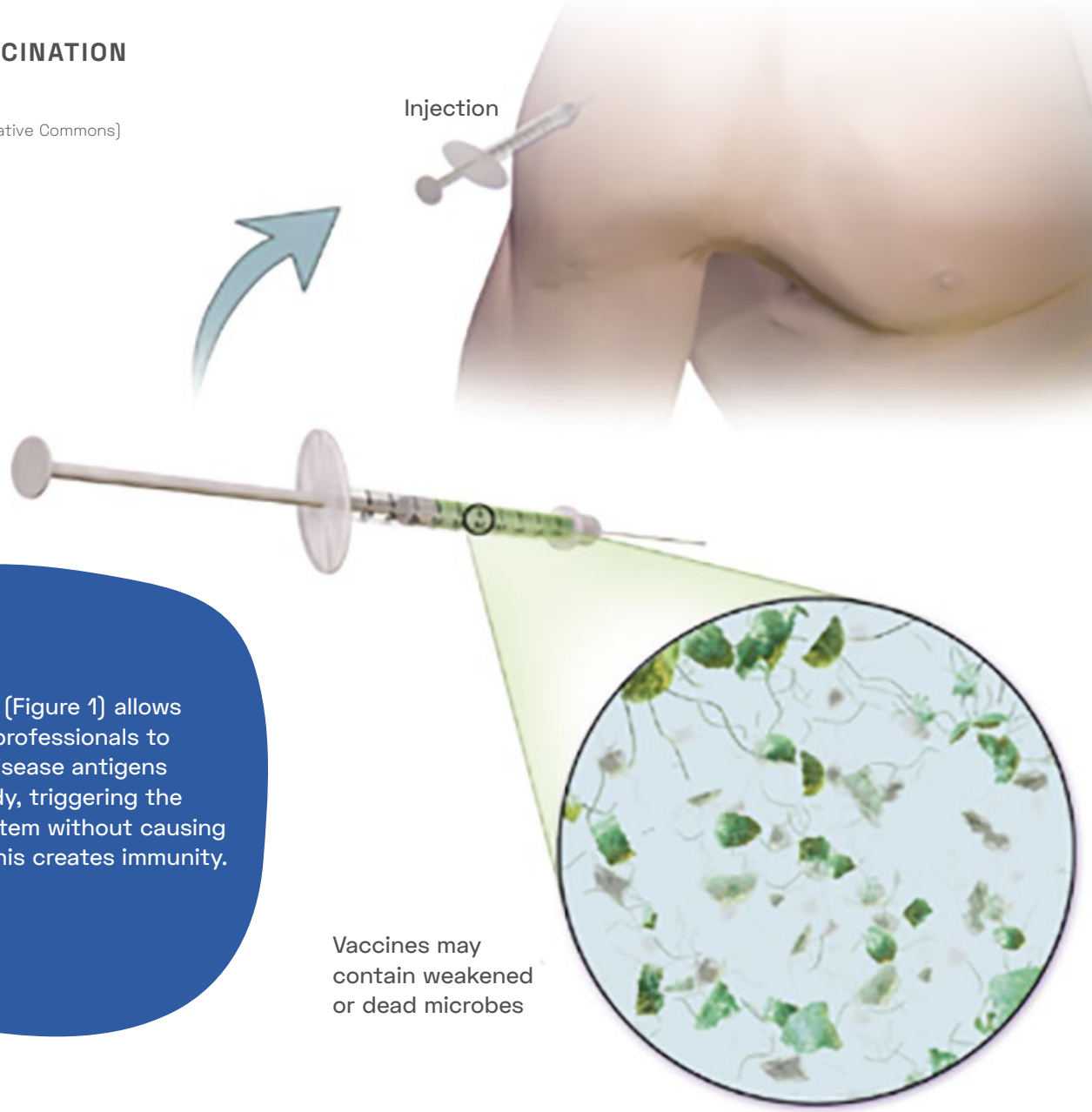
2.1 Principle of immunity and vaccination

The human immune system protects against diseases by recognizing germs entering and identifying them as foreign invaders through the antigens – short for 'antibody generator' – on their surface. When antigens invade the human body, the immune system responds by producing proteins called antibodies (humoral immunity) and highly specific cells (cellular immunity). The humoral and cellular immune systems are closely connected, and these two arms of the immune system both fight the invading germs, which may be bacteria, viruses, parasites or fungi.

Immunity is the body's successful defence against a pathogen. When the body has produced enough antibodies or specific cells to fight the disease, immunity results. This provides protection against the disease for many months, years or even for a lifetime. When a person comes into contact with that same pathogen, the immune system quickly produces the same type of antibodies, preventing re-infection. This is also called 'immunological memory', and this system can recognize and combat thousands or even millions of different organisms.

FIGURE 1: VACCINATION

Source: BruceBlaus (Creative Commons)



Vaccination (Figure 1) allows healthcare professionals to introduce disease antigens into the body, triggering the immune system without causing infection. This creates immunity.

→ Back to top

MY PATIENT ASKED: IS NATURAL IMMUNITY BETTER THAN VACCINE IMMUNITY?

It is true that natural infection almost always causes better immunity than vaccines. Whereas immunity from disease often follows a single natural infection, immunity from vaccines usually occurs only after several doses. However, the difference between vaccination and natural infection is the price paid for immunity.

As examples, among others, the price paid for immunity after natural infection might be pneumonia from chickenpox, intellectual disability from Haemophilus influenzae type b (Hib), pneumonia from pneumococcus, birth defects from rubella, liver cancer from hepatitis B virus, or death or immune system amnesia from measles.

3 The role of vaccination

There is a lot of evidence confirming that immunization is the most important public health intervention to reduce child morbidity and mortality and provide lifelong protection against disease. Each nation in Europe has its own goals, established by governments, which protect both individuals and those who cannot be or have not yet been immunized. The challenge is to translate European and national goals into local implementation.

Vaccination is a concern for all European nations, and the EU has put in place a European Vaccine Action Plan 2015–2020 (EVAP). This was drafted to complement, regionally interpret and adapt the Global Vaccine Action Plan in harmony with key regional health strategies and polices.

«EVAP sets a course through a regional vision and goals for immunization and control of vaccine-preventable diseases from 2015 to 2020 and beyond, by defining objectives, priority action areas and indicators, considering the specific needs and challenges of WHO European Region Member States.»

3.1 The importance of childhood vaccination

Since the discovery of vaccination, we have been able to eradicate smallpox globally. Wild poliovirus has been eradicated in all continents except Asia; Afghanistan and Pakistan are the only two countries where polio is classified as 'endemic'. We have also been able to reduce the number of cases, deaths and hospitalizations of a range of diseases, including:[1], [2], [3].

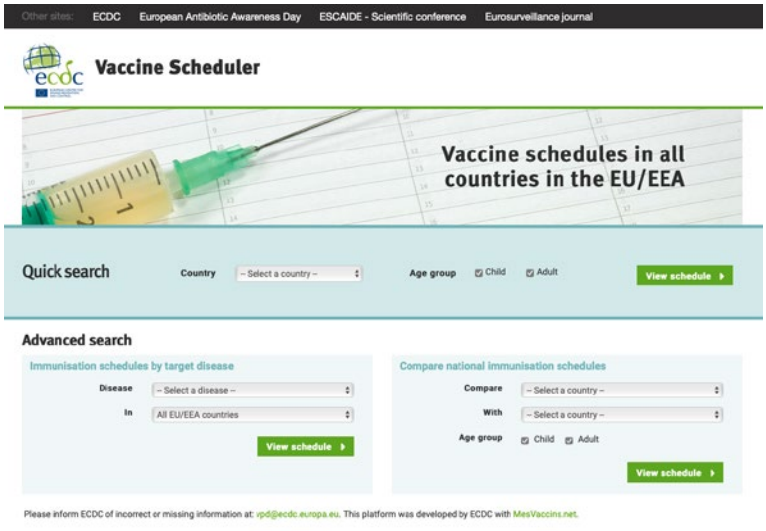
→ Back to top

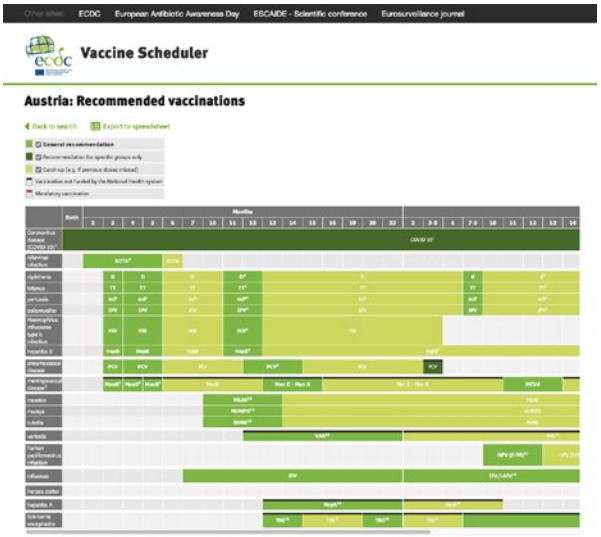
- Tetanus
- Diphtheria
- Mumps
- Pertussis (whooping cough)
- Rubella
- Hepatitis A
- Acute hepatitis B
- Hib
- Varicella
- Streptococcus pneumoniae
- HPV/cervical disease

Vaccination doesn't just reduce death rates (mortality), it reduces the long-term complications of these diseases (morbidity). Vaccination is one of the most cost-effective and successful public health interventions in history.

HINTS AND TIPS

All national vaccination schedules are published in the ECDC scheduler at vaccine-schedule.ecdc.europa.eu. Select the disease and your nation, and find out what you need to know as nurses on the vaccination program.





Back to top

The WHO's vaccination plan recommends children's vaccinations, and countries use this to create their own programs. Nurses should keep up-to-date on the WHO plan, and on the plan in their own country, as these will change over time. An example of this is the change in the HPV immunization plan. The recommended age of first immunisation has now been reduced to 9 years by the WHO, with girls aged 9 to 14 years as the primary target population, with boys aged from 9 years, and girls and women from the age of 15 as the secondary target population. This varies across countries – for example, the UK offers the vaccine to both girls and boys aged 12 to 13 years, and the Netherlands offers it to both girls and boys at the age of 9.

QUESTION FROM MY PATIENT: WHY DOES MY CHILD NEED A PERTUSSIS BOOSTERV?

Initially, pertussis immunization in infants was a single dose to control the disease and reduce deaths and long-term effects in young children. As post-marketing surveillance showed waning immunity, school entry boosters were recommended in many countries to improve disease control. To reduce infant mortality in those too young to be fully vaccinated, many countries have recommended Tdap vaccination in pregnant women.

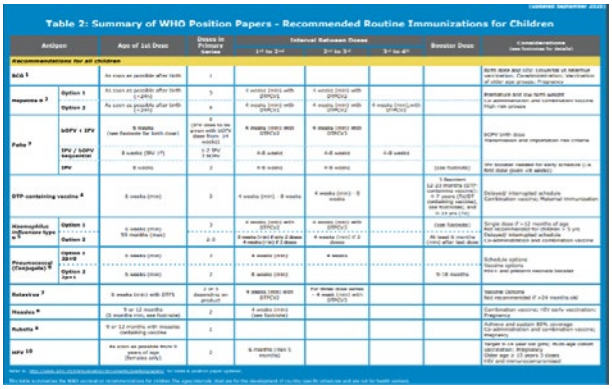


Table 2: Summary of WHO Position Papers - Recommended Routine Immunizations for Children

Antigen		Age of 1st Dose	Doses in Primary Series	Interval Between Doses			Booster Dose	Considerations
Recommendations for all children								
BCG [1]		As soon as possible after birth	1					Birth dose any site; Consider at neonatal vaccination; Contraindications; Vaccination of older age groups; Pregnancy
Hepatitis B [2]	Option 1	As soon as possible after birth (<24h)	3	4 weeks (min) with DTPCV1	4 weeks (min) with DTPCV2			Premature and low birth weight; Co-administration and combination vaccine; High risk groups
	Option 2	As soon as possible after birth (<24h)	4	4 weeks (min) with DTPCV1	4 weeks (min) with DTPCV2	4 weeks (min) with DTPCV3		
Polio [3]	bOPV + IPV	6 weeks (see footnote for both dose)	3 (IPV dose to be given with bOPV dose from 14 weeks)	4 weeks (min) with DTPCV2	4 weeks (min) with DTPCV3			bOPV (HB dose); Hexavalent and rotavirus risk course High risk groups
	IPV / bOPV sequence	8 weeks (IPV 1st)	1-2 IPV 1 bOPV	4-8 weeks	4-8 weeks	4-8 weeks		
	IPV	8 weeks	2	4-8 weeks	4-8 weeks		(see footnote)	IPV booster needed for early schedule (i.e. first dose (pair <8 weeks))
DTP-containing vaccine [4]		6 weeks (min)	3	4 weeks (min) - 8 weeks	4 weeks (min) - 8 weeks		5-Revaccination 12-23 months (DTP-containing vaccine); Booster (DTP-containing vaccine), see footnotes; and 4-14 yrs (TD)	Delayed/ interrupted schedule; Combination vaccine; Maternal immunization
Haemophilus influenzae type b [5]	Option 1	6 weeks (min) 55 months (max)	3	4 weeks (min) with DTPCV1	4 weeks (min) with DTPCV2		(see footnote)	Single dose if >12 months of age; Not recommended for children <5 yrs
	Option 2		2-3	2 weeks (min) if only 2 doses 4 weeks (min) if 3 doses	4 weeks (min) if 2 doses		At least 6 months (min) after last dose	Delayed/ interrupted schedule; Co-administration and combination vaccine
Pneumococcal (Conjugate) [6]	Option 1 2+1	6 weeks (min)	3	4 weeks (min)	4 weeks			Schedule options; Co-administration; Hib and pneumo booster
	Option 2 3+1	6 weeks (min)	2	8 weeks (min)			9-18 months	
Rotavirus [7]		6 weeks (min) with DTP1	2 or 3 depending on product	4 weeks (min) with DTPCV2	For three dose series 4 week (min) with DTPCV3			Vaccine choice; Not recommended if >24 months old
Measles [8]		9 or 12 months (3 months min, see footnote)	2	4 weeks (min) (see footnote)				Combination vaccine; HIV early vaccination; Pregnancy
Rubella [9]		9 or 12 months with measles containing vaccine	1					Adhere and sustain 80% coverage; Co-administration and combination vaccine; Pregnancy
HPV [10]		As soon as possible from 9 years of age (female only)	2	6 months (min 5 months)				Target is 14 year old girls; Multi-age cohort; Co-administration; Pregnancy; Catch-up ≥ 15 years 3 doses; HIV and immunosuppressed

FIGURE 2: WHO RECOMMENDATIONS FOR CHILDHOOD VACCINATIONS

QUESTION: WHY DOES MY SON NEED TO BE VACCINATED AGAINST RUBELLA?

