5a COVID-19

NOTIFIABLE

In some circumstances, advice in these guidelines may differ from that in the Summary of Product Characteristics (SmPC) of the vaccines. When this occurs, the recommendations in these guidelines, which are based on current expert advice from NIAC, should be followed.

NOTE:

This chapter will be updated as new evidence becomes available.

Acronyms used in this chapter

AEFI	Adverse event following immunisation
BMI	Body mass index
BTS/SIGN	British Thoracic Society/Scottish Intercollegiate Guidelines Network
CLS	Capillary Leak Syndrome
COPD	Chronic Obstructive Pulmonary Disease
COVID-19	Coronavirus disease 2019
CVST	Cerebral Venous Sinus Thrombosis
EC	European Commission
EMA	European Medicines Agency
GBS	Guillain-Barré Syndrome
HCW	Healthcare worker
HPRA	Health Products Regulatory Authority
HPV	Human Papillomavirus
IM	Intramuscular
MERS	Middle East Respiratory Syndrome
MIS-C	Multisystem Inflammatory Syndrome in Children
mRNA	Messenger RNA
NA	Neutralising antibody
NIAC	National Immunisation Advisory Committee
NIO	National Immunisation Office
PCR	Polymerase Chain Reaction
PEG	Polyethylene glycol
S antigen	Spike glycoprotein
SARS	Severe Acute Respiratory Syndrome
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
SmPC	Summary of Product Characteristics
TTS	Thrombosis thrombocytopenia Syndrome
VOC	Variants of concern
WHO	World Health Organization

Key changes

Table 5a.2

Comirnaty®

- Vaccination after COVID-19
- Immunocompromised
- Booster doses

Spikevax®

- Vaccination after COVID-19
- Immunocompromised
- Booster doses

5a.1 Introduction

Seven coronaviruses are known to be capable of causing disease in humans. Four of these (229E, NL63, OC43, HKU1) generally cause minor respiratory illnesses. Rarely they cause more serious lower respiratory tract disease in those with an underlying pulmonary disorder or immunocompromise. Three coronaviruses – Middle East Respiratory Syndrome coronavirus, Severe Acute Respiratory Syndrome coronavirus (SARS-CoV), and Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) cause more severe disease. The disease caused by SARS-CoV-2 is termed COVID-19.

5a.2 Epidemiology

Note: Refer to www.hpsc.ie for the most up-to-date information on COVID-19 epidemiology.

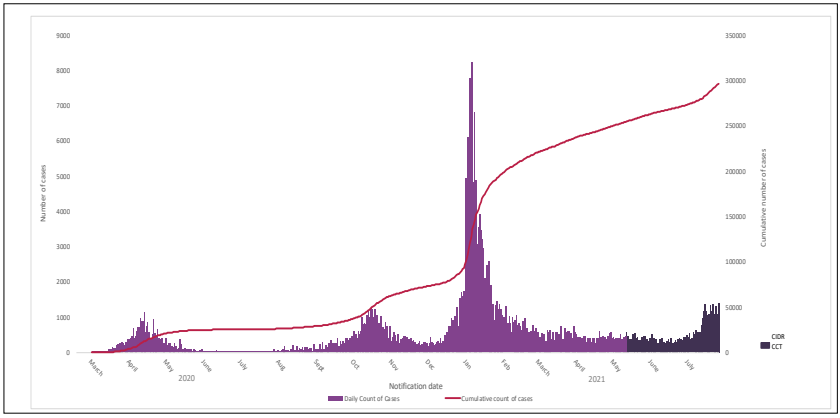
In December 2019, an outbreak of severe pneumonia was reported in Wuhan, China. The causative organism was a coronavirus, since named **S**evere **A**cute **R**espiratory **S**yndrome **Co**rona**V**irus type 2 (SARS-CoV-2). The disease it causes is called **Co**rona**vi**rus **d**isease 20**19** (COVID-19). On March 11th, 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a pandemic.

As of 23 September 2021, 230 million cases and 4.7 million deaths have been reported.

On 31 May 2021, the WHO renamed the four variants of concern (VOC): Alpha (B.1.1.7), Beta (B.1.353), Gamma (P.1) and Delta (B.1.617.2). The Delta variant is now the predominant circulating strain in Ireland.

In Ireland, the first laboratory confirmed case of COVID-19 in Ireland was on 29 February 2020. Since then there have been three waves, peaking in April and October, 2020, and January, 2021.

Figure 5a.1 Number and cumulative number of confirmed COVID-19 cases notified in Ireland by notification date to midnight 27/07/21
Source: HPSC



The highest proportion of hospitalisations and deaths have been in those aged 65 and older. Of those hospitalised with COVID-19, 63% had an underlying medical condition. Of those admitted to an intensive care unit, 89% had an underlying medical condition.

The main underlying medical conditions associated with increased risk of hospitalisation are chronic respiratory disease, chronic heart disease, hypertension, Type I and Type II diabetes mellitus, chronic neurological disease, cancer, obesity (Body mass index (BMI) ≥40), and chronic kidney disease. Other conditions that have been associated with an increased risk of having a complicated course include immunocompromise due to disease or treatment, inherited metabolic disorders, intellectual disability (including Down syndrome), severe mental illness and sickle cell disease.

In the first wave in Ireland, 56% of deaths occurred among residents of nursing homes and long-term care facilities. Healthcare workers (HCW) accounted for 30% cases and one third of these occurred in those working in long-stay care facilities (nursing homes,residential institutions, community hospitals). Since the start of the pandemic, HCW have accounted for 10% of cases. This figure continues to decline with increasing HCW vaccine uptake.

Outbreaks have occurred among patients and staff in hospitals, and among people living or working in crowded situations where self-isolation and physical distancing may be difficult to maintain (e.g. meat processing plants, the Irish Traveller community and direct provision centres).

The lowest proportion of hospitalisations and deaths is in those under 15 years of age.

Transmission
Estimates for the basic reproductive number (R_0) of SARS-CoV-2 range from 2–4. The R_0 in confined settings may be at the higher end of this range. Estimates of the effective reproductive number (R_{eff}) vary between settings and at different time points. R_{eff} depends on a range of factors, including isolation, quarantine, physical distancing, and mask wearing. Some strains (e.g. Delta and Kappa) are more transmissible.

Transmission occurs mainly indoors through contact within 2 metres for more than 15 minutes cumulative exposure via respiratory droplets or aerosol. Factors that increase the risk of infection include presence in an enclosed space with inadequate ventilation, increased exhalation of respiratory fluids if an infectious person is e.g. shouting, singing exercising), and exposure for more than 15 minutes.

Young children are less likely to transmit infection than adolescents or adults.

SARS-CoV-2 virus can survive on surfaces for several hours to a few days, depending on the surface type and environmental conditions.

The **incubation period** is 5 to 6 days (range 1-14 or longer). Around 1% of COVID-19 cases develop symptoms more than 14 days after exposure.

Infectious period Transmission can occur 1-3 days before symptom onset. Peak viral load declines after the first week of symptoms. Those with mild to moderate COVID-19 may shed the virus for up to 10 days following onset of symptoms. Some of those with severe COVID-19 may shed virus for up to 20 days. Asymptomatic persons can transmit the virus, but for shorter periods.

5a.3 Effects of COVID-19

5a.3.1. Symptoms

Overall, 80% of infections are asymptomatic or mild, 15% moderate and 5% severe. Estimates of the proportion of cases which remain asymptomatic range from 15 to 48%. These figures are estimates and vary across different countries, age cohorts and ethnic groups.

The most common symptoms of Delta infection are headache, sore throat, rhinitis, fever and persistent cough. Less common symptoms include myalgia, conjunctivitis, chest pain, dyspnoea, vomiting and diarrhoea, loss of taste or smell, and skin rash.

Symptoms among those aged 65 years and older and those with underlying medical conditions may be atypical, and fever or respiratory symptoms may be absent. While severe illness and death have been reported at all ages, severe illness and death are higher in those:

- Age 65 and older
- Age 18-64 years with medical conditions outlined in Table 5a.2 below.
- From Black, Asian and minority ethnic backgrounds

The majority of cases recover from infection without clinical intervention. However, approximately 20% of identified cases globally have resulted in hospitalisation. In up to 80% of patients symptoms last more than two weeks. Long-term symptoms ("Long COVID") include fatigue, headache, mood changes, chest pain, palpitations, hair loss, and dyspnoea. Long-term symptoms following COVID-19 are more likely with increasing age, BMI and female sex.

5a.3.2 Pregnancy

Pregnant women are at similar risk of COVID-19 infection to non-pregnant women of the same age. The overall risk of severe illness in pregnancy is low. However, pregnant women with COVID-19 infection are more likely to be admitted to ICU or to die than either pregnant women without COVID-19 or similar aged non-pregnant women with COVID-19. Pregnant women from Black, Asian and minority ethnic backgrounds may be more likely to be admitted to hospital with COVID-19 disease than other pregnant women.

COVID-19 in pregnancy may increase the risk of adverse pregnancy outcomes, such as late miscarriage, stillbirth and preterm birth.

The following factors may increase the risks of severe illness in pregnant women:

- Conditions listed in Table 5a.2
- Age >35 years
- Infection in the third trimester (28 weeks or more)
- BMI ≥30

5a.3.3 Children

The overwhelming majority of young adolescents who get SARS-CoV-2 infection will experience a mild self-limited illness. However, severe disease can occur, can require ICU admission and mechanical ventilation, and extremely rarely result in death.

In addition to the risk factors listed in Table 5a.2, the risks of severe disease and death may be increased in children and adolescents with comorbid conditions and some severe genetic disorders.

Multisystem Inflammatory Syndrome in Children (MIS-C) is a rare but serious inflammatory disorder related to prior SARS-CoV-2 infection. The estimated rate in the second wave of the UK COVID-19 pandemic was 5 per 10,000 infected children with an estimated case fatality rate of 1%. Most cases occurred in children aged 1 to 14 years (median age 9 years) and in males (59%). A recent analysis of 1,733 patients with MIS-C found that older adolescents had the highest proportion of myocarditis, pneumonia and acute respiratory distress syndrome.