Rubella, also known as three-day measles or German measles, causes few or no symptoms in most people. However, it can lead to miscarriage in pregnant women, and can cause brain damage, hearing loss and vision loss in unborn babies. Vaccinating boys as well as girls reduces the risk of pregnant women becoming infected.

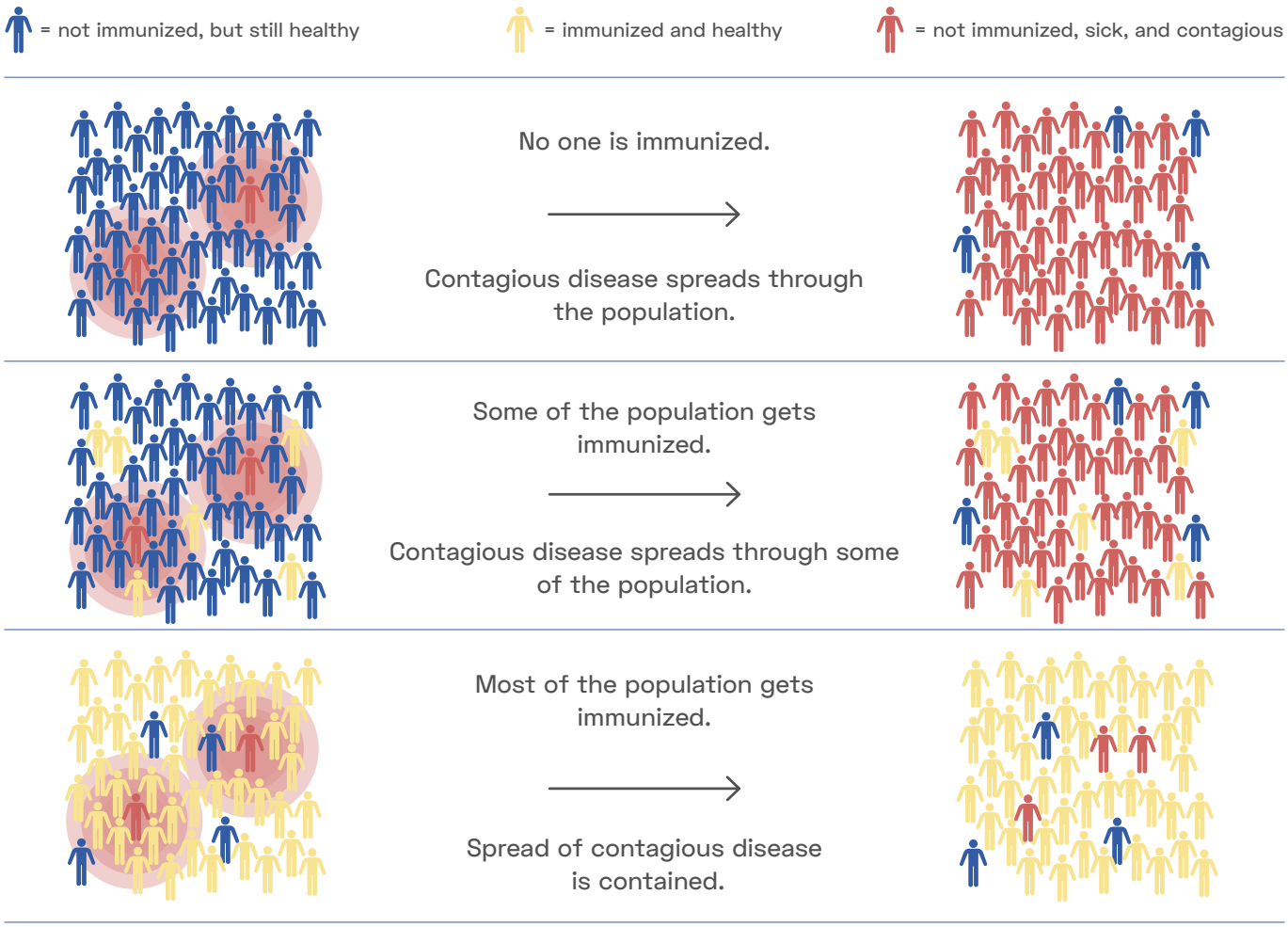
3.2 Community immunity effect (herd immunity)

The principle of community or herd immunity is that if the majority of a population is immune to an infectious disease, spread of the infection from person to person within the community is much less likely, and those that are not immune are protected from infection.

Reaching a high coverage of vaccination leads to herd immunity, protecting those individuals who cannot be or who are yet to be vaccinated, such as newborn babies, and children or adults with chronic illnesses or immune systems that are not working properly. This is known as herd immunity (Figure 3).

Back to top

FIGURE 3: HERD IMMUNITY



Source: Tkarcher (Creative Commons)

The proportion of vaccinated individuals needed to provide herd immunity is high and specific for each disease. For example, 95% of the population need to receive two doses of measles vaccines to avoid outbreaks. Herd immunity is crucial for the success of vaccination programmes, and vaccine hesitancy, which decreases vaccination coverage, compromises the herd immunity effect, leading to the resurgence of certain infectious diseases.

The lack of coverage of vaccines may be because of vaccine hesitancy, for example in certain religious groups, or in people who do not trust medicine or the pharmaceutical industry. Lack of access to healthcare, specifically preventive healthcare, also causes gaps in vaccine coverage.

If enough people in a population are immune to a viral infection, transmission of the infectious disease in that population will stop. This is known as elimination of the infection, and is achieved on a regional basis through a vaccination program. The next step is global eradication, which has only been achieved for smallpox and rinderpest. To get to eradication, elimination in all world regions must be achieved.

Key message: Herd immunity

Herd immunity describes how a population is protected from a disease after vaccination by stopping the germ responsible for the infection being transmitted between people. In this way even people who cannot be vaccinated can be protected.

→ Back to top

4 Vaccines and how they work

A prophylactic (preventive) vaccine creates immunity to a specific disease. Vaccines are like a training course for the immune system – the vaccine typically contains an agent that looks like a disease-causing microorganism, and is often made from weakened or killed forms of the microbe, its toxins or one of its surface proteins. The agent stimulates the body's immune system to recognize the agent as foreign, destroy it, and remember it, so that the immune system can recognize and destroy the organism if it is encountered again.

4.1 Key vaccine-preventable diseases

TABLE 1: TEN KEY VACCINE-PREVENTABLE DISEASES

Common name	Cause	Symptoms	How it spreads	Impact
Measles	Viral infection – measles morbillivirus	Fever, cough, runny nose and rash	Airborne through coughs and sneezes, can last for up to two hours on surfaces; 90% of people without immunity to the virus will catch it if exposed	Pneumonia, brain swelling, and death Subacute sclerosing panencephalitis (SSPE) is a rare complication, developing years after an infection Before the vaccine, there were around 2.6 million deaths worldwide each year
Whooping cough, 100-day cough (pertussis)	Bacterial infection – Bordetella pertussis	Cough	Airborne through coughs and sneezes	Pneumonia, seizures, and slowed or stopped breathing; particularly dangerous in babies
Influenza (flu)	Viral infection – type A, B or C influenza virus Virus mutates constantly	Cough, sore throat, fever, muscle pain, headache	Airborne through coughs and sneezes; droplets spread up to 2 metres.	Pneumonia, bronchitis 15,000–70,000 people die in Europe every year as a result of influenza
Poliomyelitis (polio)	Viral infection – poliovirus	No symptoms or flu-like symptoms initially	Infection is passed on by coming into contact with a sick person's faeces	Brain infection, paralysis, and death Vaccination has reduced cases, but the disease has not yet been eradicated
Non-invasive pneumococcal disease	Bacterial infection – Streptococcus pneumonia	Depend on site of infection but include: cough, pain, swelling and tenderness	Spreads through contact with an infected person's mucus or saliva	Ear infection, bronchitis, sinusitis

→ Back to top

Invasive pneumococcal disease	Bacterial infection – Streptococcus pneumonia	Depend on site of infection but include: Fever, chills, headache, cough, problems breathing	Spreads through contact with an infected person's mucus or saliva	Pneumonia, sepsis (blood infection), meningitis. Pneumonia caused by pneumococcal disease is especially serious in people older than 65. Meningitis and blood infections can be life-changing or life-threatening. 10% of invasive streptococcal infections are fatal
Tetanus (lockjaw)	Bacterial infection – Clostridioides tetani	Breathing problems, muscle spasms	Bacteria is found in soil, dust, and manure, and can enter the body through a cut or open sore	Paralysis and death Up to 10% to 20% of tetanus cases are fatal. Deaths are more common in people who are older than 60 or who have diabetes
Meningococcal disease	Bacterial infection – Neisseria meningitidis	Fever that starts suddenly, headache, and stiff neck	The bacteria live in the nose and throat, and can spread through saliva, or through close, prolonged contact	Meningitis (swelling of the brain and spinal cord), and blood infections In 2016, there were 3,280 confirmed cases and 304 deaths in Europe; fatality is 8-15%
Hepatitis B	Viral infection – hepatitis B virus	Initially, few or no symptoms	The hepatitis B virus is in blood and other body fluids, and is spread through sex or sharing needles. A pregnant woman can pass it to her baby	Liver cancer, chronic liver disease
Mumps	Viral infection – mumps rubulavirus	Fever, headache, pain, swelling of parotid (salivary) glands	Airborne through coughs and sneezes	Male sterility, encephalitis (brain inflammation), ovarian inflammation, meningitis, pancreatitis, hearing loss
Haemophilus influenzae type B (Hib)	Bacterial infection – Haemophilus influenzae type B	Depend on site of infection	Airborne infection; some people have Hib bacteria in their nose or throat but are not ill	Pneumonia, sepsis, meningitis, epiglottitis, septic arthritis, cellulitis, otitis media, and purulent pericarditis (heart valve infection) Around 5% of people with Hib meningitis will die, and 15-20% will have deafness, behavioural and learning difficulties, and speech and language problems

SCAN ME
(QR code 1)

For more information on vaccine-preventable diseases, see the CDC Manual for the Surveillance of Vaccine-Preventable Diseases at **QR code 1.**

→ Back to top

4.2 How vaccines work

When external invaders such as bacteria or viruses enter the body, immune cells called lymphocytes respond by producing protein molecules called antibodies. These recognise antigens on the microorganism's surface and protect against infection. A healthy individual can produce millions of antibodies a day, fighting infection so efficiently that people never even know they were exposed to an antigen. Unfortunately, the first time the body faces a particular invader, it can take several days to ramp up this antibody response. For really nasty antigens like the measles virus or whooping cough bacteria, a few days is too long. The infection can spread and kill the person before the immune system can fight back. That's where vaccines come in. They can't cause an infection, but the immune system still sees them as an enemy and produces antibodies in response.

Memory:

After the threat has passed, many of the antibodies will break down, but immune cells called memory cells remain in the body. When the body encounters that antigen again, the memory cells produce antibodies fast and strike down the invader before it's too late. This is why people get infections such as rubella or whooping cough only once. Vaccinations also create memory cells. Measles infections can cause 'immune amnesia', wiping the immune system of its memory of infections.

Vaccine boosters:

Some vaccines need an initial (prime) dose followed by a booster dose, to increase the immune response to protective levels. If for certain vaccines there are no follow ups, there is no effect at all. The first shots are an introduction to the body where as the final vaccination is the main medication. When only half is taken, then the first dose alone may not have the full impact.

The community effect:

Vaccines also work on a community level. Some people are very vulnerable to infection, including babies too young to be vaccinated, elderly people, and people with damaged immune systems. If everyone around them is vaccinated, unvaccinated people are protected by something called **herd immunity.** In other words, they're unlikely to even come in contact with the disease, so they probably won't get sick. When it comes to vaccines, sometimes it can pay to follow the crowd.

Measles is more than just a childhood disease

Measles causes long-term damage to the immune system, leaving children who have had it vulnerable to other infections long after the initial illness has passed, research has revealed. "We've found really strong evidence that the measles virus is actually destroying the immune system," said Prof Stephen Elledge, a geneticist at Harvard Medical School and co-author of one of the papers. "The threat measles poses to people is much greater than we previously imagined" [1-3]

→ Back to top

4.3 Most used vaccines

TABLE 2: EXAMPLES OF VIRAL AND BACTERIAL VACCINES

	Live attenuated	Killed inactivated	Subunit
Viral	Vaccinia Polio (OPV) Yellow fever Measles Mumps Rubella Influenza Rotavirus	Polio (IPV) Rabies Influenza Hepatitis A	Hepatitis B (HepB-surface antigen) Human papilloma virus (HPV)
Bacterial	BCG (tuberculosis) Salmonella typhi (oral)	Bordetella pertussis (whole cell) Cholera Bacillus anthracis	Tetanus (toxoid) Diphtheria (toxoid) Neisseria meningitidis (polysaccharide) Bordetella pertussis (acellular) Streptococcus pneumoniae, 23 valent (polysaccharide) Haemophilus influenzae, type b (Hib) (polysaccharide) Neisseria meningitidis (polysaccharide conjugate) Streptococcus pneumoniae, heptavalent (conjugate polysaccharides) Salmonella typhi Vi (capsular polysaccharide)

Source: Nascimento [4]

TABLE 3: COMMON CHILDHOOD VACCINES

Vaccine	Diseases targeted
HepB	Hepatitis B infection (liver disease)
RV	Rotavirus (major cause of diarrhoea)
DTaP	Diphtheria, tetanus, and pertussis (whooping cough)
Hib	Haemophilus influenzae type b (bacterial meningitis)
PCV	Pneumococcal disease, including pneumonia
IPV	Polio
Flu	Influenza
MMR	Measles, mumps, and rubella (German measles)
Varicella	Varicella (chickenpox)
HepA	Hepatitis A infection (liver disease)

Source: ECDC vaccine scheduler (QR code 2)

Back to top ↑

TABLE 22: COMMON VACCINES IN ADOLESCENCE AND ADULTHOOD

Vaccine	Diseases targeted
Flu	Influenza
TDaP	Diphtheria, tetanus, and pertussis (whooping cough)
HZV	Herpes zoster (shingles)
PCV	Pneumococcal disease, including pneumonia
HPV	Herpes papillomavirus (cervical and other cancers, genital warts)

Source: ECDC vaccine scheduler (QR code 2)

Other vaccines offered to adolescents and adults include meningococcal disease, hepatitis A, hepatitis B, chickenpox, measles, mumps, and rubella.

Different vaccines schedules operate in different countries across Europe – see the ECDC vaccine scheduler **(QR code 2)** or refer to your local schedules for further information.