5a.3.4 Long COVID

The majority of people who develop COVID-19 feel better in a few days or weeks. For some people, including children and adolescents, COVID-19 is associated with symptoms that persist months after the infection. This is called "long COVID".

Symptoms vary in number and severity, and include fatigue, difficulty breathing, cough, chest pain, muscle pain, headache, memory and concentration or sleep problems, anxiety, and depression. Symptoms may worsen after physical or mental activities. There is very little information on the frequency, and duration of long COVID following infection with the Delta variant.

There is wide variation in the reported rate of long COVID with some suggesting that as many as 42% of patients might be affected. It is estimated that persistent symptoms are experienced by around 10% of patients.

There is no consensus regarding the frequency of long COVID in children. Overall, the incidence of persistent symptoms in children and young adolescents appears to be less than in adults but for some, return to normal baseline health status following infection can take months.

5a.4. Vaccines

5a.4.1 Types of vaccines

mRNA vaccines

Messenger RNA vaccines include genetic material (mRNA) that instructs the recipient's antigen-presenting cells to make a spike protein antigen, thus stimulating an immune response. Rapid degradation of mRNA within cells contributes to the safety profile of these vaccines.

Comirnaty® and **Spikevax®** are authorised by the European Medicines Agency (EMA).
CVnCoV vaccine (Curevac) is undergoing an EMA rolling review.

Adenoviral vector vaccines
A non-pathogenic virus is genetically modified to encode an antigen which, when expressed by the host cell, provokes an immune response.

Vaxzevria® and**COVID-19 Janssen®** are authorised by the EMA.
Sputnik V (Gam-COVID-Vac) is undergoing an EMA rolling review.

Protein subunit vaccines
These vaccines are based on injection of key viral antigens stimulating the immune response.

NVX-CoV2373 vaccine (Novavax) is undergoing an EMA rolling review.

Virus Like Particle vaccines
Virus like particles mimic a virus structure, stimulating an immune response. They are not infectious as they contain no genetic material.

Whole virus vaccines
These consist of attenuated or inactivated virus.

5a.4.2 COVID-19 vaccine safety

While vaccine development has been rapid, the very high standards for safety monitoring have not been compromised. To date over one billion individuals have received a COVID-19 vaccine. Following close post-marketing monitoring, the benefit/risk of all authorised vaccines remains positive.

Thrombosis with Thrombocytopenia Syndrome (TTS) following COVID-19 vaccination
In March, 2021, a number of reports of blood clots associated with thrombocytopenia within weeks of Vaxzevria® vaccination were received by the EMA. The thrombi occurred in unusual locations including cerebral venous sinus thrombosis (CVST), the splanchnic vein and in arteries. Subsequently, similar reports were received in the US following COVID-19 Vaccine Janssen®. The association is now termed Thrombosis with Thrombocytopenia Syndrome (TTS).

It is estimated that 1 in 100,000 people aged 50 and older and 1 in 50,000 people aged 18-49 vaccinated with Vaxzevria® may develop TTS*. One in 5 of these may die. Preliminary UK evidence suggests that the risk of TTS is possibly substantially lower (1.6/million) after a second dose of Vaxzevria®.

Based on data* from the United States it is estimated that 1/300,000 people who are vaccinated with COVID-19 Vaccine Janssen® may develop TTS. One in 10 of these may die.

* Based on currently available data

The risk of TTS is higher in younger people. It is not yet known if there is a sex difference.

A similar condition can occur very rarely in recipients of heparin. Cerebral Venous Sinus Thrombosos (CVST) and thrombosis without thrombocytopenia can occur in the general population, however the biological mechanism in these thromboses differs from that in TTS.

The risks of CVST from COVID-19 are much greater than the risk of TTS associated with the vaccine and increase with age. In the US, the incidence of CVST in those admitted to hospital within two weeks following COVID-19 infection is about 4/ 100,000. Approximately one in five COVID-19 patients admitted to ICU has thrombosis as a complication.

No specific risk factors for TTS have been confirmed. There is no evidence of an increased risk for those with clotting or platelet disorders e.g. idiopathic or heparin induced thrombocytopenia, autoimmune conditions, history of cerebral venous sinus thrombosis, acquired or hereditary thrombophilia, antiphospholipid syndrome, or pregnancy.

Early recognition and prompt treatment are important in the management of TTS. Treatment guidelines have been developed, and appropriate management has improved the outcome. However, TTS remains a condition of serious consequences that is potentially fatal.

Healthcare professionals should be alert to the signs and symptoms of thromboembolism and/or thrombocytopenia. Vaccine recipients should be advised to promptly seek medical attention if they develop symptoms such as shortness of breath, chest pain, leg swelling, persistent abdominal pain within weeks of vaccination, or neurological symptoms including severe or persistent headaches (particularly 3 or more days after vaccination), blurred vision, confusion or seizures, or petechiae/ecchymoses beyond the site of vaccination.

Healthcare professionals should seek early expert advice from the National Coagulation Centre about specialised testing and treatment options for patients presenting with thromboembolic events associated with thrombocytopenia (including DIC or CVST) occurring within weeks following adenoviral vector vaccination.

Capillary leak syndrome

Capillary leak syndrome (CLS) is a very rare, serious condition, which can be fatal if untreated. It causes fluid leakage from the capillaries, resulting in oedema mainly affecting the limbs, hypotension, haemoconcentration

* Based on currently available data

and hypoalbuminaemia. It has been reported as an extremely rare event following COVID-19 adenoviral vector vaccines.

In June 2021, the EMA reviewed 6 reports of CLS in people who had received Vaxzevria®. Most of the cases occurred in women and within 4 days of vaccination. Three of those affected had a history of CLS and one subsequently died. As of 27 May 2021, more than 78 million doses of Vaxzevria® had been administered in the EU/EEA and the UK.

In July 2021, the EMA reviewed 3 reports of CLS in people who had received COVID-19 Vaccine Janssen®, which occurred within 2 days of vaccination. One of those affected had a history of CLS and two of them subsequently died. As of 21 June 2021, more than 18 million doses of COVID-19 Vaccine Janssen® had been administered worldwide.

Healthcare professionals should be aware of the signs and symptoms of CLS and of its risk of recurrence in people who have previously been diagnosed with the condition. Patients with an acute episode of CLS following vaccination require prompt treatment and may require continuous specialist monitoring and intensive supportive therapy.

Vaccine recipients should be advised to promptly seek medical attention if they develop oedema in the extremities or sudden weight gain in the days after vaccination, which may be associated with feeling faint (due to hypotension).

Myocarditis and pericarditis

In the US, between 1 May and 11 June 2021 there were 323 reports of pericarditis and myocarditis after an mRNA vaccine which met the CDC case definition. The median age was 19 (12 – 29) years, 291 were male and 32 female. The median interval from vaccination to symptom onset was 2 days (range 0–40 days); 92% of patients experienced onset of symptoms within 7 days of vaccination.

Of the 323 reported cases, 96% were hospitalised. The acute clinical course was generally mild; among 304 hospitalised patients with known clinical outcomes, 95% had been discharged at time of review, and none had died. The highest reporting rates were among males aged 12–17 years and those aged 18–24 years (62.8 and 50.5 events per million second doses of mRNA COVID-19 vaccine respectively).

The US Advisory Committee on Immunisation Practices concluded that the benefits of COVID-19 vaccines clearly outweighed the risks of vaccination. They estimated that in females aged 12-17 years, for each

million second doses of vaccine administered, 8-10 cases of myocarditis might be anticipated, but 8,500 cases of COVID-19, 183 hospitalisations, 38 ICU admissions and one death would be prevented. In males aged 12-17 years, for each million second doses of vaccine administered, 56 -69 cases of myocarditis might be anticipated, but 5,700 cases of COVID-19, 215 hospitalisations, 71 ICU admissions and two deaths would be prevented.

On 9 July 2021, the EMA completed a review and recommended that myocarditis and pericarditis be added to the product information of Comirnaty® and Spikevax® as very rare adverse reactions (actual frequency unknown). EMA concluded that the cases primarily occurred within 14 days after vaccination, more often after the second dose and in younger adult men. Rates were similar for Comirnaty® and Spikevax®.

For Comirnaty®, 145 cases of myocarditis were reported by 31 May 2021, by which time approximately 177 million doses had been administered in the EEA. For Spikevax® there were 19 cases of myocarditis reported in context of 20 million doses. While overall the observed rate of myocarditis was not greater than expected, the rate was higher than would be expected in younger adult males. Overall, for both mRNA vaccines the observed/expected analysis in the US and Israel, has also shown a higher rate than expected in younger adult males.

In the European case review, there were no fatal cases following Spikevax®. There were 5 fatal cases from 145 reports following Comirnaty®, all in adults aged over 50 and associated with advanced aged or with co-morbidity.

Available data suggest that the myocarditis and pericarditis is similar to the typical course, usually improving with rest or treatment. However, follow up time has been short.

In August 2021, results of a large case controlled study in Israel were published. These showed that Comirnaty® was associated with an excess risk of myocarditis (1 to 5 events per 100,000 persons). The risk of this potentially serious adverse event and of many other serious adverse events was substantially increased after SARS-CoV-2 infection.

On 3 September 2021, CDC published results from a study between March 2020–January 2021. Patients with COVID-19 had nearly 16 times the risk for myocarditis compared with patients who did not have COVID-19, and risk varied by sex and age.

In Ireland, up to 7 July 2021, the HPRA had received 17 reports describing myocarditis and/or pericarditis, of which 11 occurred following mRNA vaccination. In these 11 cases, six occurred after the first dose and five after the second dose, all occurring within 14 days of vaccination. Cases were reported in both males and females, with a median age of 56 years (range 38 to 81). There has been no trend in younger adults or following the second dose but exposure to mRNA vaccines has been very low to date in this cohort.