SCAN ME
(QR code 2)

5 Types of vaccines

Vaccine designs depend on the disease-causing agent, how it infects the cell and how the immune system responds. Vaccines can be divided into two basic groups; live attenuated and inactivated.

5.1 Live attenuated vaccines

Live attenuated vaccines are produced by weakening a disease-producing ('wild-type') virus or bacterium in the laboratory. The modified strains are able to multiply within the body and trigger a strong immune response. Live attenuated vaccines are generally given in one or two doses.

A live weakened vaccine very rarely causes disease in people with healthy immune systems; however, if it does, it is likely to be a much milder form. Sometimes the side effects of vaccines can also appear like the symptoms of the infection they are preventing.

However, live attenuated vaccines should be not generally be used in people with weakened immune systems, for example with diseases such as leukaemia or HIV/AIDS, who have had an organ transplant, or who are having cancer chemotherapy or other treatments that affect the immune system. In this group of people, live attenuated vaccines can lead to infection as a result of uncontrolled replication of the virus or bacterium.

Active immunity from a live weakened vaccine may not develop because of interference from circulating antibodies to the vaccine virus. This includes antibodies from blood transfusions, or antibodies that have crossed the placenta from mother to child. This leads to poor or no response to the vaccine, and is known as 'vaccine failure'.

→ Back to top

Examples include:

- varicella-zoster (chickenpox)
- oral poliovirus (OPV)
- yellow fever virus
- measles, mumps, and rubella (MMR)

5.2 Inactivated vaccines

Inactivated vaccines are produced by growing bacteria or viruses in culture media, then inactivating them with heat and/ or chemicals, usually formalin. Inactivated vaccines are either whole or fractional. Inactivated vaccines cannot cause disease from infection, even in immunodeficient people. Inactivated antigens are less affected by circulating antibody than live vaccines.

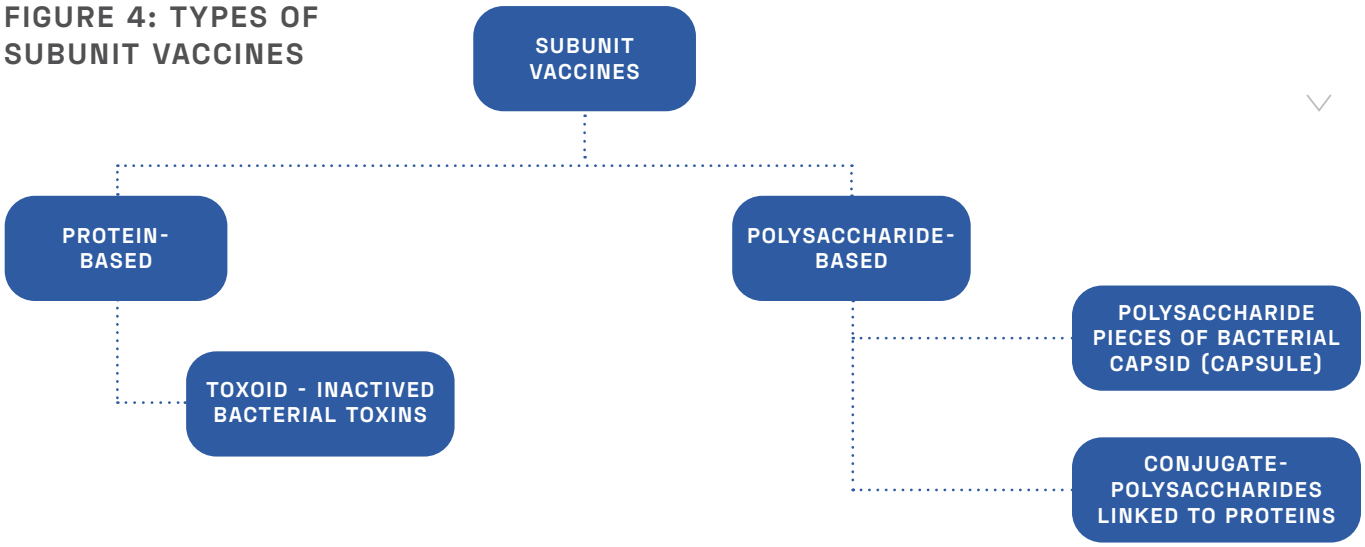
Most inactivated vaccines trigger a weaker immune system response than live vaccines, and always require multiple doses. In general, the first dose does not produce protective immunity, but 'primes' the immune system. A 'real' protective immune response develops after the second or third dose.

In contrast to live vaccines, in which the immune response closely resembles natural infection, the immune response to an inactivated vaccine is mostly humoral. Little or no cellular immunity results. Antibody titres against inactivated antigens diminish with time. As a result, some inactivated vaccines may require booster doses to increase antibody titres. The proteins in conjugate vaccines boost the immune response.

5.3 Subunit vaccines

Subunit vaccines do not attack the entire microbe but address only important parts of it: those antigens that best stimulate the immune system. In some cases, these vaccines use epitopes—the very specific parts of the antigen that antibodies or T cells recognize and bind. Because subunit vaccines contain only the essential antigens make the chances of adverse reactions much lower. Figure 30 shows a number of types of sub-unit vaccines

FIGURE 4: TYPES OF SUBUNIT VACCINES



Back to top

5.4 Toxoid vaccines

Toxoid vaccines teach the immune system to fight off the natural toxin. These vaccines are used when a bacterial toxin is identified as cause of illness. The toxins are inactivated using formalin, a solution of formaldehyde and sterilized water. These detoxified toxins, or toxoids, can then be safely used in vaccines. When the immune system receives a vaccine containing a harmless toxoid, it learns how to fight off the natural toxin. Examples of toxoid vaccines include diphtheria and tetanus in diphtheria, tetanus and pertussis (DTaP) (Figure 5).

FIGURE 5: 1940S DIPHTHERIA POSTER

Source: UK Government (public domain)

5.5 Polysaccharide and conjugate vaccines

Polysaccharide and conjugate vaccines have been developed to target bacteria with capsids (capsules) made up of long chains of sugar, known as polysaccharides. Pure polysaccharide vaccines are available for three diseases: pneumococcal disease, meningococcal disease, and typhoid fever.

Polysaccharide vaccines are inactivated subunit vaccines composed of long chains of sugar molecules that make up the surface capsule of certain bacteria. Pure polysaccharide vaccines are available for three diseases: pneumococcal disease, meningococcal disease, and typhoid fever.

→ Back to top

Young children do not respond consistently to polysaccharide antigens, probably because of immaturity of the immune system. In the late 1980s, it was discovered that those problems could be overcome through conjugation, in which the polysaccharide is chemically combined with a protein molecule. Conjugation changes the immune response from T-cell independent to T-cell dependent, leading to immune memory, increased immunogenicity in infants and antibody booster response to multiple doses of vaccine.

The polysaccharide coatings can disguise the antigens, making it hard to trigger an immune response, particularly in young children with immature immune systems. This can be overcome by conjugation, where polysaccharides are chemically combined with a protein molecule. This improves the immune response and immune memory, increases immunogenicity in infants, and boosts the antibody response to multiple doses of vaccine.

TABLE 3: VIRAL AND BACTERIAL VACCINES

	Live attenuated	Inactivated	Subunit
Viral	Vaccinia Polio (OPV) Yellow fever Measles Mumps Rubella Influenza Rotavirus	Polio (IPV) Rabies Influenza Hepatitis A	Hepatitis B (HepB-surface antigen) Human papilloma virus (HPV)
Bacterial	BCG (tuberculosis) Salmonella typhi (oral)	Bordetella pertussis (whole cell) Cholera Bacillus anthracis	Tetanus (toxoid) Diphtheria (toxoid) Neisseria meningitidis (polysaccharide) Bordetella pertussis (acellular) Streptococcus pneumoniae, 23 valent (polysaccharide) Haemophilus influenzae, type b (Hib) (polysaccharide) Neisseria meningitidis (polysaccharide conjugate) Streptococcus pneumoniae, heptavalent (conjugate polysaccharides) Salmonella typhi Vi (capsular polysaccharide)

SCAN ME
(QR code 3)

Source: Nascimento & Leite [4]; CDC Understanding how Vaccines work **(QR code 3)**

→ Back to top

5.6 Recombinant vaccines

Vaccine antigens may also be produced by genetic technology. Hepatitis B vaccines are produced by insertion of a segment of the hepatitis B virus gene into the gene of an animal or a yeast cell. The modified cell produces pure hepatitis B surface antigen when it grows.

5.7 Nucleic acid vaccines

Nucleic acid vaccines use genetic material – either RNA or DNA – to provide cells with the instructions to make the antigen. In the case of COVID-19, this is usually the viral spike protein. Once this genetic material gets into human cells, it uses our cells' protein factories to make the antigen that will trigger an immune response. The advantages of such vaccines are that they are easy to make, and cheap. Since the antigen is produced inside our own cells and in large quantities, the immune reaction should be strong. RNA vaccines need to be kept at ultra-cold temperatures, -70C or lower, which could prove challenging for countries that don't have specialised cold storage equipment, particularly low- and middle-income countries.

5.8 Vaccine adjuvants and other additives

Adjuvants are added to vaccines to improve the immune response. The adjuvants most commonly used in Europe are the alum (aluminium salt) adjuvants.

These compounds bind to the antigens in the vaccine, helping to retain them at the site of injection, and deliver them to the lymph nodes, where antigen immune responses are initiated. Slowing the release of antigens to tissue around the injection site and improving the delivery of antigens to the lymph nodes can produce a stronger antibody response than the antigen alone. Alum adjuvants are also taken up by immune cells in the blood, supporting the immune response.

In addition to adjuvants, vaccines may contain antibiotics to prevent bacterial contamination during manufacturing, preservatives to keep multi-dose vials of vaccine sterile after they are opened, or stabilizers to maintain a vaccine's potency when stored in less-than-optimal temperatures

5.9 Combination vaccines

Combination vaccines combine two or more vaccines into a single injection. Getting a number of vaccines at the same time has been confirmed to be safe. If a number of vaccines are administered by injection at the same time, these should be at different sites on the body, and location recorded in medical records.

5.9.1 Subunit vaccines

Subunit vaccines do not attack the entire microbe but just target the antigens that best stimulate the immune system. In some cases, these vaccines use epitopes – subsections of the antigens that are recognised by antibodies or immune cells. Because subunit vaccines contain only the essential antigens, the chance of adverse reactions is much lower.

→ Back to top

5.9.2 Adjuvants and other ingredients

Adjuvants are added to a vaccine to improve the immune response. The most commonly used adjuvants in use in Europe are the alum adjuvants, which are aluminium salts. These compounds bind to the antigens in the vaccine, slow the release of the antigens from the site of infection, and help deliver antigens to the lymph nodes, where immune responses to the antigens are initiated. The slowed release of antigens to tissue around the injection site and the improved delivery of antigens to the lymph nodes help to produce a stronger antibody response than the antigen alone. Alum adjuvants are also taken up by cells such as macrophages and improve the presentation of antigens to the lymphocytes.

Vaccines may also contain **antibiotics to prevent bacterial contamination during manufacturing**, preservatives to keep multi-dose vials of vaccine sterile after they are opened, or stabilizers to maintain a vaccine's potency at less-than-optimal temperatures.

6 Vaccine administration and handling

For administration, follow the instructions given in the product leaflets, as administration may differ between vaccines, even those for the same infection.

6.1 Routes of administration

There are five possible routes for vaccine administration:

- IM (intramuscular)
- SC (subcutaneous)
- ID (intradermal)
- Oral (mouth)
- Nasal (nose)

The appropriate route will depend on the manufacturer's recommendation, and on outcomes of clinical trials. Using a different route may reduce vaccine efficacy or even increase adverse reactions. For example, IM vaccines containing adjuvants can cause local irritation, induration, skin discoloration, inflammation and even granuloma formation when given SC or ID.

Choosing injection sites for IM, SC and ID injection will depend on manufacturer's recommendations, and on an individual's tissues. The location should be chosen to avoid local, neural, vascular, or tissue injury. For IM administration, injection technique is the most important parameter to ensure efficient intramuscular vaccine delivery. Appropriate needle length depends on age and body mass. Longer needles are associated with less redness or swelling. In infants and children, distraction, pain relief, sweet liquids (including breastmilk), swaddling and swaying can help to reduce pain and distress.

Oral delivery is easier for patients but more challenging for manufacturers, requiring formulations to overcome the harsh gastrointestinal (GI) environment. Rotavirus, adenovirus, cholera vaccine, and oral typhoid vaccines are the only vaccines administered orally in Europe.

→ Back to top

HINTS AND TIPS

Some single-dose manufacturer-filled vaccines come with an air pocket in the syringe chamber. Do we need to expel the air pocket before vaccinating?

No. You do not need to expel the air pocket. The air will be absorbed. This is not true for syringes that you fill yourself; you should expel air bubbles from these syringes prior to vaccination to the extent that you can do so.

6.2 Managing pain

Childhood vaccinations are part of routine care, but the pain associated with vaccines can be upsetting for children and distressing for parents. Untreated pain may also have long-term consequences, increasing anxiety about future medical procedures and health care. This can lead to delayed vaccinations, or avoiding vaccinations all together, so leaving children unprotected.

There are a number of techniques that can help to reduce the distress, for children, adolescent and adult recipients of vaccines, and for their caregivers:

- Healthcare professionals need to explain things clearly, remain calm, be positive, and avoid using any language that triggers anxiety or distrust
- The patient should be in the right position for the vaccine
  - Infants or younger children should be held on a caregiver's lap
  - Older children, adolescents and adults should be sitting upright
- The vaccine should be given rapidly
- Topical anaesthetics may help
- Distractions can help
  - Rubbing or stroking the skin before and during vaccination
  - Breast or bottle feeding or sweet-tasting solutions for infants
  - Toys or books
  - Singing, music, talking, joking, telling stories
  - Deep breathing for older children, adolescents and adults

→ Back to top

6.3 Spacing of vaccine administration

Based on guidance from the Advisory Committee on Immunization Practices (ACIP), a committee within of the US Centers for Disease Control and Prevention (CDC) and American Academy of Pediatrics (AAP):

- All vaccines can be administered at the same visit, unless patients are high risk – see vaccine product leaflets for further information
- There is no upper limit for the number of vaccines that can be administered during one visit
- Vaccination should not be deferred because multiple vaccines are needed
- All live vaccines can be given at the same visit if required
  - If live vaccines are not given at the same visit, they should be separated by 4 weeks or more
- Multiple vaccines given in the same visit should be separated by 2.5 cm or more, to avoid local reactions overlapping

My patient asked: Do vaccines overload the immune system?

Within hours of birth, a baby's gastrointestinal and respiratory tract are heavily colonised with bacteria. Rather than overwhelming the immune system, vaccines help stimulate and strengthen it. Immune systems need stimulation to develop well: allergies may result from too little immune stimulation in our cleaner environments.

There is no evidence that vaccines can overload the immune system. The immune system is designed to deal with a constant stream of foreign antigens on the surface and inside our bodies.

6.3.1 Dosing vaccines outside the approved schedule

In clinical practice, vaccine doses occasionally are administered at shorter than the minimum recommended interval or at ages lower than the minimum recommended age. Doses administered too close together or at too young an age can lead to less of an immune response. However, administering a dose a limited number of days earlier than the minimum interval or age is unlikely to have a substantially negative effect on the immune response to that dose.

See section 7.4 Travel for information on spacing of travel vaccines.

6.3.2 Booster doses

For some vaccines, the levels of antibodies in the body can drop over time after the initial dose, leaving people under-protected. Giving a booster shot 'wakes up' the immune system to continue its protection. Because of this, it's important to check whether patients are up to date with their vaccinations and boosters at routine and other appointments. Nurses should encourage patients to keep records of vaccinations for themselves and their family members.

→ Back to top

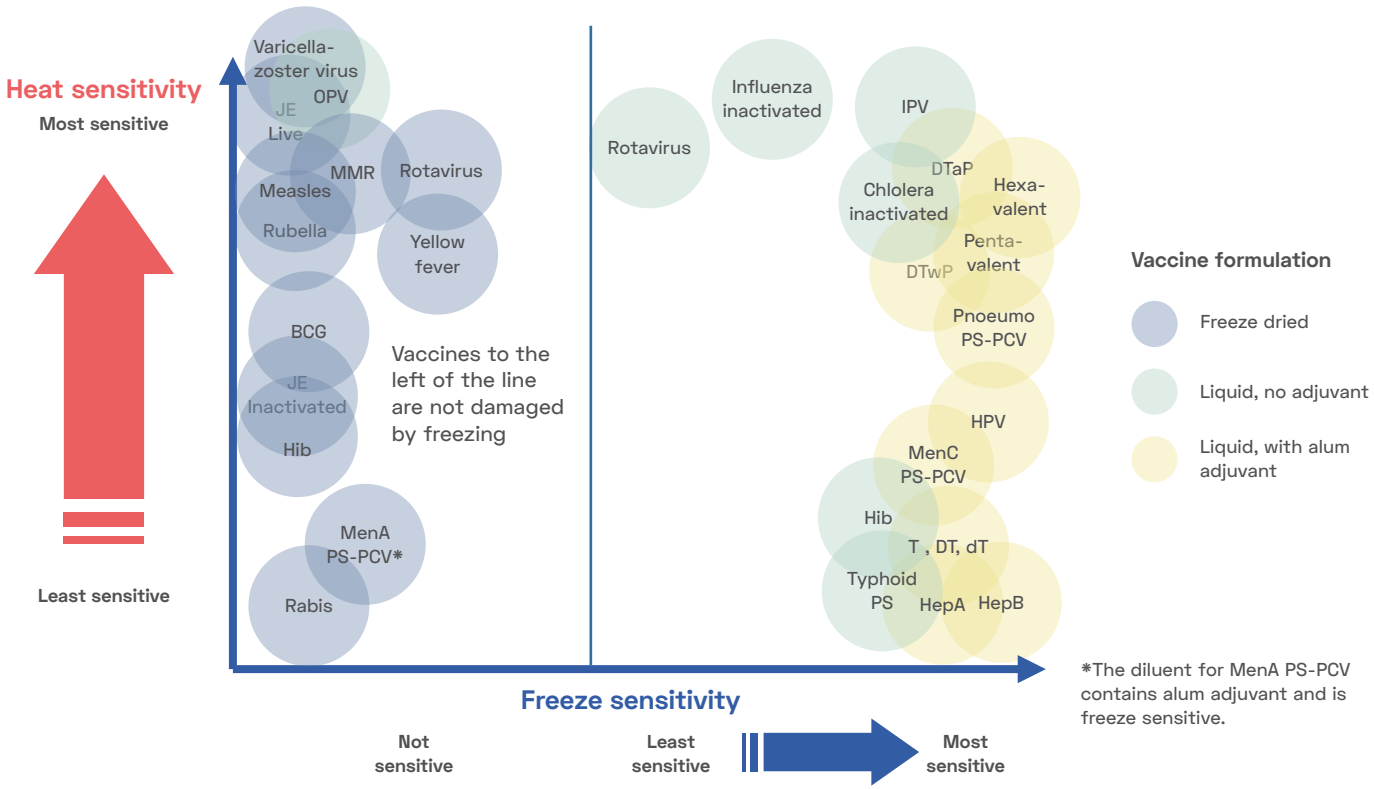
6.4 Vaccine storage and handling

Many vaccines are sensitive to heat and cold (Figure 6). To maintain their effectiveness and safety, vaccines must be kept at the correct temperature from the time they are manufactured until they are used.

6.4.1 Cold chain

Vaccines must be stored and distributed in a temperature-controlled environment. Known as the 'cold chain', this must be maintained at every stage from the manufacturing plant, through distributors and pharmacists, to the healthcare professionals' clinic.

FIGURE 6: TEMPERATURE SENSITIVITY OF VACCINES



Source: WHO/PATH vaccine stability presentation

The WHO has recommendations for cold chain equipment and monitoring. Manufacturers will provide storage instructions for individual vaccines, and it is important to refer to the product leaflets for individual vaccines.

Back to top

7 Vaccination in special situations

There are a number of factors that can influence the immune response. These include:

- The presence of maternal antibodies
- Nature and dose of antigen
- Route of administration
- Presence of adjuvants
- Age
- Nutritional status
- Genetics
- Coexisting disease.

Some groups of people are at increased risk of vaccine-preventable diseases:

- Preterm infants
- Pregnant women
- Immune-compromised patients
- Travellers

These special populations either cannot be vaccinated, are less responsive to vaccines, or are under-vaccinated. Reasons for under-vaccination include:

- Lack of awareness of vaccine-preventable diseases
- Uncertainty or misconceptions about the safety and efficacy of vaccination among patients, parents and healthcare professionals
- Cost
- Inability of healthcare systems to ensure all patients can receive recommended vaccines

7.1 Preterm infants

Infection tends to have more serious consequences in preterm than in full-term infants, mainly because of immaturity of the immune system. Consequently, preterm and low birth weight infants have a higher risk of vaccine-preventable diseases, including those caused by pertussis, Streptococcus pneumoniae and rotavirus.

It is generally recommended that preterm infants who are otherwise healthy are immunised according to the vaccination schedule used for full-term infants. To ensure early protection, preterm infants should be vaccinated according to their chronological rather than corrected gestational age and regardless of birth weight. It may be appropriate to administer additional vaccine doses to preterm or extremely low birth weight infants who produce suboptimal vaccine responses, for example hepatitis B in babies under 2 kg.

→ Back to top

7.2 Pregnant women

The physiological changes associated with pregnancy can weaken the immune system. This can increase the risk of complications for pregnant women; for example, influenza in pregnancy can lead to bronchitis and pneumonia, and mumps can increase the risk of miscarriage.

Infections during pregnancy can also increase risks to the unborn baby:

- Influenza during pregnancy may lead to premature birth and reduced birth weight. Newborns that catch the infection from the mother may become seriously ill.
- Rubella during pregnancy can lead to congenital rubella syndrome, resulting in babies with:
  - Reduced birth weight
  - Sight and hearing loss
  - Damage to the brain, heart, liver and spleen

Newborn babies are vulnerable to pertussis (whooping cough), which remains endemic in much of the world, especially in the early months of life before vaccination, once protective maternal antibody levels have waned. Vaccination of the pregnant woman remains the best strategy to protect babies during their first months of life.

7.3 Immune-compromised patients

There are a number of different reasons that people may be immune-compromised:

- People with chronic or immune-compromising medical conditions
- People being treated with immunosuppressants
- Older people

Immunodeficiencies may be primary (hereditary or genetic) or secondary (acquired through illness, disease treatment, malnutrition or aging).

It is important that people who are immunocompromised receive appropriate inactive vaccines to protect them from disease. They may not be given live vaccines (see 21.1: Live attenuated vaccine). People who live with immunocompromised patients can also receive inactivated vaccines.
Not all immunocompromised people will respond to vaccinations, but they can be protected through herd immunity (see 19.1: Community immunity effect (herd immunity)).

→ Back to top

MY PATIENT ASKED: SHOULD IMMUNE COMPRISED PEOPLE BE VACCINATED?

It's especially important that people with weaker immune systems are protected from infectious diseases. However, the choice of the vaccine is important as live vaccines can cause serious reactions in people who are immunocompromised. Older people do not always respond as well to vaccines, so may need a version of a vaccine especially formulated for their age group.
Patients who are concerned about whether they should receive a particular vaccine should discuss this with their doctor or get advice from patient organisations such as the European Patient Forum, or specific disease-based patient groups for more information.

7.4 Travel

Travel vaccines, also called travel immunizations or travel shots, are given to travellers before visiting certain areas of the world, to help to protect them from serious illnesses. It also avoids bringing diseases back home for which most of the population is not protected.

In some countries, vaccination against certain diseases is compulsory to avoid the reimportation of a disease for which the vector is present, but the disease has been eradicated (for example yellow fever), or to prevent the introduction or spread of different serotypes (for example meningococcal strains).

The WHO emphasizes that all travellers should be up to date with routine vaccinations. Travel is a good opportunity for healthcare professionals to review the immunization status of infants, children, adolescents and adults. Non-immunized or incompletely immunized travellers should be offered the routine vaccinations recommended in their national immunization schedules, in addition to those needed for international travel. Ideally, consultation should be done at least 2 or 3 weeks before travel.

When people travel last minute, they may not be able to complete the full course of vaccines that require multiple doses to induce full protection, for example hepatitis B, Japanese encephalitis, or rabies. Accelerated schedules may be possible, or the traveller could get further doses at their destination. The level of protection may not be complete if the full series of doses isn't given.

Travellers intending to visit friends and relatives (VFRs) are a specific group of travellers who have been identified as having an increased risk of travel-related morbidity. It's both a risk for themselves and for their country of origin, as they may introduce a disease when coming back from their travel for which the population is not protected. This risk is often underestimated.

VFRs should be made aware of their increased risk for travel-related illnesses and how to prevent them. Higher levels of non-immunity to vaccine-preventable disease and increased prevalence of chronic diseases among VFRs should also be addressed. In addition, health care providers should stress the importance of adherence and address potential challenges to achieving it.

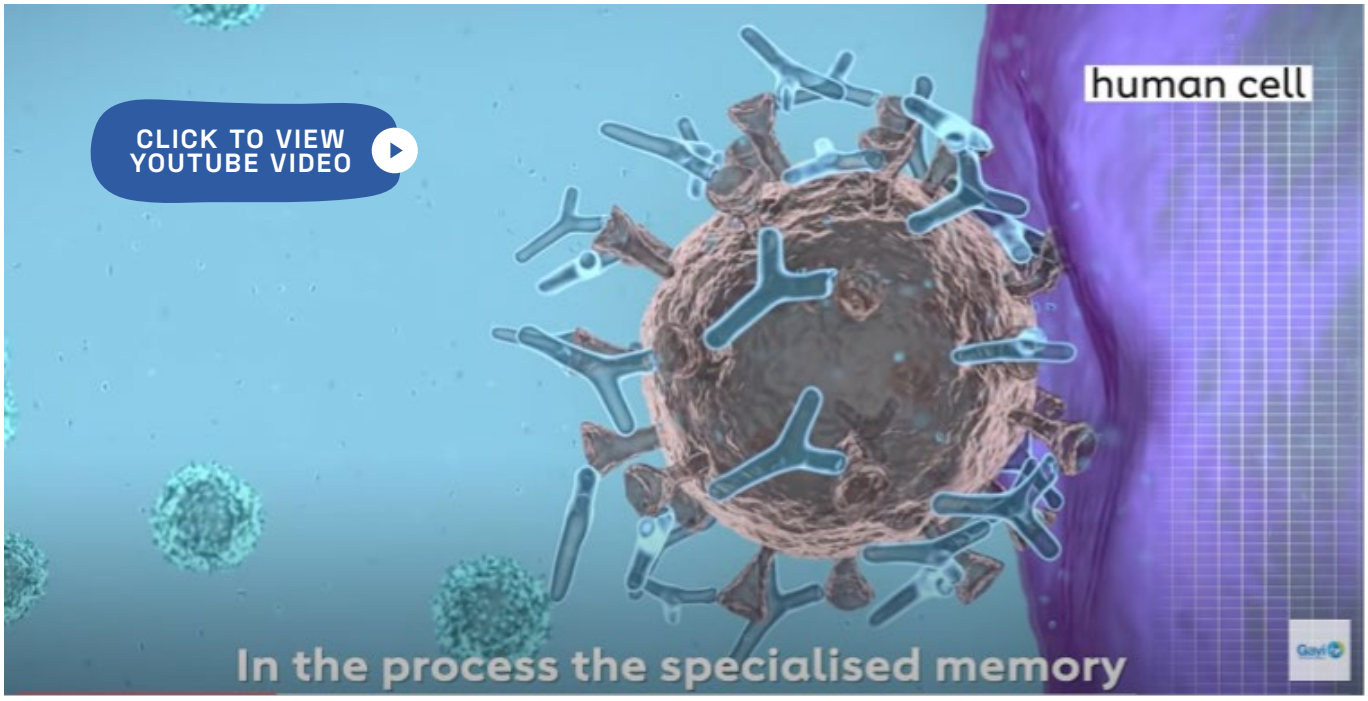
→ Back to top

8 COVID-19 and Vaccination

At the time this report was written (April 2021), there were thirteen COVID-19 vaccines approved worldwide and 60 in development – see the RAPS vaccine tracker for an update at www.raps.org/news-and-articles/news-articles/2020/3/covid-19-vaccine-tracker.

There are four main types of COVID-19 vaccines – nucleic acid, whole virus, protein subunit and viral vector. The section on Types of vaccines explains more, as does the Gavi video 'There are four types of COVID-19 vaccines: here's how they work', at www.youtube.com/watch?v=lFjlVIIcCvc.

FIGURE 7: THERE ARE FOUR TYPES OF COVID-19 VACCINES: HERE'S HOW THEY WORK



Source: Gavi

for more in-depth information, refer to Module 1 that will be published in Summer 2021

Question from my patient: Has the flu disappeared because of COVID-19? Do I still need the flu vaccine?

The number of cases of flu over Winter 2020/2021 has been much lower than usual. There still needs to be more analysis done, but the reduction may be because of better hand hygiene, social distancing, mask-wearing, less travelling, and children being kept at home, as well as because of the much greater uptake in flu vaccination by healthcare professionals and the general public.