The EMA concluded that very rare cases of myocarditis and pericarditis have been reported following vaccination with mRNA vaccines, but the overall benefit risk remains favourable.

Healthcare professionals should be aware of the signs and symptoms of myocarditis and pericarditis. Vaccine recipients should be advised to promptly seek medical attention if they develop (acute and persisting) chest pain, palpitations or shortness of breath in the days after vaccination.

Healthcare professionals should consult applicable guidance and/or consult specialists (e.g. cardiologists) to diagnose and treat these conditions.

Guillain-Barré syndrome (GBS)
In July 2021, the EMA agreed to include a warning to raise awareness among healthcare professionals and people taking Vaxzevria® and COVID-19 vaccine Janssen® of cases of Guillain-Barré syndrome (GBS) reported following vaccination.

The EMA assessed all the available evidence, including cases reported to the European database for suspected side effects (EudraVigilance) and data from the scientific literature, but at this stage the available data neither confirms nor rules out a possible association with the vaccine.

Healthcare professionals should be alert to signs and symptom of GBS, allowing early diagnosis, supportive care and treatment. Vaccine recipients should be advised to seek immediate medical attention if they develop weakness and paralysis in the extremities that can progress to the chest and face.

Vaccine availability and storage
An up-to-date list of licensed vaccines is available on the Health Products Regulatory Authority (HPRA) website www.hpra.ie

A list of the vaccines currently available from the National Cold Chain Service can be found at https://www.hse.ie/eng/health/immunisation/

Vaccines should be stored at the temperature specified in the Summary of Product Characteristics (SmPC). Those that require reconstitution must be used within a defined number of hours.

All vaccines are provided in multi-dose vials. Appropriate infection control precautions should always be taken. Specific guidelines are available on the National Immunisation Office (NIO) website at www.immunisation.ie

5a.5 Recommendations

The objective of the COVID-19 vaccination programme is to ensure equitable access to a safe and effective vaccine with the goals of limiting mortality and morbidity from COVID-19, protecting healthcare capacity and enabling social and economic activity.

Table 5a.1 Priority groups for COVID-19 vaccination

Group	Rationale
Adults aged ≥65 years who are residents of long-term care facilities. Consider offering vaccination to all residents and staff on site	At greatest risk of severe illness and death In Ireland, in the first wave of COVID-19, 56% of deaths occurred in this setting
Frontline HCW* in direct patient contact roles or who risk exposure to bodily fluids or aerosols	At very high or high risk of exposure and/or transmission. In the first wave over 30% of cases were in healthcare workers
Aged 70 and older in the following order: 85 and older 80-84 75-79 70-74	At higher risk of hospitalisation and death
Aged 16-69 with medical conditions that put them at very high risk** of disease	At similar very high risk of hospitalisation and death as those aged 70-74
Aged 65-69. Prioritise those with medical conditions** which put them at high risk of severe disease Other HCWs not in direct patient contact Key workers	At higher risk of hospitalisation and death Provide essential health services, protect patients Providing services essential to the vaccination programme
Aged 18-64 years with medical conditions** which put them at high risk of severe disease	At higher risk of hospitalisation
Aged 16 - 64 years Residents of long-term care facilities Traveller and Roma communities People who are homeless Aged 16 - 64 years in descending order e.g. 10-year cohorts	Based on risk of ICU admission and death
Aged 12-15 years	Reducing the rare risk of severe disease Maintain access to educational opportunities Facilitate psychosocial development

* HCW who work in and out of all healthcare settings including vaccinators
**See Table 5a.2

Pregnant women and adolescents from 12 years of age should be offered COVID-19 vaccination at any stage in pregnancy following an individual benefit/risk discussion with their obstetric caregiver.

Table 5a.2 Medical conditions and medications associated with very high risk or high risk of severe COVID-19 disease.
May also include others, based on clinical judgement and a needs assessment.

Conditions in the shaded areas may be associated with a suboptimal response to vaccines and patients with these conditions should be given a mRNA vaccine if practicable and timely. However, if preferential selection of a mRNA vaccine will result in delayed vaccination for more than 3 weeks, any benefit of using a higher efficacy vaccine may be lost.

Medical condition	Very high risk	High risk
Cancer	Receiving or within 6 weeks of receiving systemic cytotoxic chemotherapy, targeted therapy, monoclonal antibodies or immunotherapies Receiving treatment or pending treatment for a haematological cancer Undergoing or within 6 weeks of surgery or radical radiotherapy for lung or head and neck cancer Advanced/ metastatic cancer	Haematological[1] - within 5 years of treatment Non haematological cancer within 1 year following immunomodulating treatment All other cancers being treated (excluding hormonal treatment)
Chronic heart and vascular disease		e.g. heart failure, hypertensive cardiac disease
Chronic kidney disease	On dialysis, or eGFR <15 ml/min	eGFR <30ml/min
Chronic liver disease		e.g. cirrhosis or fibrosis
Chronic neurological disease or condition	With evolving respiratory failure requiring non-invasive ventilation e.g. motor neurone disease, spinal muscular atrophy	Significantly compromised respiratory function and/or the ability to clear secretions e.g. Parkinson's disease, cerebral palsy
Chronic respiratory disease	Severe e.g. severe cystic fibrosis, severe COPD, severe pulmonary fibrosis	Other conditions e.g. stable cystic fibrosis, severe asthma (continuous or repeated use of systemic corticosteroids), moderate COPD
Diabetes	HbA1c ≥58mmol/mol	All other diabetes (Type 1 and 2)

Immunocompromise due to disease or treatment	Severe e.g. **Transplantation:** - Listed for solid organ or haematopoietic stem cell transplant (HSCT) - Post solid organ transplant at any time - Post HSCT within 12 months **Genetic diseases:** - APECED[2] - Inborn errors in the interferon pathway **Treatment:** - including but not limited to Cyclophosphamide, Rituximab, Alemtuzumab, Cladribine or Ocrelizumab in the last 6 months	Other e.g. High dose systemic steroids[3] HIV, not on treatment or CD4 count <200 x10^{-6}L for adults
Inherited metabolic diseases	Disorders of intermediary metabolism/at risk of acute decompensation e.g. Maple Syrup Urine Disease	Disorders of intermediary metabolism not fulfilling criteria for very high risk
Intellectual disability	Down Syndrome	Intellectual disability excluding Down Syndrome
Obesity	BMI >40 Kg/m^2	BMI >35 Kg/m^2
Severe mental illness		e.g. schizophrenia, bipolar disorder, severe depression
Sickle cell disease	Sickle cell disease	

[1] Includes e.g., leukaemia, lymphomas, blood dyscrasias or other malignant neoplasms affecting the bone marrow or lymphatic systems

[2] APECED - autoimmune polyendocrinopathy candidiasis ectodermal dystrophy

[3] The following doses of prednisolone (or equivalent dose of other glucocorticoid) are likely to be immunosuppressive:

- Adults and children ≥10kg: ≥40mg/day for more than 1 week, or ≥20mg/day for 2 weeks or longer
- Children <10 kg: 2mg/kg/day for 2 weeks or longer

Authorised COVID-19 vaccines

- **Comirnaty® (Pfizer/BioNTech)**
- **Spikevax®** (formerly COVID-19 Vaccine Moderna®)
- **Vaxzevria®** (formerly COVID-19 Vaccine AstraZeneca®)
- **COVID-19 Vaccine Janssen®**

Any currently authorised COVID-19 vaccine can be given to adults of all ages, unless contraindicated.

Comirnaty® and Spikevax® are the only COVID-19 vaccines authorised for those aged 12-17 years.

mRNA vaccines

Table 5a.3: Vaccination of those due an mRNA COVID-19 vaccine

	History	Action
Contraindication	• Anaphylaxis after a previous dose of Comirnaty® or Spikevax® • Anaphylaxis after polyethylene glycol (PEG), e.g., some bowel preparations for endoscopy, certain laxatives such as Movicol®	If aged 12-17, discuss with allergist/ immunologist If aged ≥18 years, consider vaccination[1] with Vaxzevria® or COVID-19 vaccine Janssen® in a suitable facility. Observe for 30 minutes or Discuss with allergist/ immunologist
	• Anaphylaxis after Trometamol®; Spikevax® is contraindicated	Vaccinate with alternate vaccine
Special precautions	• Anaphylaxis after multiple, different drug classes, with no identified allergen (may indicate PEG allergy) • Anaphylaxis after a vaccine, or a medicine known to contain PEG • Unexplained anaphylaxis (may indicate PEG allergy)	Clarify if PEG is tolerated (see FAQs) If 12-17 years, discuss with allergist/ immunologist If aged ≥18 years[1], consider vaccination with Vaxzevria® or COVID-19 vaccine Janssen® Observe for 30 minutes
	• Mastocytosis • Idiopathic anaphylaxis • Anaphylaxis after food, venom or medication	Vaccinate as scheduled Observe for 30 minutes
Not a contraindication or a precaution	• Non-anaphylactic food allergy • Family history of allergy, including anaphylaxis • Previous local reaction to any vaccine • Hereditary angioedema • Contact dermatitis to PEG containing cosmetic product • Underlying asthma • Hay fever • NSAID allergy • Chronic spontaneous urticaria	Vaccinate as scheduled Observe for 15 minutes

[1] including pregnant women

Comirnaty® (Pfizer/BioNTech)

This medicinal product is subject to additional monitoring. This will allow quick identification of new safety information. Healthcare professionals are asked to report any suspected adverse reactions to the HPRA.

The vaccine should be stored in a freezer at -80°C to -60°C. Each pack contains 195 vials. Vials should be transferred to +2°C to +8°C to thaw which may take 3 hours. Alternatively, frozen vials may be thawed for 30 minutes at temperatures up to +30°C for immediate use.