This doesn't mean that the flu has gone, though – when society opens again and precautions decline, the numbers of cases of flu are likely to increase again. The lack of flu in the 2020/2021 season may make it harder to produce the next season's vaccine, as it will be harder to predict which strains are circulating. It's still worth getting vaccinated for the flu as well, as flu vaccines against particular strains can still reduce the severity of other strains.

Back to top

Question from my patient: Are some vaccines better than others?

All the available COVID-19 vaccines have been tested and approved as safe and effective. At the time of a global pandemic, the best vaccine to get is the one that is available the soonest, to ensure that you are protected as quickly as possible.

Question from my patient: How were the COVID-19 vaccines developed so quickly? They are still experimental – why should I be a guinea pig?

There are a number of reasons why the COVID-19 vaccine was so fast. Many researchers dropped everything they were doing and focused on COVID-19 research, and collaborated globally A lot of the time in drug development under 'normal' conditions is waiting for one set of studies to finish before another one can start. Because of the global emergency, many of these trials were carried out at the same time instead. Another source of delays is waiting for funding – governments put a lot of money into research, so there were no delays as the money was already available. In the usual process of drug development, a company will develop one candidate, and if it fails, move onto another. In COVID-19 vaccine development, some companies worked on a number of candidates in parallel, and this reduced the risk of failure.

The EU's PRIME (PRIority MEdicines) process, which helps the development of drugs and vaccines for unmet medical needs, allows approval in a shorter period of time because of a serious health threat. The PRIME scheme supported development of vaccines for the Ebola and Zika outbreak, as well as the COVID-19 pandemic.
The vaccines are not experimental and have been approved following preclinical and clinical trials, and their continued monitoring is part of the normal post-approval process. The Emergency Use Authorization (EUA) in the EU confirms that the vaccine is safe and effective.

→ Back to top

A letter from the chair of the Dutch Influenza Foundation

Our main concern is that without influenza vaccination, influenza will return when COVID-19 is under control. Lockdown, masks, increased hygiene and social distancing measures for COVID-19 has meant that circulation of the influenza virus has fallen to levels not seen for over a century. The falling immunity levels to influenza - normally sustained by seasonal circulation of the virus - could now pave the way for one of the worst flu outbreaks for years.

In most years, seasonal flu kills many people, depending on the strain and effectiveness of the annual vaccine. But over the last 12 months, flu deaths have hardly registered. In most countries in the Northern hemisphere hardly any flu cases have been reported all year, as in the Southern hemisphere last year. This not only makes a violent rebound of the disease likely but makes predicting which strain will hit us next and deciding which vaccine to produce much more difficult. There is also concern that the current pressure on the flu virus could also see a more transmissible strain emerge.

Over the past five years the number of specimens the Global Influenza Surveillance and Response System has collected - a proxy measure of the spread of flu worldwide - has ranged from roughly 15,000 to 40,000. In the past 12 months, this has plunged to below 1,000. The same is true for other infectious diseases, like by the norovirus, RSV and pneumococci.

Besides the social distancing for COVID-19, interference between different viruses might have played a role. Although cases of double infection by influenza and SARS-CoV2 have been reported (and proven more deadly than solo infections), there is no proof that in the next season this will not happen.

Without the flu viruses circulating, we did not get any boosting to our immunity levels, so we are going into the next flu season with lower immunity. The one way to help improve our immunity is to definitely get vaccinated for both COVID-19 and influenza. My main message is that it's very important to continue with the influenza vaccination program.

Ted van Essen, chair Dutch Influenza Foundation – March 2021

→ Back to top

9 Role of vaccination in the fight against antimicrobial resistance (AMR)

Vaccines against bacterial infections can reduce the prevalence of AMR by reducing the need for antibiotic use. Because people can pass resistant infections to one another, and because bacteria can pass on AMR to other bacteria, vaccination could also reduce the spread of resistance by reducing the number of infections on a population. There is more on AMR at 11.3: Antibiotic resistance.

Vaccines against viruses can also play a role, as some viral infections, such as influenza, make people vulnerable to bacterial infections. Reductions in the number of viral infections could also reduce the numbers of antibiotics that are inappropriately prescribed for viral infections.

These effects may be amplified by herd immunity, extending the protection to unvaccinated persons in the population.

10 Vaccine safety and monitoring mechanisms

Adverse events following immunization (AEFIs) should be recorded and reported; this is important for tracking both common and rare AEs, and has been successful in bringing to light serious AEFIs after vaccines have been marketed.

10.1 Definition of an adverse event

An adverse effect (AE), also known as a side effect, is defined as:

Any untoward medical occurrence in a patient or clinical investigation subject administered a pharmaceutical product and which does not necessarily have to have a causal relationship with this treatment.

Put more simply, an AE is any undesired effect from a medical treatment or intervention.

AEFIs can be categorised as:

- Vaccine product-related reaction – linked to the properties of the vaccine itself
- Vaccine quality defect-related reaction – caused by manufacturing problems
- Immunization error-related reaction – caused by issues with vaccine storage or administration
  - > Preventable through education of the healthcare professional
- Immunization anxiety-related reaction – caused by stress or anxiety in the patient
  - > Preventable through patient education and support

→ Back to top

- Coincidental event – caused by illness or other situations not related to the vaccination
  - Preventable through patient education and support

Many vaccine product-related AEFIs are minor, for example soreness, fever or redness, and go away within a few days. Some vaccine product related AEFIs are specific to the individual vaccine, and will be listed in the manufacturer's information.

It is important to remember that it is hard to identify whether apparent side effects are caused by a particular vaccine.

HINTS AND TIPS

- Monitor patients for around 30 minutes after giving a specific vaccine for the first time, if patients have a potential allergy, or if you are concerned about a patient
  - Use your clinical judgement
  - Be aware of local guidelines
  - Be aware of the information in the manufacturer's product information
- If a patient is going to have an anaphylactic reaction, this will be within the first 20 minutes, and is very rare

10.2 Main safety surveillance systems

10.2.1 European Medicines Agency

The European Medicines Agency (EMA), based in Amsterdam, coordinates and supports the pharmacovigilance system in the European Union (EU). This system monitors the safety of drugs across Europe.

The EMA's Pharmacovigilance Risk Assessment Committee (PRAC) is responsible for assessing and monitoring the safety of human medicines. It is made up of experts in medicines safety from regulatory authorities in member states, as well as scientific experts and representatives of patients and healthcare professionals, including specialist nurses. The EMA shares information with the US Food and Drug Administration (FDA), and the WHO.

Nurses can report any concerns to the EMA using the yellow card system.

10.2.2 Vaccine Safety Datalink

The Vaccine Safety Datalink (VSD) is one of the largest ongoing networks that is population-based and expressly focused on vaccine safety surveillance. It was started in 1990 as a collaborative research enterprise between the Centers for Disease Control and Prevention (CDC) and four health maintenance organizations (HMOs) to enable studies into serious adverse events following immunization.

Back to top

10.2.3 Vaccine Adverse Events Reporting System (VAERS)

VAERS receives reports of events that are submitted voluntarily by patients or their caregivers.

10.3 National and immunization safety surveillance systems

The national regulatory authority (NRA) and the national immunization programme (NIP) are responsible for developing and maintaining a national AEFI surveillance system.

In countries that produce their own vaccines, vaccine manufacturers and national control laboratories may be part of the national AEFI surveillance system.

11 The role of healthcare professionals

11.1 Nurse training

ESNO strongly recommends training on vaccination and vaccination-preventable diseases for nurses, with an emphasis on regional and local requirements. Being equipped with the right information makes it easier to educate and motivate patients about vaccination. All nurses who administer vaccines should receive competency-based training and education on vaccine administration before providing vaccines to patients.

Training objectives should include:

- Strategies for vaccine communication
- Infection control guidelines
- Vaccine preparation and storage
- Administration routes, sites, and needle sizes
- Pain control techniques
- Vaccine administration in special situations
- Documentation requirements
- Avoiding vaccine administration errors
- Managing adverse events

Providers need to orient new staff to vaccines used in their office and validate nurses' knowledge and skills about vaccine administration with a skills checklist. This needs to include temporary nurses who may be filling in on days when the facility is short staffed or helping during peak times such as flu season.

→ Back to top

Senior nurses should be involved at all stages of the creation of education programs:

- Policy
- Composing recommendations
- Program design
- Development of educational material
- Organisation of education and training activities.

SCAN ME
(QR code 4)

For further details on the role of nurses, read 'The Role of Nurses in Immunisation: A snapshot from OECD countries', from the International Council of Nurses **(see QR code 4)**. In the near future, ESNO aims to set out a detailed study on varieties and with recommendations.

11.2 Providing education and communication

Nurses are the most important and trusted source of information on protection from vaccine-preventable disease. The personal credibility of nurses and their positions of trust places them in a unique and responsible position to play an important role in education and communication. This needs to be backed up by knowledge, skills and attitude. The nurse should also communicate no vaccine hesitancy or other personal opinions on vaccination, and should ideally be a vaccine advocate. Nurses should remain neutral on compulsory vaccination, as this is a matter of policy set at a national level.

The nurse's role is both before and after vaccination, including discussing after-effects and follow-up. Follow up includes:

- Monitoring adverse reactions
- Remaining available to answer questions following vaccination
- Recording the vaccination (including location) in medical records and personal vaccination records

Nurses should collect information on vaccinations for education for colleagues and patients. Nurses should also ensure that they receive all relevant vaccinations.

HINTS AND TIPS

- Use positive language when talking about vaccines
- Don't just quote data
- Talk about protection and prevention
  - > Use images like roofs on houses, umbrellas or car seatbelts

→ Back to top

11.3 Clinical practice on vaccination per specialist nursing

SCAN ME
(QR code 5)

11.3.1 Oncology

There are a number of national guidelines for vaccination in oncology, for example the Vaccination guidelines in haematopoietic transplant patients: recommendations from the Transplantation Committee of the Belgian Hematological Society (BHS) Transplant Committee **(QR code 5)**.

Practice example: Belgian nurse example – Marijke Quaghebeur, Clinical Nurse Specialist, haematology

In the haematology department of University Hospital Ghent, physicians, the clinical nurse specialist and the nurse consultant have access to the professional vaccine government network. This access was requested at the Flemish Vaccinet group in order to provide a comprehensive vaccination program post-stem cell transplantation. Access to and application of the Vaccinet program generally results in better follow-up of vaccinations in patients according to current guidelines and reimbursement conditions.

SCAN ME
(QR code 6)

In the multidisciplinary team of the haematology department, specialized cancer nurses coordinate the vaccination follow up. Apart from the prescription for vaccination, nurses inform, educate about and administrate the necessary vaccine on the right time according the evidence based guidelines. The overall information and education about the post treatment vaccination is provided during a nurse led consultation. All patients and carers receive an overview on the vaccination plan, meaning that patients can be involved in their healthcare management.

The logistic and communication part of the Vaccinet system is completely managed by the clinical nurse specialist and the nurse consultant. Through the Vaccinet system, these specialized nurses ensure that vaccine stocks are always replenished, and that the vaccination status of the patient is up to date. As a result, both hospital and the first line healthcare professionals, e.g. general practitioner, can access the correct vaccination status of the patient at all times.

For more information about vaccination following stem cell transplantation, see The European Blood and Marrow Transplantation Textbook for Nurses **(QR code 6)**.

SCAN ME
(QR code 7)

For guidelines for the vaccination of patients with haematological malignancies who did not have transplantations, see **QR code 7.**

→ Back to top

12 Vaccine hesitancy

Vaccine hesitancy refers to delays in acceptance or refusal of vaccines even when they are freely available. Vaccine hesitancy is complex and context-specific, varying across time, geographic area and disease type. It is influenced by factors such as complacency, convenience and confidence, and can have its roots in religious beliefs, or in mistrust of 'modern' medicine.

Vaccine hesitancy has been around as long as vaccines have, and in 1802, the satirist James Gillray ridiculed the opponents of vaccination (Figure 8).

FIGURE 8: THE COW-POCK—OR—THE WONDERFUL EFFECTS OF THE NEW INOCULATION!—VIDE. THE PUBLICATIONS OF YE ANTI-VACCINE SOCIETY

Source: James Gillray (public domain)

Anti-vaccination campaigns have grown in strength since the DTP controversy in the mid-1970s and the publication of Andrew Wakefield's paper on MMR in 1998, which led to a huge downturn in vaccination uptake. The growth of social media has fed the anti-vaccination movement. Around 31 million people worldwide follow anti-vaccine groups on Facebook, with 17 million people subscribing to similar accounts on YouTube. While there are people who are genuinely hesitant about vaccines and concerned about their effects, many of these movements are driven by individuals and companies who look to manipulate people's fears in order to make money.

The manipulation of fear, and the aggressive tactics within some of these communities has made it hard for health professionals to help and support people and communicate with them about their worries. It has also put nurses at risk. Nurses and their colleagues need to support and help each other, and keep their communications skills up-to-date.

→ Back to top

'It's terrible to have received compliments and applause of the society in the beginning, and now to have to endure verbal and physical violence and aggression in the clinic and sometime also outside because I'm a nurse.'

'Spreading intentional false information and feeding conspiracy theories is big business'

The outcomes of vaccine hesitance

Vaccine hesitancy in Europe and the US have resulted in large outbreaks and fatalities in countries that had previously been reported free of certain diseases. For example, measles in Europe primarily occurs in unvaccinated populations in both adults and children. In 2019, the UK lost its measles-free status. Europe is polio-free, but falling vaccine rates could mean its return. There have also been rising numbers of diphtheria in countries whereas the disease was virtually eliminated thanks to high vaccination coverage.

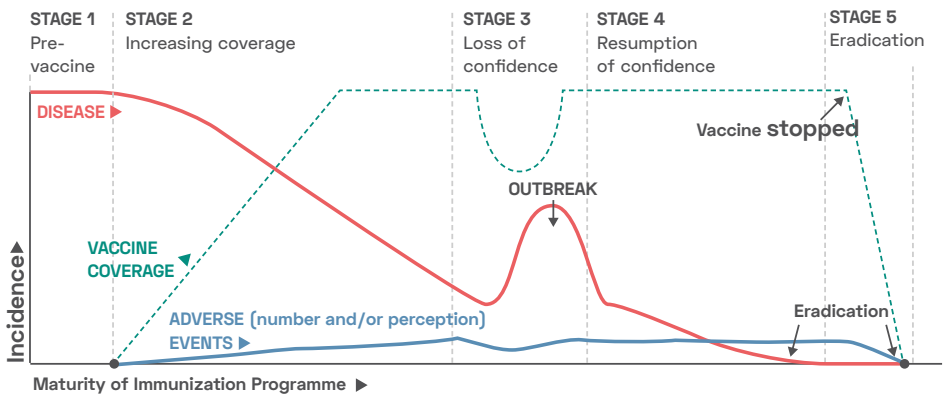
Hesitancy in vaccination is not a refusal but often an natural response to protect. The challenge is to provide accurate and tailored information rather than overwhelming with data and morality. Time and trust are important ingredients towards acceptance and adaptation

In the pre-vaccine era, morbidity and mortality caused by infectious diseases that are now preventable were high. The more successful a vaccination campaign is, the less visible the prevented disease may become to the public. As the threat of the original disease vanishes in the perception of the public, the attention of the population may focus to the adverse events of the vaccine. A distorted perception of the risk of vaccines and negligence of the much greater health threat by the original disease may lead to decreased acceptance of the vaccine (Figure 9).

To ensure continued public acceptance of vaccines, it is essential to:

- Monitor the incidence of AEFIs,
- Scientifically evaluate the likely associations,
- Respond to newly identified risks from vaccines,
- Communicate the benefits and risks to patients and parents through a trusted health care source in advance of the vaccination visit.

FIGURE 9: CHANGES IN VACCINE USE OVER THE TIME OF AN IMMUNISATION PROGRAMME



Back to top

12.1 The role of healthcare professionals

Vaccine hesitance is very complex, and the group of people who are hesitant cover a wide range:

- Questioning
- Not informed
- Not engaged
- Doubtful
- Refusing outright

Telling people in these groups to just trust the healthcare professional is not enough. Giving them scientific data, reports or vaccine brochures may not help, especially those people who have total mistrust of vaccines. Healthcare professionals need to be informed, able to communicate and competent. They also need support, especially those nurses responsible for teams, education activities and training programs.

Surveys show that many scientists believe that the public does not know enough about science, which makes they likely to make mistakes in judgement and policy preferences. The scientists believe strongly that they should have a role in public debates and view policy-makers as the most important group with which they should engage. Few of the scientists questioned saw themselves as having a role in enabling public participation in decision-making. These attitudes do not help to bridge the gap between scientists and the public, or help people to better understand the role of science. This is where the nurses' role is vital. Nurses can build trust and relationships with individuals, supporting them in their decision-making and providing answers to their questions. To do this, nurses need to:

1. Have up-to-date knowledge on viruses, vaccines and vaccination
2. Be a good communicator to patients and the general public
3. Be competent in handing and administering vaccines.

'The biggest communication problem is we do not listen to understand, but listen to reply'

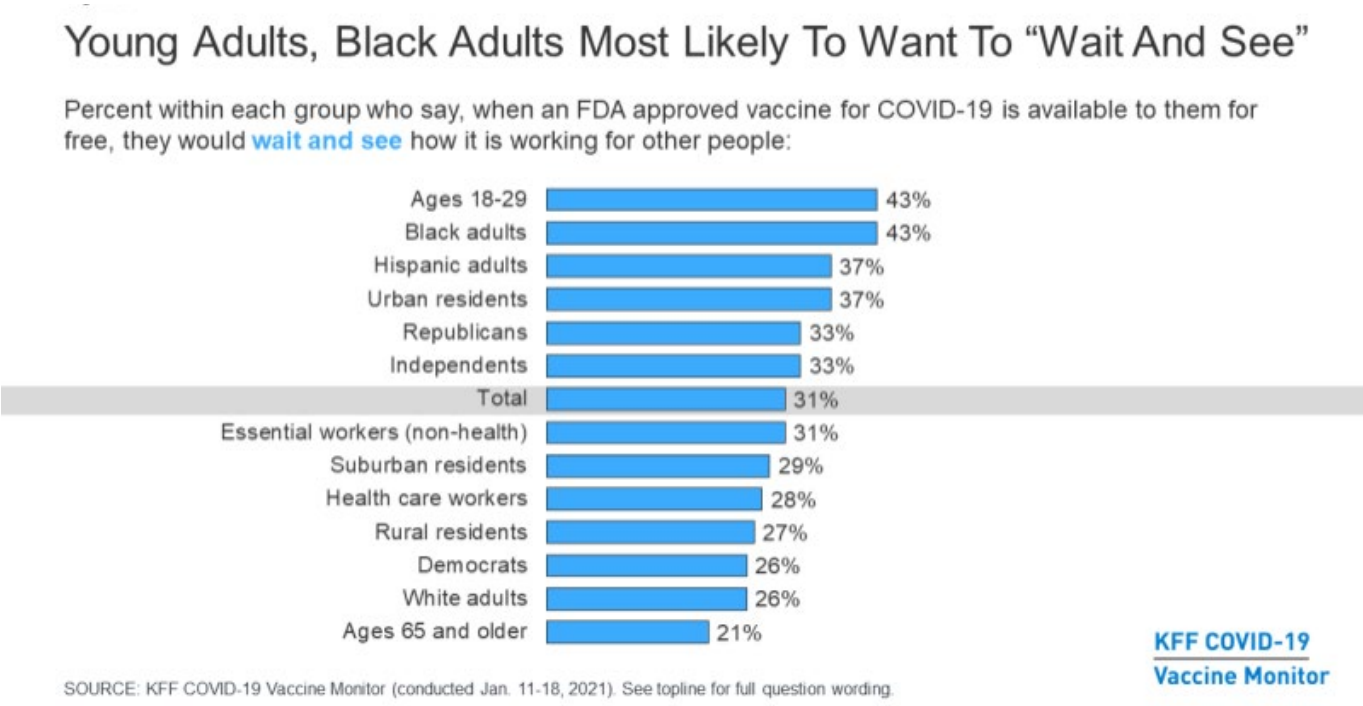
Nurses also need support, especially those nurses responsible for teams, education activities and training programs.

12.2 Hesitancy and specific groups

12.2.1 The Black community

Over the past years, outcomes of surveys showed that the citizens from the Black community are more likely to have concerns about vaccination. The KFF COVID-19 Vaccine Monitor reported in January 2021 that Black adults were more wary about the COVID-19 vaccine than white adults, with a higher rates of 'wait and see'. This is concerning because there are high rates of COVID-related mortality in people of colour.

→ Back to top



It's important to understand the reasons for mistrust of healthcare in people of colour. There is a history of medical and research abuse of Black people, including the Tuskegee syphilis study in the United States where prisoners and people with low incomes were paid to join the study. Over half had latent syphilis and were not treated and were followed for 40 years without their knowledge. Other studies Unethical sturdies involving Black people continued into the 1990s. Even though this type of research could not happen today, it has left many Black people afraid and has damaged their trust.

Experience has shown us that trust is vital in vaccine education. The best people to pass on vaccine information and to help people make decisions about vaccines are those who are trusted, and who have the right knowledge to hand. These might be doctors, nurses, family members, counsellors or teachers, rather than officials from the government. While data and outcomes from studies are important, they may not convince people in the same way as one-to-one discussions with trusted people. The aim for governments should be to invest in communities and ensure that healthcare is provided equitably.

12.2.2 Hesitance and religious groups

Religious views, which may be strongly rooted, relate to the essentials of life: 'where do I come from, why am I here and where am I going to after my life.' Religious values can drive a community's morals and ethics. While no major religions prohibit vaccinations, vaccination hesitancy is sometimes motivated by individual's interpretations of their religious beliefs. Religious exemptions for vaccinations may unfortunately be misused as an excuse to get out of vaccinations.

Nurses' roles: Communication with specific religious or cultural groups may be easier when nurses with a similar background or belief speak with patients, or bring in religious leaders who are briefed on vaccination issues.

→ Back to top

12.2.3 Roma people

Europe is rich in all types of diversities, by countries, regions, cultures, and language. As nurses we are the most trusted profession for many, and play an important role in bridging differences and paying attention to the vulnerable.

The Roma community in Europe is a group with a long history of suppression, discrimination and exclusion.

> *According to some reports, Roma have been severely impacted both by the virus itself and repressive responses from governments. Their substandard housing conditions in segregated neighbourhoods make it impossible to follow essential protective public health measures on hygiene and physical distancing. These are crucial COVID-19 vulnerability factors, according to scientific evidence. Yet, there is hardly any data on the number of infections, hospitalizations, ITU admissions, and mortality among Roma. Roma is also not mentioned in national vaccination roll-out plans (with the exception of Slovakia), with only a few advocates making the case for their vaccination priority. This is a contra-factual development, and it is due to conventional anti-gypsy sentiment and concerns over sparking new waves of anti-Roma racism across Europe.*
>
> *One-third of the Roma surveyed continue to live in housing with no tap water inside. This has an impact on the hygiene standards set out by governments to limit the spread of COVID-19, for example hand-washing.*

Nurses' roles: Communication with Roma may be easier when nurses with a similar background speak with patients, or bring in Roma leaders who are briefed on vaccination issues.

12.3 Myth: Understandings and misunderstandings

Parents, patients, and healthcare professionals all have misconceptions about vaccinations.
Patients and parents are increasingly questioning the safety and effectiveness of vaccines. This is supported by anti-vaccination groups and fake news spread on social media. Responding to patients and parents requires knowledge, tact, and time. Healthcare professionals can miss opportunities to vaccinate by following unnecessary or outdated rules.

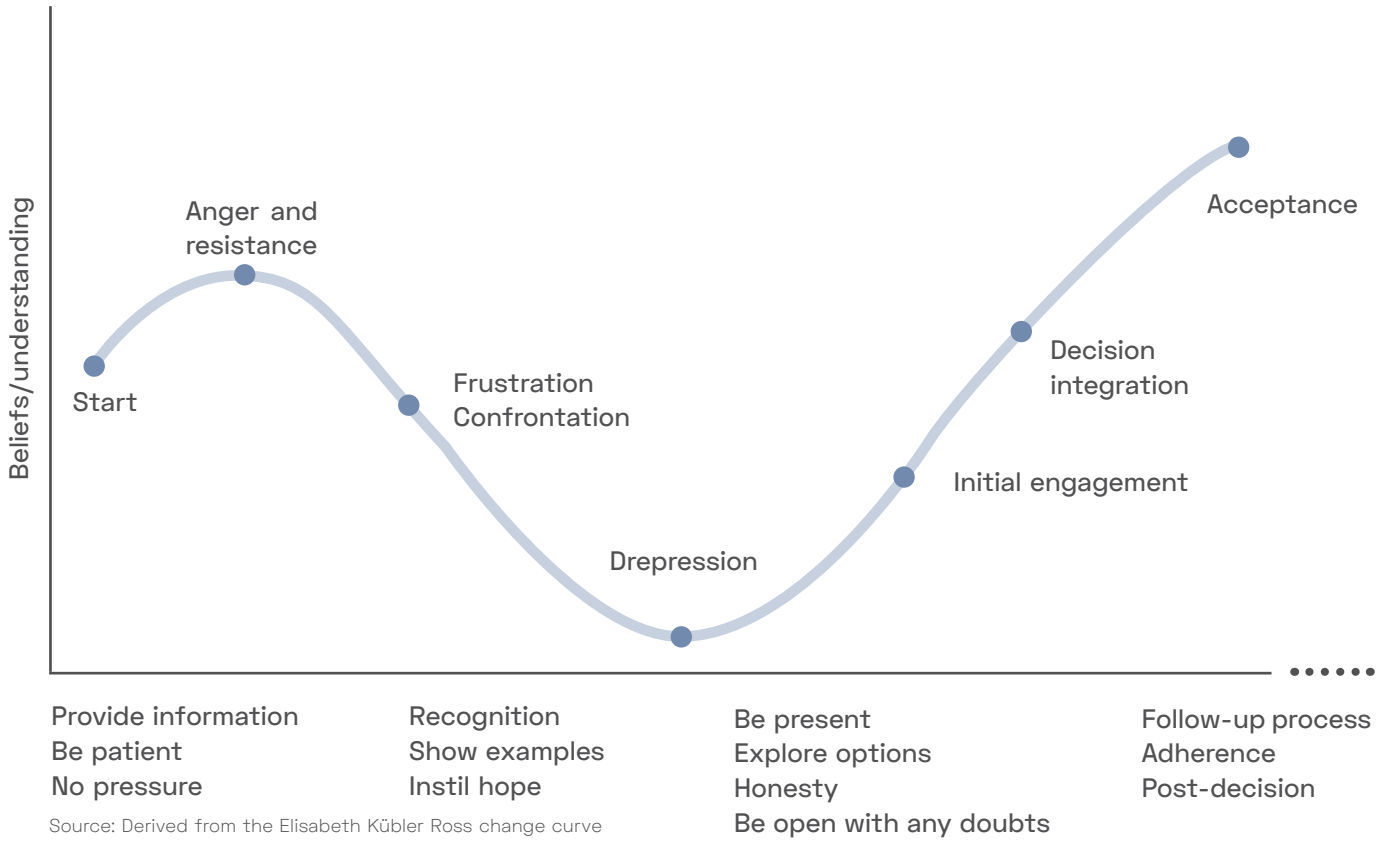
Useful and effective tools have been developed by European and global organizations such as WHO, ECDC, LHSTM and others to help you to debunk myths, provide you with up-to-date recommendations and support you in your conversations about vaccines.

12.4 Response strategies for vaccine hesitancy

Healthcare professionals, including nurses, need to be informed about vaccine-hesitant people and understand the impact vaccine hesitancy. Vaccine myths may have convinced some people for decades, and this may be supported by their communities – it may not be possible to change their viewpoint in a single discussion. One approach is to use the Kübler-Ross curve of change (see Figure 10).

→ Back to top

FIGURE 10: USING THE KÜBLER ROSS IDEAS OF CHANGE FOR TALKING TO VACCINE-HESITANT PEOPLE



Source: Derived from the Elisabeth Kübler Ross change curve

Case study

A head nurse asked a team nurse to inform some patients at the ward about their vaccination, to be given the following week. An hour later the nurse returned, saying that only half of them will take the vaccination; the rest have refused.

The head nurse asked the nurse to go back and ask the refusers to explain why. This resulted in a debate in the ward amongst the nurses and between the nurses and patients, leading to a campaign on vaccination, and giving one of the nurses the responsibility of being a 'vaccination steward'. There was a positive result in the first year, moving from 'shock' on the Kübler-Ross curve, through 'experiment' and 'decision' to 'integration'.

→ Back to top

As numbers of people who are vaccine-hesitant or anti-vaccination grows, the WHO has developed a document 'How to respond to vocal vaccine deniers in public' that provides very practical principles for health providers how to respond **(QR code 8)**.

The document includes an algorithm to suggest approaches, depending on the reasons given by the vaccine-hesitant person.

SCAN ME
(QR code 8)

- Step 1
  - > Identifying the approach that the vaccine-hesitant person is using to deny the value of vaccination, for example conspiracy or false logic
- Step 2
  - > Identifying the topic behind the technique, for example denial of the threat of disease, or validity of alternatives to vaccination
- Step 3
  - > Respond by unmasking the technique used, and using they key message, for example exposing the fake expert behind the claim that there is no threat of disease, and then confirming the importance of vaccination as a protection

The ECDC has developed guidance called 'Let's talk about protection: enhancing childhood vaccination uptake' **(QR code 9)**. This is practical peer-reviewed advice and evidence-based guidance to increase the uptake of childhood vaccinations for healthcare professionals who are involved with immunisation services.