After thawing, undiluted vaccine can be stored for up to one month (31 days) at +2°C to +8°C and up to 2 hours at up to +30°C. Once thawed, the vaccine cannot be re-frozen.

Stability data indicate that the unopened vial is stable for up to:

- 24 hours when stored at temperatures from -3°C to +2°C
- a total of 4 hours when stored at temperatures from +8°C to +30°C.

The vaccine requires dilution with 1.8ml of 0.9% sodium chloride. After dilution, the vaccine should be kept at +2°C to +30°C and used within 6 hours.

Licensed indications
Active immunisation to prevent COVID-19 caused by SARS-CoV-2 virus, in individuals 12 years of age and older.

Vaccine efficacy
Efficacy is 95-100% after two doses in those aged 12 and older.

Vaccine effectiveness
A large trial in Israel showed two dose effectiveness of 87% (95% CI, 55 to 100) against hospitalisation and 92% against severe disease from 7 days after the second dose. This effectiveness may not apply to all variants.

Dose, route and schedule
The dose of vaccine is 0.3 ml intramuscularly (IM) into the deltoid muscle. The course consists of 2 doses 21-28 days apart.

If more than six 0.3ml doses can be safely and accurately withdrawn from a diluted vial, they can be used as valid doses. There should be no pooling of the contents of different vials.

If the interval between doses is longer than 28 days, the second dose should be given as soon as possible. The course does not need to be restarted.

If the second dose is given between 17 and 20 days after the first dose, it is a valid dose. If the second dose is given before 17 days, this is not considered a valid dose. A third dose should be given 28 days after the second (invalid) dose.

Interchangeability
The same vaccine should preferably be used for both doses.

Consideration may be given to adenoviral vector vaccination after anaphylaxis to a dose of this vaccine if aged 18 years or older, including pregnant women. The adenoviral vector vaccine should be given after an interval of at least 28 days and the person should be considered fully vaccinated.

Contraindications (see Table 5a.3)

- Anaphylaxis (serious systemic allergic reaction requiring medical intervention) following a previous dose of the vaccine or any of its constituents (including polyethylene glycol (PEG)).
- Anaphylaxis following another mRNA vaccine.
- Previous history of myocarditis after a dose of an mRNA vaccine (see Section 5a.4.2).

Those with a contraindication to one mRNA COVID-19 vaccine should not receive another authorised mRNA vaccine. Consideration may be given to adenoviral vector vaccination for anyone 18 and older including pregnant women. This should be given after an interval of at least 28 days and the person should be considered fully vaccinated.

For those aged 12-17 years of age, discuss with an allergist/immunologist.

Appropriate support should be available in case of anaphylaxis or fainting after vaccine administration.

Precautions should be in place to minimise injury from fainting.

Precautions (see Table 5a.3)

- Acute severe febrile illness; defer until recovery.
- Previous history of pericarditis after a dose of an mRNA vaccine - seek specialist advice (see Section 5a.4.2).
- Consider adenoviral vector vaccination for those aged 18 and older, including pregnant women, with:
    - Anaphylaxis after multiple, different drug classes, with no identified allergen (may indicate PEG allergy)
    - Anaphylaxis after a vaccine, or a medicine which contained PEG
    - Unexplained anaphylaxis (may indicate PEG allergy)

If vaccination is advised for a person with prior anaphylaxis to an unrelated allergen observe for 30 minutes after vaccination.

Discuss with allergist/immunologist for those aged 12-17 years of age.

For more information see Frequently Asked Questions about COVID-19 vaccines for people with pre-existing allergic conditions.

Patients with planned immunosuppressing therapy should ideally complete vaccination two weeks before treatment. The recommended minimum interval may be used. Specialists should consider the individual's risk and likelihood of disease exposure, and provide advice based on knowledge and understanding of the patient's immune status and likely immune response to vaccination.

Vaccination after COVID-19
Those with persisting symptoms post COVID-19 may be vaccinated, unless there is evidence of recent clinical deterioration.

Vaccination should be deferred until clinical recovery from COVID-19 infection and for at least four weeks after diagnosis or onset of symptoms, or four weeks from the first PCR positive specimen in those who are asymptomatic.

Those aged under 65 years and immunocompetent
Vaccination may be deferred for up to nine months after diagnosis, symptom onset, or from the first PCR or antigen positive specimen.

Those who have had previous laboratory confirmed COVID-19 infection within 9 months:
- aged *50 years and older* should receive a full COVID-19 vaccine schedule
- aged *under 50 years and immunocompromised (including pregnant women)* should receive a full COVID-19 vaccine schedule
- aged *under 50 years and immunocompetent*: a single dose of COVID-19 vaccine is sufficient and they should then be considered fully vaccinated.

Those who have had laboratory confirmed COVID-19 infection within 9 months after a first dose of COVID-19 vaccine should complete the vaccine course.

If a person in a group for whom an additional or booster dose is recommended has had laboratory confirmed COVID-19 infection after a completed primary vaccine course (i.e. a breakthrough infection), the additional or booster dose should be delayed for at least six months after the COVID-19 infection was diagnosed.

Serological testing prior to giving an additional or booster dose is not recommended.

Post vaccination observation period

- Those with no history of anaphylaxis: 15 minutes
- Those with a history of anaphylaxis from any cause: 30 minutes
- Those with immediate itching, swelling or urticarial reaction at the vaccination site: 30 minutes or longer as clinically indicated

Immunocompromised *(see Chapter 3)*
Immunocompromised individuals due to disease or treatment may be vaccinated if they have no contraindications.

Data indicates that those with severe immunocompromise do not have adequate protection following a primary COVID-19 vaccine course. There is evidence that protection can be enhanced by an additional mRNA vaccine dose, representing an extension of the primary vaccination series.

An additional mRNA vaccine dose should be given to those aged 12 and older with immunocompromise associated with a suboptimal response to vaccines at the time of vaccination, who have completed their primary course. The mRNA vaccine should be given regardless of whether the primary course was of an mRNA or an adenoviral vector vaccine. This is an extended primary vaccination course. The additional vaccine should be given after a minimum interval of two months following the last dose of an authorised COVID-19 vaccine.

An additional adenoviral vector vaccine can be considered for those with a contraindication or precaution to an mRNA vaccine.

Serological testing prior to giving an additional dose is not recommended.

See Table 5a.2 for conditions that may be associated with a suboptimal response to vaccines.

Pregnancy
Animal reproductive toxicology studies of the mRNA vaccines did not identify any safety concerns.

There is now a growing body of evidence on the safety and effectiveness of COVID-19 vaccination, in both animal and human studies, clearly indicating that the benefits of vaccination outweigh any know or potential risks of COVID-19 vaccination during pregnancy.

Pregnant women and their obstetric caregivers should engage in shared decision-making in advance of vaccination. Counselling should balance available data on vaccine safety, risks to pregnant women from COVID-19 infection, and a woman's individual risk for infection and severe disease.

The two doses should be given 28 days apart at any stage in pregnancy.

Breastfeeding
There is no known reason for vaccinees to avoid breastfeeding.

Children from 12 years of age
On 28 May 2021, the EMA extended the indication to include use in children aged 12 to 15 years.

In a study in adolescents without evidence of prior infection aged 12 to 15 years, the point estimate for efficacy was 100% (95% confidence interval 75.3, 100.0).

Reactogenicity occurred at a slightly higher frequency compared to the adult population. No new safety concerns were observed.

Vaccination of those with bleeding disorders or on anticoagulants
Individuals with a bleeding disorder or receiving anticoagulant therapy may develop haematomas in IM injection sites. Prior to vaccination, inform the recipient about this risk. For those with thrombocytopenia (platelet count<$50x10^9$/L), consult the supervising consultant. People with mild bleeding disorders or on maintenance dose Emicizumab (Hemlibra®) do not require haemostatic cover for vaccination. Details of haemostatic cover for all others can be found in the Patient Information tab at http://www.stjames.ie/services/hope/nationalcoagulationcentre

Those with inherited coagulopathies who require factor replacement therapy should receive it on the day of vaccination, prior to the IM vaccination.

If there is uncertainty about the need for replacement therapy, contact the patient's Comprehensive Care Centre.

Those receiving long-term anticoagulation with either Warfarin® or heparin are not considered to be at higher risk of bleeding complications following vaccination. There is no reason to expect that there is a greater risk of bleeding complications with the oral anticoagulants or antiplatelet agents, than with other anticoagulants.

People on Warfarin® should follow their usual schedule for international normalised ratio (INR) testing and can be vaccinated if it is less than 4.0. If the INR is 4.0 or more, follow the advice of the clinic/practice managing Warfarin® and wait until the INR is less than 4.0 to be vaccinated.

See Chapter 2, sections 2.4.6 and 2.4.7 for further information, including technique for IM injection, in this patient group.

Adverse reactions
A full list of adverse reactions may be found in the Summary of Product Characteristics (SmPC).

Terms used for frequency of adverse events
Very common: >1/10
Common: >1/100 and <1/10
Uncommon: >1/1,000 and <1/100
Rare: >1/10,000 and <1/1,000
Very rare: <1/10,000

Local:
Very common: injection site pain and swelling
Common: injection site erythema
Uncommon: injection site pruritus

General:
Very common: arthralgia, diarrhoea, fatigue, fever, headache, myalgia
Common: nausea, vomiting
Uncommon: insomnia, hypersensitivity reactions (e.g. rash, pruritus, angioedema), lymphadenopathy in the same arm as vaccination, malaise, extremity pain
Rare: acute peripheral facial paralysis
Unknown frequency: extensive swelling of the vaccinated limb, facial swelling (in those with a history of dermatological fillers), myocarditis, percarditis (see Section 5a.4.2)

The most frequent adverse reactions during clinical trials in those aged ≥16 years were injection site pain (> 80%), fatigue (> 60%), headache (> 50%), myalgia and chills (> 30%), arthralgia (> 20%), pyrexia and injection site swelling (> 10%).

The most frequent adverse reactions in adolescents 12 to 15 years of age were injection site pain (> 90%), fatigue and headache (> 70%), myalgia and chills (> 40%), arthralgia and pyrexia (> 20%), injection site pain or swelling, fatigue and chills (≥10%).

These were usually mild or moderate in intensity, and resolved within a few days after vaccination. A lower frequency of adverse events is associated with greater age. A higher rate of pyrexia is seen after the second dose.

Post marketing surveillance has reported an anaphylaxis rate of 2-5/ million in the US and 14/million in the UK (the latter figure includes anaphylactoid reactions). These rates are higher than after non COVID-19 vaccines.

Co-administration
COVID-19 vaccines and other vaccines may be administered at the same time or at any interval.

As it is not known if COVID-19 vaccine reactogenicity is increased with co-administration, vaccines should preferably be given in different limbs.

Duration of immunity

There is insufficient information to determine the duration of protection from the vaccine.

Vaccine recipients may not have optimal protection until 7 days after the second dose, and the vaccine may not protect all vaccinees.

Vaccinated persons should continue to follow current public health guidance to protect themselves and others.

Booster doses
A booster dose of an mRNA vaccine should be given to all those aged 80 and older and those living in long term care facilities aged 65 and older who have completed their primary course with any vaccine type.

The booster dose should be given after an interval of six months following the last dose of an authorised COVID-19 vaccine and can be given at the same time or at any interval before or after seasonal influenza vaccine.

In exceptional circumstances, a minimum interval of two months can be used between the booster dose and the last dose of an authorised COVID-19 vaccine.

A booster adenoviral vector vaccine can be considered for those with a contraindication or precaution to an mRNA vaccine.

Serological testing prior to giving a booster dose is not recommended.

Spikevax® (formerly COVID-19 Vaccine Moderna®)

This medicinal product is subject to additional monitoring. This will allow quick identification of new safety information. Healthcare professionals are asked to report any suspected adverse reactions to the HPRA.

The vaccine should be stored in a freezer at -25°C to -15°C. Each pack contains 10 vials. Vials should be transferred to +2°C to +8°C to thaw which may take 2 and a half hours, and must sit at room temperature for 15 minutes before administering. Alternatively, frozen vials may be thawed for 1 hour at room temperature between +15°C to +25°C for immediate use.

After thawing, the vaccine can be stored for up to 30 days at +2°C to +8°C and up to 24 hours at +8°C up to +25°C. Once thawed, the vaccine cannot be re-frozen.

The vaccine does not require dilution. Once the multidose vial is punctured the vaccine should be kept at +2°C to +25°C and used as soon as possible and within 19 hours.

Licensed indications
Active immunisation to prevent COVID-19 caused by SARS-CoV-2 virus, in individuals 12 years of age and older.

Vaccine efficacy
Clinical trial data demonstrated a two-dose vaccine efficacy of 94.1% (95% confidence interval of 89.3% to 96.8%) in those aged 18 and above. This

efficacy may not apply to all variants.

Dose, route and schedule
The dose of vaccine is 0.5 ml IM, preferably into the deltoid muscle. The course consists of two doses, 28 days apart.

If more than ten 0.5ml doses can be safely and accurately withdrawn from a vial, they can be used as valid vaccines doses. There should be no pooling of the contents of different vaccine vials.

If the interval between doses is longer than 28 days, the second dose should be given as soon as possible. The course does not need to be restarted.

If the second dose was given between 21 and 27 days after the first dose, it is a valid dose. If the second dose is given before 21 days, this is not considered a valid dose. A third dose should be given 28 days after the second (invalid) dose.

Interchangeability
The same vaccine should preferably be used for both doses.

Consideration may be given to adenoviral vector vaccination after anaphylaxis to a dose of this vaccine if aged 18 years or older, including pregnant women. The adenoviral vector vaccine should be given after an interval of at least 28 days and the person should be considered fully vaccinated.

Contraindications (see Table 5a.3)

- Anaphylaxis (serious systemic allergic reaction requiring medical intervention) following a previous dose of the vaccine or any of its constituents (including polyethylene glycol (PEG)).
- Anaphylaxis following another mRNA vaccine.
- Previous history of myocarditis after a dose of an mRNA vaccine (see Section 5a.4.2).

Those with a contraindication to one mRNA COVID-19 vaccine should not receive another authorised mRNA vaccine. Consideration may be given to adenoviral vector vaccination for anyone 18 and older including pregnant women. This should be given after an interval of at least 28 days and the person should be considered fully vaccinated.

For those aged 12-17 years of age, discuss with an allergist/immunologist.

Appropriate support should be available in case of anaphylaxis or fainting after vaccine administration.

Precautions should be in place to minimise injury from fainting.

Precautions (see Table 5a.3)

- Acute severe febrile illness; defer until recovery.
- Previous history of pericarditis after a dose of an mRNA vaccine - seek specialist advice (see Section 5a.4.2).
- Consider adenoviral vector vaccination for those aged 18 years or older, including pregnant women, with:
  - Anaphylaxis after multiple, different drug classes, with no identified allergen (may indicate PEG allergy)
  - Anaphylaxis after a vaccine, or a medicine which contained PEG
  - Unexplained anaphylaxis (may indicate PEG allergy)

If vaccination is advised for a person with prior anaphylaxis to an unrelated allergen observe for 30 minutes after vaccination.

For those aged 12-17 years, discuss with an allergist/immunologist.

For more information see Frequently Asked Questions about COVID-19 vaccines for people with pre-existing allergic conditions.

Patients with planned immunosuppressing therapy should ideally complete vaccination two weeks before treatment. The recommended minimum interval may be used. Specialists should consider the individual's risk and likelihood of disease exposure, and provide advice based on knowledge and understanding of the patient's immune status and likely immune response to vaccination.

Vaccination after COVID-19

Those with persisting symptoms post COVID-19 may be vaccinated, unless there is evidence of recent clinical deterioration.

Vaccination should be deferred until clinical recovery from COVID-19 and for at least four weeks after diagnosis or onset of symptoms, or four weeks from the first PCR positive specimen in those who are asymptomatic.

Those aged under 65 years and immunocompetent:
Vaccination may be deferred for up to nine months after diagnosis, symptom onset, or from the first PCR or antigen positive specimen.

Those who have had previous laboratory confirmed COVID-19 infection within 9 months:

- aged *50 years and older* should receive a full COVID-19 vaccine schedule
- aged *under 50 years and immunocompromised (including pregnant women)* should receive a full COVID-19 vaccine schedule
- aged *under 50 years and immunocompetent*: a single dose of COVID-19 vaccine is sufficient and they should then be considered fully vaccinated.

Those who have had laboratory confirmed COVID-19 infection within 9 months after a first dose of COVID-19 vaccine should complete the vaccine course.

If a person in a group for whom an additional or booster dose is recommended has had laboratory confirmed COVID-19 infection after a completed primary vaccine course (i.e. a breakthrough infection), the additional or booster dose should be delayed for at least six months after the COVID-19 infection was diagnosed.

Serological testing prior to giving an additional or booster dose is not recommended.

Post vaccination observation period

- Those with no history of anaphylaxis: 15 minutes
- Those with a history of anaphylaxis from any cause: 30 minutes
- Those with immediate itching, swelling or urticarial reaction at the vaccination site: 30 minutes or longer as clinically indicated

Immunocompromised *(see Chapter 3)*
Immunocompromised individuals due to disease or treatment may be vaccinated if they have no contraindications.

Data indicates that those with severe immunocompromise do not have adequate protection following a primary COVID-19 vaccine course. There is evidence that protection can be enhanced by an additional mRNA vaccine dose, representing an extension of the primary vaccination series.

An additional mRNA vaccine dose should be given to those aged 12 and older with immunocompromise associated with a suboptimal response to vaccines at the time of vaccination, who have completed their primary course. The mRNA vaccine should be given regardless of whether the primary course was of an mRNA or an adenoviral vector vaccine. This is an extended primary vaccination course. The additional vaccine should be given after a minimum interval of two months following the last dose of an authorised COVID-19 vaccine.

An additional adenoviral vector vaccine can be considered for those with a contraindication or precaution to an mRNA vaccine.

Serological testing prior to giving an additional dose is not recommended.

See Table 5a.2 for conditions that may be associated with a suboptimal response to vaccines.

Pregnancy
Animal reproductive toxicology studies of the mRNA vaccines did not identify any safety concerns.

There is now a growing body of evidence on the safety and effectiveness of COVID-19 vaccination, in both animal and human studies, clearly indicating that the benefits of vaccination outweigh any know or potential risks of COVID-19 vaccination during pregnancy.

Pregnant women and their obstetric caregivers should engage in shared decision-making in advance of vaccination. Counselling should balance available data on vaccine safety, risks to pregnant women from COVID-19 infection, and a woman's individual risk for infection and severe disease.

The two doses should be given 28 days apart at any stage in pregnancy.

Breastfeeding
There is no known reason for vaccinees to avoid breastfeeding.

Children from 12 years of age
On 23 July 2021, the EMA extended the indication to include use in children from 12 years of age.

In a study in adolescents without evidence of prior infection aged 12 to 17 years, there were no symptomatic COVID-19 cases in 2,163 participants who received the vaccine and 4 cases out of 1,073 who received a placebo.

No new safety concerns were observed.

Vaccination of those with bleeding disorders or on anticoagulants

Individuals with a bleeding disorder or receiving anticoagulant therapy may develop haematomas in IM injection sites. Prior to vaccination, inform the recipient about this risk. For those with thrombocytopenia (platelet count<$50x10^9$/L), consult the supervising consultant. People with mild bleeding disorders or on maintenance dose Emicizumab (Hemlibra®) do not require haemostatic cover for vaccination. Details of haemostatic cover for all others can be found in the Patient Information tab at http://www.stjames.ie/services/hope/nationalcoagulationcentre

Those with inherited coagulopathies who require factor replacement therapy should receive it on the day of vaccination, prior to the IM vaccination.