SCAN ME
(QR code 9)

SCAN ME
(QR code 10)

The Vaccine Confidence Project **(QR code 10)** by the London School of Hygiene & Tropical Medicine (LHSTM), Strategic Advisory Group of Experts (SAGE) on Immunization – WHO working group and ECDC (European Centre for Disease Prevention and Control) has led research and developed well-designed tools to understand, monitor and restore public confidence in immunization programmes.

12.5 HPV vaccination: Uptake and hesitancy

Every year in Europe, more than 60,000 new cervical cancer cases are diagnosed and over 25,000 women die from the disease, making it one of the commonest cancers in women [5].

There are currently three HPV vaccines licensed in Europe: the bivalent vaccine Cervarix (GlaxoSmithKline Biologicals) that contains virus-like-particles (VLPs) of HPV types 16 and 18, the quadrivalent HPV vaccine Gardasil (Merck Sharp & Dohme – MSD) that includes VLPs of HPV types 6, 11, 16 and 18 and the nonavalent

→ Back to top

vaccine Gardasil 9 (MSD), that contains VLPs of HPV types 6, 11, 16, 18, 31, 33, 45, 52 and 58. Potentially, the bivalent and the quadrivalent vaccines could prevent 71% of all cervical cancer cases worldwide (i.e. those attributable to HPV types 16 and 18), while the nonavalent vaccine could increase the preventive potential to 89% of cervical cancer cases.

The three vaccines are licensed for the prevention of premalignant anogenital lesions (cervical, vulvar, vaginal and 163 anal), cervical cancers and anal cancers and for Gardasil 9 also vulvar and vaginal cancers causally related to high-risk types included in the vaccines. In addition, the quadrivalent and nonavalent vaccines are licensed for the prevention of genital warts. All vaccines are approved from the age of 9 years with a recommended schedule of two doses (0–6 months) up to and including the age of 14 years for the bivalent and nonavalent vaccines and up to and including the age of 13 years for the quadrivalent vaccine. In individuals older than the above indicated ages (15 years of age for the bivalent and nonavalent, 14 years of age for the quadrivalent), the recommended schedule is 3 doses administered at months 0, 1 (or 2) and 6 [6-8].

The duration of protection from HPV-related cervical and genital disease attributable to serotypes 6, 11, 16 and 18 has been demonstrated for at least 14 years with the quadrivalent vaccine given in a 3-dose schedule to preadolescents and adolescents and at least 12 years with the quadrivalent vaccine given in a 3-dose schedule to women 16-26 years old. A duration of 9.4 years of protection from infection and cervical lesions attributable to HPV-16 and HPV-18 has also been demonstrated with the bivalent vaccine in a Phase II study with a 3-dose schedule. Finally, 7.6 years of protection from infection and cervical, vulvar and vaginal lesions with the nonavalent vaccine in a 3-dose schedule was shown [6-8].

In countries such as the UK, where coverage has been good, infections by the most aggressive strains of HPV have been reduced by 86% and precancerous cervical disease has been reduced by 71% [9]. Other diseases attributed to HPV infection have also fallen dramatically [10].

FIGURE 11: THE IMPORTANCE OF HPV VACCINATION

Source: National Cancer Institute (NCI) (public domain)

→ Back to top

Question from my patient: Why does my son need the HPV vaccine?

Answer: The human papillomavirus (HPV) vaccine protects boys against HPV infection, which can cause cancer of the anus, penis, and mouth/throat. By being vaccinated, boys are less likely to spread HPV to their current and future partners. HPV is very common: nearly one in four Americans are infected. By getting HPV vaccine at the recommended age—between 9 and 12 years old—both boys and girls get the best protection against HPV cancers.

12.5.1 Updates to the HPV programme

The HPV vaccination program has been updated, and now children get the vaccine at 9 years rather than 11 years. The vaccine is given as a series of shots:

- Children ages 9–14 get the vaccine in two shots over a 6- to 12-month period.
- Teens and young adults (ages 15–26) get it in three shots over a 6-month period.

The role of healthcare providers in HPV vaccination programs

The Human Papillomavirus (HPV) Prevention and Control Board convened a meeting in Bucharest, Romania (May 2018), to discuss the role of healthcare providers (HCPs) in prevention programs, with a focus on HPV vaccination and cervical cancer screening. International and local experts discussed the role that HCPs can play to increase the uptake of HPV vaccine and screening. Experts recommended:

1) increasing HCP norms of getting vaccinated
2) training providers to make effective recommendations
3) making culturally appropriate materials available, in local languages
4) centralizing and coordinating education and information material, to direct both HCPs and the general public to the best material available.

To achieve these recommendations, ESNO has stated that there needs to be an investment of time and energy in connecting with the HCP community and providing support and education, as well as involving HCPs in future program developments.

12.5.2 Falling trust in HPV vaccination

Trust in HPV vaccination is currently being shaken in many European countries, the impact of which is indicated by low and/or decreasing coverage rates [11]. Currently, HPV vaccine coverage rates (VCR) in Europe are very variable. In a recent study, highest HPV VCRs were associated with school delivery within structured vaccination programmes and the use of reminders [12].

→ Back to top

Apart from issues of affordability and access to healthcare common to any vaccination program, the HPV vaccines have struggled with the distribution of inaccurate information about the vaccine's safety via media and social media and with the fact that HPV is considered a sexually-transmitted disease [10,13,14]. Since vaccination is a prophylactic intervention, it makes sense to vaccinate against HPV before the initiation of sexual activity, but in some countries, parents struggle with the concept of vaccinating pre-teen girls against a sexually-transmitted disease [15].

The dissemination of inaccurate information via social media has had dramatic, negative impact on uptake of the HPV vaccine in some countries [13]. Although this can be countered by effective public health campaigns, not all health authorities have responded effectively [16]. Where misinformation is not countered, HPV vaccination rates continue to languish, even though there are no signals that the vaccine is unsafe [17]. This shows the importance of providing comprehensive, accurate information on the safety and effectiveness of HPV vaccination to the public – and on the risks of not getting vaccinated. Parental concerns that vaccination against HPV may (for example) promote promiscuity have also been shown to be unfounded and the same approach can be effective here, namely providing clear and accurate information about vaccine benefits and risks [18].

The WHO has created a video called 'Get the facts, get the HPV vaccine: the personal story of an HPV vaccination advocate':

Strategies developed with the goal of addressing HPV vaccine hesitancy should not only focus on providing more information about the safety and effectiveness of the vaccine, but also aim to rebuild and maintain trust in public health institutions, including HCPs and health authorities, in order to prevent or manage future potential confidence crises.

The European Center for Disease Control (ECDC) has developed a set of guides for communication about immunisation **(QR code 11)**. Many organisations have had similar initiatives, with the purpose of inform, support and guide HCPs as well as the public on the importance of immunisation.

SCAN ME
(QR code 11)

In collaboration with the National Nursing Associations (NNA), 15 of the 36 OECD (Office of Economic Cooperation and Development) countries were invited to participate in a survey to determine the current state of nursing's involvement in immunisation in their countries, fifteen countries responded. The survey consisted of five key areas reflecting:

1. nursing's overall role in, and preparation for immunisation interventions
2. prescribing immunisation
3. administering vaccination
4. activities related to expanding nursing's role in immunisation; and respondent information. In addition, further analysis was carried out to determine the degree of nurse immunisation role engagement by country.

The results of the immunisation survey of 15 OECD countries, provide a profile of nurses' role in immunisation and can be used to shape further action in this area. Such action should focus on reinforcing and expanding nurses' contribution to immunisation through support for more involvement in immunisation education, and in immunisation programme and policy development.

→ Back to top

In addition, advocating for nurse prescribing and addressing the major barriers to nurses working to full potential in immunisation, requirement for a prescription to immunise, time for immunisation interventions in the work schedule, and necessary enabling legislation would have a marked effect on nursing's ability to impact immunisation rates [19].

Countries excelling in nurse immunisation role engagement were those in which nurses were:

1. very likely to promote and support immunisation
2. involved and prepared in all aspects of immunisation- education, managing vaccination, vaccine administration and prescription, and advisory roles
3. successful in overcoming key barriers to full engagement in immunisation activities such as requirement for prescription and other individual, system and organisational barriers
4. supported to prescribe immunisations, particularly the RN and APN roles and the National Nursing Association was engaged in expanding the role of nurses in prescribing, and enhancing their role in immunisation.

Furthermore, an expert technical meeting on the role that HCPs can play to increase the uptake of HPV vaccine and screening concluded that: [20]

1. increasing HCP norms of getting vaccinated
2. training providers to make effective recommendations
3. making culturally appropriate materials available, in local languages
4. centralizing and coordinating education and information material, to direct both HCPs and the general public to the best material available.

The message is clear: HPV vaccination is an effective method for reducing the burden of serious HPV-related disease, and healthcare providers need to be proactive in refuting the myths about the vaccine that continue to circulate.

12.6 Leading by example

There has been a sharp decline of vaccination of healthcare professionals across Europe. During the 2018 flu season, the number of cases of flu in nurses was high, with the consequence that certain wards in hospitals had to be closed in part because of staff sickness. This came at a time when there was already a shortage of nurses in Europe.

From Anonymous Nurse: Convincing Patients to Get Vaccinated is Becoming More Difficult **(QR code 18)**

The spread of misinformation has meant more patients are refusing vaccines

Back to top

From Anonymous Nurse: Convincing Patients to Get Vaccinated is Becoming More Difficult **(QR code 12)**

SCAN ME
(QR code 12)

Yet despite overwhelming evidence of the complications from not being vaccinated, the huge amount of information, and misinformation, available on the internet still results in patients refusing vaccines. There's so much information floating around out there that it can be difficult for non-medical people to understand what is legit and what is downright false

People who work in healthcare settings are frequently exposed to germs while being with or around patients. Vaccinating healthcare professionals, including physicians and nurses, helps protect them from potentially dangerous diseases such as flu and whooping cough, as well as protecting the patients in their care. This is particularly important when working in hospital settings, as vaccination of healthcare professionals is the main measure for preventing nosocomial infections, such as influenza.

Hospitals, medical staff and regulators have the responsibility to support nurses to be up-to-date on recommended routine vaccines. Immunization promotes optimal health and protects patients and the community from vaccine preventable diseases. Nurses work in environments where they are exposed to many communicable diseases and infections, so it's especially important to have the following vaccines:

- Seasonal influenza
- Tetanus, diphtheria, and pertussis (TDaP) – especially for nurses working with new-born or compromised infants
- Measles, mumps, and rubella (MMR)
- Hepatitis B
- Varicella zoster

→ Back to top

12.7 2020 EU Health Award: Vaccines Winners

12.7.1 **First prize** - Cyprus Association of Cancer Patients and Friends, PASYKAF

The HPV Elimination Programme in Cyprus

PASYKAF HPV Elimination Programme has been rolled out across Cyprus each year since 2010 as part of the Association's commitment and contribution towards cancer eradication. The programme focuses on three areas: creating awareness about the prevention of HPV related cancers, achieving the establishment of a national school-based HPV vaccination program for 12-year-old girls in 2016 and extending the coverage to boys in 2020, and leading the implementation of a national elimination plan for HPV related cancers by 2030 in accordance with ECCO guidelines.

ec.europa.eu/health/sites/health/files/ngo_award/doc/ev_20210302_co01_en.pdf

12.7.2 **Second prize** - Polish Pharmaceutical Students' Association

Vaccines - it does not hurt

'Vaccines - it does not hurt' is an initiative centred around increasing the knowledge and raising awareness of Polish high school students on vaccines and their safety. We focus on providing adolescents with the information and tools necessary to make free, knowledge-based and evidence-based decisions. To fulfil project objectives, we utilize interactive workshops with high school students and social media platforms. In 2020, our initiative reached almost 1800 pupils. Our mission is to educate the youth so that they can assume the role of educators in their communities, making science more accessible.

ec.europa.eu/health/sites/health/files/ngo_award/doc/ev_20210302_co02_en.pdf

12.7.3 **Third prize** - Dutch Cancer Society

HPV vaccination online media campaign

The Dutch Cancer Society decided to become more involved in HPV vaccination, with the aim of increasing vaccination coverage and reducing the levels of HPV-related cancers. The online campaign aims to proactively encourage parents to have their daughters vaccinated. The main goal is to give parents confidence in HPV vaccination and to convince them of the necessity of this vaccine for their daughters' health. Through Google Search and social media, we are getting the right information to the right people in the right region at the right moment.

ec.europa.eu/health/sites/health/files/ngo_award/doc/ev_20210302_co08_en.pdf

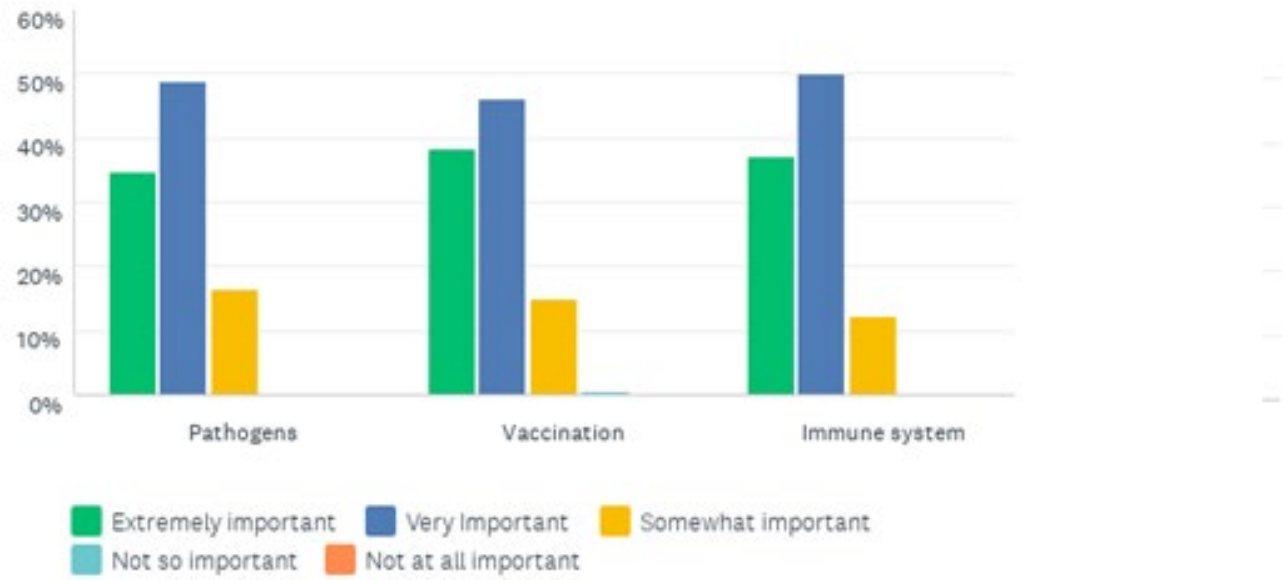
→ Back to top

13 ESNO survey and outcomes

The COVID-19 pandemic made 2020 an unprecedented year, and meant that attention became focused on viral and other infectious diseases, and especially on vaccination. Before this, there were increasing concerns about nurses' personal uptake of the influenza vaccination, 'with opinions being expressed without having heard the nurse's voice'. ESNO is a strong advocate and promoter of nursing knowledge and competencies related to infectious disease transmission and vaccination. We wanted to find out about your personal decisions about vaccine uptake, especially around the influenza and COVID-19 vaccines, and how this relates to professional activity and training needs.