If there is uncertainty about the need for replacement therapy, contact the patient's Comprehensive Care Centre.

Those receiving long-term anticoagulation with either Warfarin® or heparin are not considered to be at higher risk of bleeding complications following vaccination. There is no reason to expect that there is a greater risk of bleeding complications with the newer oral anticoagulants or antiplatelet agents, than with other anticoagulants.

People on Warfarin® should follow their usual schedule for international normalised ratio (INR) testing and can be vaccinated if it is less than 4.0. If the INR is 4.0 or more, follow the advice of the clinic/practice managing Warfarin® and wait until the INR is less than 4.0 to be vaccinated.

See Chapter 2, sections 2.4.6 and 2.4.7 for further information, including technique for IM injection, in this patient group.

Adverse reactions
A full list of adverse reactions may be found in the Summary of Product characteristics (SmPC).

Terms used for frequency of adverse events

Very common:	>1/10
Common:	>1/100 and <1/10
Uncommon:	>1/1,000 and <1/100
Rare:	>1/10,000 and <1/1,000
Very rare:	<1/10,000

Local:	Very common: injection site pain and swelling Common: injection site erythema, rash and urticaria Uncommon: injection site pruritis
General:	Very common: arthralgia, axillary lymphadenopathy on the side of injection, chills, fatigue, fever, headache, myalgia, nausea, vomiting Rare: acute peripheral facial paralysis, facial swelling (in those with a history of dermatological fillers) Unknown frequency: myocarditis, percarditis (see Section 5a.4.2)

The most frequent adverse reactions during clinical trials in those aged ≥18 years were injection site pain (>90%), fatigue (70%), headache (>60%), myalgia (>60%), arthralgia (> 40%), chills (>40%), nausea and vomiting (>20%), axillary swelling/tenderness, pyrexia and injection site swelling (>15%), which were similar in those aged 12-17 years.

These were usually mild or moderate in intensity and resolved within a few days after vaccination. A slightly lower frequency of adverse events was associated with greater age.

A lower frequency of adverse events is associated with greater age. A higher rate of local and systemic adverse events are seen after the second dose.

Post marketing surveillance has reported an anaphylaxis rate of 2-5/ million in the US and 21/million in the UK (the latter figure includes anaphylactoid reactions). These rates are higher than after non COVID-19 vaccines.

Co-administration
COVID-19 vaccines and other vaccines may be administered at the same time or at any interval.

As it is not known if COVID-19 vaccine reactogenicity is increased with co-administration, vaccines should preferably be given in different limbs.

Duration of immunity
There is insufficient information to determine the duration of protection from the vaccine.

Vaccine recipients may not have optimal protection until 14 days after the second dose, and the vaccine may not protect all vaccinees.

Vaccinated persons should continue to follow current public health guidance to protect themselves and others.

Booster doses
A booster dose of an mRNA vaccine should be given to all those aged 80 and older and those living in long term care facilities aged 65 and older who have completed their primary course with any vaccine type.

The booster dose should be given after an interval of six months following the last dose of an authorised COVID-19 vaccine and can be given at the same time or at any interval before or after seasonal influenza vaccine.

In exceptional circumstances, a minimum interval of two months can be used between the booster dose and the last dose of an authorised COVID-19 vaccine.

A booster adenoviral vector vaccine can be considered for those with a contraindication or precaution to an mRNA vaccine.

Serological testing prior to giving a booster dose is not recommended.

Adenoviral vector vaccines

Table 5a.4: Vaccination of those due a COVID-19 adenoviral vector vaccine

	History	Action
Contraindication	• Anaphylaxis after a previous dose of Vaxzevria® • Anaphylaxis after polysorbate 80	Consider vaccination with Comirnaty® or Spikevax® in a suitable facility Observe for 30 minutes or Discuss with allergist/ immunologist
Special precautions	• Anaphylaxis after a vaccine, injected antibody preparation, or a medicine known to contain polysorbate 80 • Unexplained anaphylaxis (may indicate polysorbate 80 allergy)	Clarify if polysorbate 80 is tolerated (see FAQs) Discuss with allergist/ immunologist Consider vaccination with Comirnaty® or Spikevax® Observe for 30 minutes
	• Mastocytosis • Idiopathic anaphylaxis • Anaphylaxis after food, venom or medication	Vaccinate as scheduled Observe for 30 minutes
Not a contraindication or a precaution	• Non-anaphylactic food allergy • Family history of allergy, including anaphylaxis • Previous local reaction to any vaccine • Hereditary angioedema • Contact dermatitis to polysorbate 80 containing cosmetic product • Underlying asthma • Hay fever • NSAID allergy • Chronic spontaneous urticaria	Vaccinate as scheduled Observe for 15 minutes

Vaxzevria® (formerly COVID-19 Vaccine AstraZeneca®)

This medicinal product is subject to additional monitoring. This will allow quick identification of new safety information. Healthcare professionals are asked to report any suspected adverse reactions to the HPRA.

The vaccine should be stored at +2°C to +8°C. Each pack contains 10 vials.

The vaccine does not require dilution. Once the multidose vial is punctured, the vaccine should be used immediately. If not used, it may be kept for a single period for up to 30°C and used within 6 hours or an opened vial may be stored in a refrigerator (+2°C to + 8°C) for a maximum of 48 hours if it is immediately returned to the refrigerator following each puncture.

Licensed indications

Active immunisation to prevent COVID-19 caused by SARS-CoV-2 virus, in individuals 18 years of age and older.

Vaccine efficacy

Clinical trial data demonstrated a two-dose vaccine efficacy of 59.5% (95% confidence interval of 45.8% to 69.7%) in those aged 18 and above. There was insufficient clinical data to allow reliable calculation of efficacy in those aged 55 and older. However, as a similar immune response was shown in all age groups, including those aged 65 and older, the EMA authorised the vaccine for all adults.

The World Health Organization (WHO) Strategic Advisory Group of Experts (SAGE), subsequently reported the overall vaccine efficacy at 63.1%. There were no cases of COVID-19 hospitalisation, severe disease, or death in those aged 65 and older who received the vaccine.

Vaccine effectiveness

A prospective population study of 5.4 million people from Scotland found that the first dose of vaccine showed effectiveness of 94% (95% CI 73 to 99) for COVID-19 related hospitalisation at 28-34 days post-vaccination. This effectiveness may not apply to all variants.

Dose, route and schedule

The dose of vaccine is 0.5 ml IM, preferably into the deltoid muscle. The vaccine is authorised as a two dose course 4-12 weeks apart.

If more than ten 0.5ml doses can be safely and accurately withdrawn from a vial, they can be used as valid vaccines. There should be no pooling of the contents of different vials.

It is recommended the two doses are given 8-12 weeks apart because there is evidence which shows that higher efficacy of 82% was reported when the second dose was given after 12 weeks.

The threat of new variants in circulation and evidence of suboptimal protection against the delta variant after one dose of Vaxzevria® means that the shorter 4-week interval is preferable to ensure earlier protection, if practicable.

If the interval between doses is longer than 12 weeks, the second dose should be given as soon as possible. The course does not need to be restarted.

The minimum interval is 3 weeks (21 days). If the second dose is given before 21 days, this is not considered a valid vaccine. A third dose should be given 28 days after the second (invalid) vaccine.

Interchangeability
The same vaccine should preferably be used for both doses. If an mRNA vaccine is used as a second dose, it should be given after an interval of at least 28 days and the person should be considered fully vaccinated.

For those who have already had a first dose of Vaxzevria® and who did not complete the vaccination schedule as recommended, an mRNA vaccine should be offered in line with their priority grouping or age cohort.

Contraindications (see Table 5a.4)
- Anaphylaxis (serious systemic allergic reaction requiring medical intervention) following a previous dose of the vaccine or any of its constituents (including polysorbate 80).
- Thrombosis with Thrombocytopenia Syndrome after the first dose. of Vaxzevria® or COVID-19 Vaccine Janssen® (see Section 5a.4.2).
- Previous history of capillary leak syndrome (see Section 5a.4.2).

Those with a contraindication to one adenoviral vector vaccine should not receive another adenoviral vector vaccine. They should be offered an mRNA vaccine, given at least 28 days later and the person considered fully vaccinated.

Appropriate support should be available in case of anaphylaxis or fainting after vaccine administration.

Precautions should be in place to minimise injury from fainting.

Precautions (see Table 5a.4)
- Acute severe febrile illness; defer until recovery.
- Consider mRNA vaccination for those with:
  - Anaphylaxis after a vaccine, injected antibody preparation, or a medicine known to contain polysorbate 80
  - Unexplained anaphylaxis (may indicate polysorbate 80 allergy).

If vaccination is advised, in a patient with prior anaphylaxis to an unrelated allergen, the patient should be observed for 30 minutes after vaccination.

For more information see Frequently Asked Questions about COVID-19 vaccines for people with pre-existing allergic conditions.

Those aged **under 50 years** including those with medical conditions with very high or high risk of severe COVID-19 disease should be given an mRNA vaccine, unless they have received one dose of Vaxzevria®; in that case they should receive their second dose as scheduled.

Healthy people aged 18-49 years may choose to avail of an earlier Vaxzevria® vaccine provided they have made an informed decision. This decision should be based on their understanding of the risk of developing thrombosis with thrombocytopenia syndrome (TTS) compared with the consequences of COVID-19 infection, the options of other effective public health and social measures and the benefits of a sooner vaccine.

For those who have already had a first dose of Vaxzevria® and who did not complete the vaccination schedule as recommended, an mRNA vaccine should be offered in line with their priority grouping or age cohort. Those who receive a heterologous schedule should be considered fully vaccinated after their second vaccine (7 days after Comirnaty®, 14 days after Spikevax®).

Patients with planned immunosuppressing therapy should ideally complete vaccination two weeks before treatment. The recommended minimum interval may be used. Specialists should consider the individual's risk and likelihood of disease exposure, and provide advice based on knowledge and understanding of the patient's immune status and likely immune response to vaccination.

Vaccination after COVID-19
Those with persisting symptoms post COVID-19 may be vaccinated, unless there is evidence of recent clinical deterioration.

Vaccination should be deferred until clinical recovery from COVID-19 infection and for at least four weeks after diagnosis or onset of symptoms, or four weeks from the first PCR positive specimen in those who are asymptomatic.

Those aged under 65 years and immunocompetent
Vaccination may be deferred for up to nine months after diagnosis, symptom onset, or from the first PCR or antigen positive specimen.

Those who have had previous laboratory confirmed COVID-19 infection within 9 months:

- aged *50 years and older* should receive a full COVID-19 vaccine schedule
- aged *under 50 years and immunocompromised* should receive a full COVID-19 vaccine schedule
- aged *under 50 years and immunocompetent*: a single dose of COVID-19 vaccine is sufficient and they should then be considered fully vaccinated,

Those who have had laboratory confirmed COVID-19 infection within 9 months after a first dose of COVID-19 vaccine should complete the vaccine course.

Post vaccination observation period

- Those with no history of anaphylaxis: 15 minutes
- Those with a history of anaphylaxis from any cause: 30 minutes
- Those with immediate itching, swelling or urticarial reaction at the vaccination site: 30 minutes or longer as clinically indicated

Immunocompromised

Data are not currently available to establish vaccine safety or efficacy in these groups. Individuals with immunocompromise due to disease or treatment may be vaccinated if they have no contraindications.

See immunocompromised sections of mRNA vaccines re extension of primary vaccination series.

Pregnancy

This vaccine is not recommended for those aged under 50 years, including those with medical conditions with very high or high risk of severe COVID-19 disease.

See Precautions section for those who have received a first dose.

The vaccine may be considered for those with a contraindication or precaution to an mRNA vaccine (see Table 5a.3 and contraindications sections of mRNA vaccines).

Breastfeeding

There is no known reason for vaccinees to avoid breastfeeding.

Children and adolescents under 18 years of age

There are no data available on vaccine safety and efficacy in children.

Vaccination of those with bleeding disorders or on anticoagulants

Individuals with a bleeding disorder or receiving anticoagulant therapy may develop haematomas in IM injection sites. Prior to vaccination, inform the recipient about this risk. For those with thrombocytopenia (platelet count<$50x10^9$/L), consult the supervising consultant. People with mild bleeding disorders or on maintenance dose Emicizumab (Hemlibra®) do not

require haemostatic cover for vaccination. Details of haemostatic cover for all others can be found in the Patient Information tab at http://www.stjames.ie/services/hope/nationalcoagulationcentre

Those with inherited coagulopathies who require factor replacement therapy should receive it on the day of vaccination, prior to the IM vaccination.

If there is uncertainty about the need for replacement therapy, contact the patient's Comprehensive Care Centre.

Those receiving long-term anticoagulation with either Warfarin® or heparin are not considered to be at higher risk of bleeding complications following vaccination. There is no reason to expect that there is a greater risk of bleeding complications with the newer direct oral anticoagulants or antiplatelet agents, than with other anticoagulants.

People on Warfarin® should follow their usual schedule for international normalised ratio (INR) testing and can be vaccinated if it is less than 4.0. If the INR is 4.0 or more, follow the advice of the clinic/practice managing Warfarin® and wait until the INR is less than 4.0 to be vaccinated.

See Chapter 2, sections 2.4.6 and 2.4.7 for further information, including technique for IM injection, in this patient group.

Adverse reactions
A full list of adverse reactions may be found in the Summary of Product Characteristics (SmPC).

Terms used for frequency of adverse events

Very common:	>1/10
Common:	>1/100 and <1/10
Uncommon:	>1/1,000 and <1/100
Rare:	>1/10,000 and <1/1,000
Very rare:	<1/10,000

Local:	Very common: injection site bruising, pain, pruritus, tenderness, warmth
	Common: injection site erythema, swelling
	Uncommon: injection site haematoma
General:	Very common: arthralgia, chills, fatigue, feverishness, headache, malaise, myalgia, nausea
	Common: asthenia, diarrhoea, fever >38°C, influenza-like illness, pain in extremity, thrombocytopenia (asymptomatic), vomiting
	Uncommon: abdominal pain, decreased appetite, dizziness, hyperhidrosis, lethargy, lymphadenopathy, pruritus, somnolence, rash, urticaria

Very rare: Guillain-Barré syndrome, thrombosis with thrombocytopenia syndrome
(see Section 5a.4.2)
Unknown frequency: capillary leak syndrome
(see Section 5a.4.2)

Patients are asked to talk to their healthcare professionals before they are given Vaxzevria® if they previously had Guillain-Barré syndrome after being given Vaxzevria®.

The most frequent adverse reactions during clinical trials in those aged ≥18 years were injection site tenderness (>60%), fatigue, headache, injection site pain (50%), malaise, myalgia (>40%), chills, feverishness, pyrexia (>30%) and arthralgia and nausea (>20%).

A lower frequency of adverse events is associated with greater age. The rate and severity of local and systemic adverse reactions is lower after the second dose.

Post marketing surveillance in the UK has reported an anaphylaxis rate of 17/million (the figure includes anaphylactoid reactions). This rate is higher than after non COVID-19 vaccines.

Co-administration
COVID-19 vaccines and other vaccines may be administered at the same time or at any interval.

As it is not known if COVID-19 vaccine reactogenicity is increased with co-administration, vaccines should preferably be given in different limbs.

Duration of immunity
There is insufficient information to determine the duration of protection from the vaccine.

Protection starts from approximately three weeks after first dose of vaccine with 76% protection overall against symptomatic COVID-19 disease for up to 90 days (12 weeks). There is no evidence of significant waning of protection for up to 16 weeks after vaccination. Higher efficacy of 82% was reported when the second dose was given after 12 weeks.

Vaccine recipients may not have optimal protection until 15 days after the second dose, and the vaccine may not protect all vaccinees.

Vaccinated persons should continue to follow current public health guidance to protect themselves and others.

Booster doses
The need for, and timing of booster doses has not been established.

COVID-19 Vaccine Janssen®

This medicinal product is subject to additional monitoring. This will allow quick identification of new safety information. Healthcare professionals are asked to report any suspected adverse reactions to the HPRA.

The vaccine should be stored at +2°C to +8°C. Each pack contains 10 vials.

The vaccine does not require dilution.
After the first dose has been withdrawn, the vaccine should be used immediately. If not used, the vial can be maintained between 2° to 8°C for up to 6 hours or at room temperature (up to 25°C) for up to 3 hours. Discard the vial if vaccine is not used within these times.

Licensed indications
Active immunisation to prevent COVID-19 caused by SARS-CoV-2 virus, in individuals 18 years of age and older.

Vaccine efficacy
Clinical trial data demonstrated a vaccine efficacy against severe COVID-19 disease of 76.7% (95% confidence interval 54.6% to 89.1%) 14 days after vaccination, increasing to 85.4% (95% confidence interval 54.2% to 96.9%) 28 days in those aged 18 and above. High efficacy was observed across age and sex, and among persons with underlying medical conditions. This efficacy may not apply to all variants.

Dose and route of administration
The dose of vaccine is 0.5 ml IM, preferably into the deltoid muscle.

The course consists of one 0.5 ml dose.

If more than five 0.5ml doses can be safely and accurately withdrawn from a vial, they can be used as valid vaccines.

Interchangeability
The vaccine may be used as the second dose for a person who had anaphylaxis to an mRNA vaccine and the person should be considered fully vaccinated.

Contraindications (see Table 5a.4)

- Anaphylaxis (serious systemic allergic reaction requiring medical intervention) following a previous dose of the vaccine or any of its constituents (including polysorbate 80).
- Anaphylaxis following another adenoviral vector vaccine.
- Thrombosis with Thrombocytopenia Syndrome (TTS) after the first dose of another adenoviral vector COVID-19 vaccine (see Section 5a.4.2).
- Previous history of capillary leak syndrome (see Section 5a.4.2).

Appropriate support should be available in case of anaphylaxis or fainting after vaccine administration.

Precautions should be in place to minimise injury from fainting.

Precautions

- Acute severe febrile illness; defer until recovery.

- Consider mRNA vaccination for those with:
  - Anaphylaxis after a vaccine, injected antibody preparation, or a medicine known to contain polysorbate 80
  - Unexplained anaphylaxis (may indicate polysorbate 80 allergy).

If vaccination is advised, in a patient with prior anaphylaxis to an unrelated allergen, the patient should be observed for 30 minutes after vaccination.

mRNA vaccines are recommended for those aged **under 50 years** including those with medical conditions with very high or high risk of severe COVID-19 disease.

Healthy people aged 18-49 years may choose to avail of an earlier COVID-19 Vaccine Janssen® provided they have made an informed decision. This decision should be based on their understanding of the risk of developing TTS compared with the consequences of COVID-19 infection, the options of other effective public health measures and the benefits of a sooner vaccine.

Advice from a relevant specialist should be sought for a person with a history of an immediate severe allergic reaction to multiple drug classes with no identified allergen, any other vaccine injected antibody preparation or medicine likely to contain polysorbate 80 or idiopathic anaphylaxis and the risks should be weighed against the benefits of vaccination.

Patients with planned immunosuppressing therapy should ideally receive vaccination two weeks before treatment. Specialists should consider the individual's risk and likelihood of disease exposure, and provide advice based on knowledge and understanding of the patient's immune status and likely immune response to vaccination.

Vaccination after COVID-19
Those with persisting symptoms post COVID-19 may be vaccinated, unless there is evidence of recent clinical deterioration.

Vaccination should be deferred until clinical recovery from COVID-19 infection and for at least four weeks after diagnosis or onset of symptoms, or four weeks from the first PCR positive specimen in those who are asymptomatic.