The results from the Survey on Nurses and Vaccination showed that a vast majority recognise the importance of education on: 1) pathogens; 2) vaccination; and 3) immune systems. No one scored on not (at all) important.

Q23: Do you think it would be important to organise Training Programmes for nurses on vaccination and immune system?



THE FULL RESULTS WILL BE AVAILABLE ON THE ESNO FOUNDATION WEBSITE AT FONSE.EU/BLOG/PROJECT-VACCINATION.

14 Fake medication and criminality

14.1 How can we spot fake medical products?

Counterfeit medicines are often packaged to a high standard and look identical to the genuine ones. Sometimes a laboratory test is the only way to identify the difference. It is essential to take care when buying your medicines, especially online.

→ Back to top

Look out for the six Ps:

1. **Place** - Never buy medicines from unknown websites or at a market. Buy medicines only from licensed suppliers who display an authenticity certificate. If you are unsure about a supplier's credentials, check the list of registered dispensaries at your local health regulatory body. This applies to suppliers both online and offline.

2. **Prescriptions** - Only buy medicine that has been prescribed by your doctor or healthcare professional. When buying online, make sure the website requires you to present a prescription. Do not buy from websites that offer prescriptions on the basis of questionnaires or do not have a contactable pharmacist.

3. **Promises** - Be wary of pharmacies that offer 'too good to be true' promises. False promises to watch out for are 'cures all types' of a major illness, 'money-back guarantee', 'no risk' or 'limited supply – buy in advance'.

4. **Price** - Check the price against products you usually buy or with reputable providers. If it is substantially cheaper, it is likely to be a fake.

5. **Privacy** - Do not supply any financial information to a website, unless you are sure it has a secure online payment system. The trade in fake medical products has also been linked to credit card fraud and identity theft. Do not reveal any personal information beyond appropriate medical details.

6. **Product** - Compare the medicines against your usual prescription.

A medicine is fake if:

- It contains too much, too little or any different ingredients;
- Claims to have different properties or side-effects;
- Has a different shape, size, taste or colour;
- Is not correctly labelled or not labelled at all;
- Has an out-of-date or missing expiry date;
- Does not contain information on how to store the medicine;
- The packaging looks poorly constructed or appears to have interfered with;
- There are spelling or grammatical errors on the packaging or instructions.

14.2 If you've seen it, report it!

If you think you have used a fake medical product, contact the pharmacy where you purchased it and your healthcare professional.

If you suspect you have seen fake medical products for sale (either online or offline), report it to your local police or health regulatory authority.

Back to top

14.3 Take notice about false claims on COVID-19 medication

False claims abound of medicines which can protect against, or even cure, the virus. But when purchasing these, you do not know what sort of medicine you are actually receiving or if it is safe to consume. What sounds like a cure could actually be harmful to your health.

14.4 The system behind detecting fake medication

Modern science has opened up immensely powerful and expensive forensic chemistry techniques that can give investigators information on the unique fingerprints that manufacturers leave on their products. Such an analysis can give prosecutors the evidence necessary to tie falsified drugs to particular sources, but such sensitivity comes at a cost.

- As criminals become more sophisticated, there will be an increased need for expensive technologies to detect falsified medicines.

- There are several categories of techniques to analyse pharmaceuticals. They include visual inspection of product and packaging; tests for physical properties such as disintegration, reflectance spectroscopy, and refractive index; chemical tests including colorimetry and dissolution; chromatography; spectroscopic techniques; and mass spectrometry.

- Novel technologies are constantly being developed to detect falsified and substandard medicines. To find out more, watch 'Combatting the Counterfeit Drug Trade: Ashifi Gogo' at TEDxBoston' at www.youtube.com/watch?v=4ZIwOoaCPxI.

14.5 Impact on individuals

Bad quality counterfeit medicines can affect individuals in a variety of ways):

- Adverse effects (for example toxicity) from incorrect active ingredients

- Failure to cure or prevent future disease, thereby increasing mortality, morbidity and the prevalence of disease

- Contributing to the progression of antimicrobial resistance and drug-resistant infections

- A loss of confidence in health care professionals, health programmes and health systems

- Increasing out-of-pocket and health system spending on health care

- Lost income due to prolonged illness or death

- Lost productivity costs to patients and households when seeking additional medical care, the effects of which are felt by businesses and the wider economy.

→ Back to top

15 Q&A

15.1 Questions about vaccination in general

Question 1
IS THERE A LINK BETWEEN VACCINATION AND AUTISM?

Answer 1 No – there is no link between vaccination and autism. This has been proven by many studies over the past decade, involving hundreds of thousands of people.

Question 2
I HAVE HEARD THAT THERE ARE HEAVY METALS/ANTIFREEZE/MERCURY/ HARMFUL CHEMICALS IN VACCINES

Answer 2 All of the ingredients in vaccines have been shown to be safe in many clinical trials, and in the millions of people who have been given vaccines over many years.

Question 3
I'M HEALTHY AND DISEASES LIKE MEASLES AND FLU AREN'T REALLY THAT SERIOUS - WHY SHOULD I GET VACCINATED?

Answer 3 Even in healthy people, vaccine-preventable diseases can be dangerous for some. In pregnant women, babies and those who have issues with their immune systems, the complications can be life-changing or even fatal. People who are not vaccinated can pass on infection even when they feel well. The more people who are vaccinated, the less infection is circulating in the community and so the vulnerable people are protected. Getting vaccinated protects you. But it also protects your friends, your family, your colleagues and the wider community.

Question 4
WHAT IS HERD IMMUNITY?

Answer 4 When enough people in a community are vaccinated, the risk of infection goes down, protecting people who are not vaccinated – this is known as herd or community immunity. When the levels of vaccination go down, the risk of disease increases.

Question 5
CAN EVERYBODY BE VACCINATED?

Answer 5 Not everybody can be vaccinated – it depends on age, health and treatments for illness. Talk to your nurse about whether you can be vaccinated.

Question 6
CAN PEOPLE HAVING CHEMOTHERAPY OR STEM CELL/BONE MARROW TRANSPLANTS BE VACCINATED?

Answer 6 People having chemotherapy, or being prepared for stem cell/bone marrow transplants can be more vulnerable to infection. Vaccine choice and vaccine timing is important – for example, these individuals can have inactivated vaccines, but not live vaccines. It is also important that friends, family and healthcare professionals are up to date on vaccinations, to avoid transmitting the disease during this critical period.

→ Back to top

Question 7
WHY DO PEOPLE OLDER THAN 60 OR 65 GET DIFFERENT VACCINES?

Answer 7 As people age, their immune system becomes less effective. They may be given higher dose vaccines, or vaccines that contain an adjuvant to increase the immune response. Older people may also be given boosters to increase the response to earlier vaccines.

Question 8
WHY SHOULD I ONLY HAVE A VACCINATION WHEN I FEEL WELL

Answer 8 Vaccines are more effective when you are healthy. However, mild illness is not a reason to delay vaccination.

Question 9
I WORK IN A HOSPITAL BUT I'M IN THE OFFICE – WHY DO I NEED TO BE VACCINATED?

Answer 9 Even if you aren't in direct contact with patients, you may be in contact with doctors, nurses and patients, for example in the corridors or in the hospital restaurant, and so you may put them at risk if you are not vaccinated.

15.2 Questions about flu vaccines

Question 10
I HAD THE FLU VACCINE LAST YEAR AND A STILL GOT THE FLU – SOMEONE SAID IT WAS BECAUSE THEY USED THE WRONG STRAIN. WHY SHOULD I GET A VACCINE THIS YEAR?

Answer 10 The team developing the flu vaccine each year track data from 142 national influenza centres in 113 different countries around the world. This allows them to understand which strains of the virus are making people sick, how efficiently those strains are spreading, and how well previous vaccines have worked to combat their targeted viruses. Researchers at the World Health Organization Collaborating Centres for Reference and Research on Influenza analyse the data to identify new flu strains and to determine which strains of the virus are most likely to spread and cause illness in the upcoming flu season. Recommendations are made in February for the composition for the annual seasonal flu vaccine for the northern hemisphere, and in September for the southern hemisphere. This information is shared with all vaccine manufacturers.

Even if the flu strains in the vaccine and those that are circulating aren't an exact match, the vaccine will still protect against some cases of flu, and can reduce the risk of complications such as pneumonia.

Getting a flu vaccine every year helps to maintain levels of immunity.

→ Back to top

16 Acknowledgments

Contributing experts – ESNO Microbe Focus Group 2021

Aafke Bosma - Netherlands

Ber Oomen - Netherlands

Brioni Elena - Italy

Cristiano Magnaghi - Italy

Enrique Castro-Sanchez - Spain

Ingeborg Groothuis - Netherlands

Jeannette Verkerk - Netherlands

Josephine Declay - Belgium

Judith Perez-Gomez - Spain

Luigi Apuzzo - Italy

Maria-Teresa Parisotto – Italy

Marijke Quaghebeur - Belgium

Noel Abela - Malta

Rebecca Cachia-Faerne - Belgium

Suzanne Elvidge – United Kingdom

Tihana Batrnek - Croatia

We thank also those who advise us and provide valuable information

Elle Kuhlmann – EUPHA

Ted van Essen – Dutch Influenza Foundation

Emma Keuleyan – Hungary

This guide is endorsed by

Health First Europe

European Health Management Association

This guide is made possible with sponsors

Vaccines Europe

SANOFI

Design and layout

ZN

Back to top

17 References

1. Devlin H. Measles wipes out immune system's memory, study finds. The Guardian, 31 October 2019. Available from: https://www.theguardian.com/science/2019/oct/31/measles-wipes-out-immune-systems-memory-study-finds.
2. Mina MJ, Kula T, Leng Y, et al., Measles virus infection diminishes preexisting antibodies that offer protection from other pathogens. Science 2019. 366(6465): p. 599-606. 10.1126/science.aay6485.
3. Petrova VN, Sawatsky B, Han AX, et al., Incomplete genetic reconstitution of B cell pools contributes to prolonged immunosuppression after measles. Sci Immunol 2019. 4(41). 10.1126/sciimmunol.aay6125.
4. Nascimento IP, Leite LC, Recombinant vaccines and the development of new vaccine strategies. Braz J Med Biol Res 2012. 45(12): p. 1102-11. 10.1590/s0100-879x2012007500142.
5. Bruni L, Albero G, Serrano B, et al. Human Papillomavirus and Related Diseases in the World: Summary Report (17 June 2019). Available at: https://www.hpvcentre.net/statistics/reports/XWX.pdf.
6. EMA. Gardasil 9 (5 August 2019). Available at: https://www.ema.europa.eu/en/medicines/human/EPAR/gardasil-9.
7. EMA. Gardasil (5 August 2019). Available at: https://www.ema.europa.eu/en/medicines/human/EPAR/gardasil.
8. EMA. Cervarix (4 June 2019). Available at: https://www.ema.europa.eu/en/medicines/human/EPAR/cervarix.
9. Saliba V. Ten years on since the start of the HPV vaccine programme – what impact is it having? Blog: Public health matters, 18 June 2018. Available from: https://publichealthmatters.blog.gov.uk/2018/06/18/ten-years-on-since-the-start-of-the-hpv-vaccine-programme-what-impact-is-it-having/.
10. WHO, Global Advisory Committee on Vaccine Safety, 2–3 December 2015. Weekly epidemiological record 2016. 3: p. 21-32.
11. Karafillakis E, Simas C, Jarrett C, et al., HPV vaccination in a context of public mistrust and uncertainty: a systematic literature review of determinants of HPV vaccine hesitancy in Europe. Hum Vaccin Immunother 2019. 15(7-8): p. 1615-1627. 10.1080/21645515.2018.1564436.
12. Nguyen-Huu NH, Thilly N, Derrough T, et al., Human papillomavirus vaccination coverage, policies, and practical implementation across Europe. Vaccine 2019. 10.1016/j.vaccine.2019.11.081.
13. Suppli CH, Hansen ND, Rasmussen M, et al., Decline in HPV-vaccination uptake in Denmark – the association between HPV-related media coverage and HPV-vaccination. BMC Public Health 2018. 18: p. 1360.
14. Bednarczyk RA, Addressing HPV vaccine myths: practical information for healthcare providers. Hum Vaccin Immunother 2019. 15(7-8): p. 1628-1638. 10.1080/21645515.2019.1565267.
15. Mupandawana ET, Cross R, Attitudes towards human papillomavirus vaccination among African parents in a city in the north of England: a qualitative study. Reproductive Health 2016. 13: p. 97.
16. Hansen PR, Schmidtblaicher M, Brewer NT, Resilience of HPV vaccine uptake in Denmark: Decline and recovery. Vaccine 2020. 10.1016/j.vaccine.2019.12.019.
17. Hanley SJ, Yoshioka E, Ito Y, et al., HPV vaccination crisis in Japan. Lancet 2015. 385(9987): p. 2571. 10.1016/S0140-6736(15)61152-7.
18. GS O, F P, HN P, et al., Population-level sexual behaviours in adolescent girls before and after introduction of the human papillomavirus vaccine (2003-2013). CMAJ 2018. 190: p. E1221–E1226.
19. Bajnok I, Shamian J, Catton H, et al. The Role of Nurses in Immunisation: A snapshot from OECD countries 2018). Available at: https://www.icn.ch/sites/default/files/inline-files/IMMUNISATION_Report%20%28002%29.pdf
20. Vorsters A, Bonanni P, Maltezou HC, et al., The role of healthcare providers in HPV vaccination programs - A meeting report. Papillomavirus Res 2019. 8: p. 100183. 10.1016/j.pvr.2019.100183.

→ Back to top

FULL PROJECT ON **WWW.FONSE.EU**

FIND MORE INFORMATION ON **WWW.ESNO.ORG**

THIS GUIDE IS FOR EDUCATIONAL MATERIAL
AND FOR THEACHING PURPOSES.

SECRETARIAT@ESNO.ORG