Those aged under 65 years and immunocompetent
Vaccination may be deferred for up to nine months after diagnosis, symptom onset, or from the first PCR or antigen positive specimen.

Post vaccination observation period
- Those with no history of anaphylaxis: 15 minutes
- Those with a history of anaphylaxis from any cause: 30 minutes
- Those with immediate itching, swelling or urticarial reaction at the vaccination site: 30 minutes or longer as clinically indicated

Immunocompromised
Data are not currently available to establish vaccine safety and efficacy in these groups. Individuals with immunosuppression due to disease or treatment may be vaccinated if they have no contraindications.

See immunocompromised sections of mRNA vaccines re extension of primary vaccination series.

Pregnancy
This vaccine is not recommended for pregnant women including those with medical conditions with very high or high risk of severe COVID-19 disease.

The vaccine may be considered for those with a contraindication or precaution to an mRNA vaccine (see Table 5a.3 and contraindications sections of mRNA vaccines).

Breastfeeding
There is no known reason for vaccinees to avoid breastfeeding. Breastfeeding mothers should be vaccinated according to their risk grouping.

Children and adolescents under 18 years of age
There is no data available on vaccine safety and efficacy in children.

Vaccination of those with bleeding disorders or on anticoagulants
Individuals with a bleeding disorder or receiving anticoagulant therapy

may develop haematomas in IM injection sites. Prior to vaccination, inform the recipient about this risk. For those with thrombocytopenia (platelet count<50x10^9/L), consult the supervising consultant. People with mild bleeding disorders or on maintenance dose Emicizumab (Hemlibra®) do not require haemostatic cover for vaccination. Details of haemostatic cover for all others can be found in the Patient Information tab at http://www.stjames.ie/services/hope/nationalcoagulationcentre

Those with inherited coagulopathies who require factor replacement therapy should receive it on the day of vaccination, prior to the IM vaccination.
If there is uncertainty about the need for replacement therapy, contact the patient's Comprehensive Care Centre.

Those receiving long-term anticoagulation with either Warfarin® or heparin are not considered to be at higher risk of bleeding complications following vaccination. There is no reason to expect that there is a greater risk of bleeding complications with the newer oral anticoagulants or antiplatelet agents, than with other anticoagulants.

Those on Warfarin® should follow their usual schedule for international normalised ratio (INR) testing and can be vaccinated if it is less than 4.0. If the INR is 4.0 or more, follow the advice of the clinic/practice managing Warfarin® and wait until the INR is less than 4.0 to be vaccinated.

See Chapter 2, sections 2.4.6 and 2.4.7 for further information, including technique for IM injection, in this patient group.

Adverse reactions
A full list of adverse reactions may be found in the Summary of Product Characteristics (SmPC).

Terms used for frequency of adverse events

Very common:	>1/10
Common:	>1/100 and <1/10
Uncommon:	>1/1,000 and <1/100
Rare:	>1/10,000 and <1/1,000
Very rare:	<1/10,000

Local:	Very common: injection site pain Common: injection site erythema, swelling
General:	Very common: fatigue, headache, myalgia, nausea Common: arthralgia, chills, cough, pyrexia Uncommon: asthenia, back pain, diarrhoea, hyperhidrosis, malaise, muscular weakness, oropharyngeal pain, pain in extremity, paraesthesia, rash, sneezing, tremor Rare: hypersensitivity, hypoesthesia, lymphadenopathy, tinnitus, urticaria, vomiting

Very rare: thrombosis with thrombocytopenia, Guillain-Barré syndrome (see Section 5a.4.2).
Unknown frequency: capillary leak syndrome (see Section 5a.4.2)

The most frequent adverse reactions during clinical trials in those aged ≥18 years were injection site pain (> 40%), fatigue, headache, myalgia (> 30%), nausea (>10%) and fever (9%). A lower frequency and severity of adverse events was associated with greater age.

Co-administration
COVID-19 vaccines and other vaccines may be administered at the same time or at any interval.

As it is not known if COVID-19 vaccine reactogenicity is increased with co-administration, vaccines should preferably be given in different limbs.

Duration of immunity
There is insufficient information to determine the duration of protection from the vaccine.

Vaccinated persons should continue to follow all current public health guidance to protect themselves and others.

Clinical trial follow-up is ongoing to determine the duration of protection from the vaccine.

Booster doses
The need for, and timing of booster doses has not been established.

COVID-19 vaccination outside Ireland

Those who have documentary evidence of a complete COVID-19 vaccination course with a COVID-19 vaccine authorised by the FDA, MHRA or recommended by WHO should be considered fully vaccinated.

Those who have partially completed a COVID-19 vaccine course with a vaccine authorised by the FDA, MHRA or recommended by WHO should be offered an EMA authorised COVID-19 vaccine to complete the series, and then should be considered fully vaccinated. The minimum interval between the last vaccine dose and an EMA authorised COVID-19 vaccine is 28 days.

Those who have received a partial or complete course of COVID-19 vaccine not authorised by the FDA, MHRA or recommended by WHO should be offered a complete course of an EMA authorised COVID-19 vaccine. The

minimum interval between the last dose and an EMA authorised COVID-19 vaccine is 28 days.

5a.6 Post-marketing surveillance (Pharmacovigilance)

The HPRA is responsible for managing the national pharmacovigilance system. The HPRA reports nationally occurring adverse reactions to the EMA. Adverse reaction reporting is an important part of the EMA intensive monitoring plan for COVID-19 vaccines, so that any changes in benefit risk balance can be promptly detected and acted upon. This enables the EMA to continue to safeguard public health safety.

Healthcare professionals and members of the public are encouraged to report suspected adverse reactions to the HPRA following the instructions available on the HPRA website www.hpra.ie

Bibliography

Andersen EJ et al (2020). Safety and Immunogenicity of SARS-CoV-2 mRNA-1273 Vaccine in Older Adults. NEJM
https://www.nejm.org/doi/full/10.1056/NEJMoa2028436

Barda N et al (2021). Safety of the BNT162b2 mRNA Covid-19 Vaccine in a Nationwide Setting. NEJM https://www.nejm.org/doi/full/10.1056/NEJMoa2110475

Boehmer TK et al. (2021). Association Between COVID-19 and Myocarditis Using Hospital-Based Administrative Data — United States, March 2020–January 2021. MMWR Morb Mortal Wkly Rep 2021;70:1228–1232. DOI: http://dx.doi.org/10.15585/mmwr.mm7035e5external icon

Buddy Creech et al (2021). SARS-CoV-2 vaccines. JAMA
https://jamanetwork.com/journals/jama/fullarticle/2777059

Buonseno et al. (2021). Preliminary Evidence on Long COVID in children Acta Paediatr. 110(7): 2208–2211. Epub 2021 Apr 18. doi: 10.1111/apa.15870

Centers for Disease Control and Prevention (2020). People with certain medical conditions
https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html

Centers for Disease Control and Prevention (2021). Interim Clinical Considerations for Use of mRNA COVID-19 Vaccines Currently Authorized in the United States
https://www.cdc.gov/vaccines/covid-19/info-by-product/clinical-considerations.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvaccines%2Fcovid-19%2Finfo-by-product%2Fpfizer%2Fclinical-considerations.html#CoV-19-vaccination

Centers for Disease Control and Prevention (2021). Allergic Reactions Including Anaphylaxis After Receipt of the First Dose of Pfizer-BioNTech COVID-19 Vaccine — United States, December 14–23, 2020
https://www.cdc.gov/mmwr/volumes/70/wr/mm7002e1.htm

Centers for Disease Control and Prevention (2021). Allergic Reactions Including Anaphylaxis After Receipt of the First Dose of Moderna COVID-19 Vaccine — United States, December 21, 2020–January 10, 2021
https://www.cdc.gov/mmwr/volumes/70/wr/mm7004e1.htm

Centers for Disease Control and Prevention (2021).SARS-CoV-2 Variant Classifications and Definitions
https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/variant-surveillance/variant-info.html#Concern

Centers for Disease Control and Prevention (2021). ACIP Presentation Slides: April 23, 2021 Meeting https://www.cdc.gov/vaccines/acip/meetings/slides-2021-04-23.html

Centers for Disease Control and Prevention (2021). ACIP Presentation Slides: June 23, 2021 Meeting https://www.cdc.gov/vaccines/acip/meetings/slides-2021-06.html

Cerqueira-Silva T et al (2021). Influence of age on the effectiveness and duration of protection in Vaxzevria and CoronaVac vaccine. medRxiv (preprint).
https://www.medrxiv.org/content/10.1101/2021.08.21.21261501v2

Cheng HY et al (2020). Contact Tracing Assessment of COVID-19 Transmission Dynamics in Taiwan and Risk at Different Exposure Periods Before and After Symptom Onset. JAMA Intern Med 180(9):1156-1163.
https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2765641

Clift AK et al (2020). COVID-19 Mortality Risk in Down Syndrome: Results From a Cohort Study Of 8 Million Adults. Ann Int Med.
https://www.acpjournals.org/doi/10.7326/M20-4986

Dagan N et al (2021). BNT162b2 mRNA Covid-19 Vaccine in a Nationwide Mass Vaccination Setting. NEJM 2021 Feb 24. doi: 10.1056/NEJMoa2101765.

Department of Health (2020). Ethical framework to decision making in a pandemic
https://www.gov.ie/en/publication/dbf3fb-ethical-framework-for-decision-making-in-a-pandemic/

European Centre for Disease Control (2021). Risk related to the spread of new SARS-CoV-2 variants of concern in the EU/EEA – first update.
https://www.ecdc.europa.eu/sites/default/files/documents/COVID-19-risk-related-to-spread-of-new-SARS-CoV-2-variants-EU-EEA-first-update.pdf

European Medicines Agency (2021). AstraZeneca's COVID-19 vaccine: benefits and risks in context.
https://www.ema.europa.eu/en/news/astrazenecas-covid-19-vaccine-benefits-risks-context

Fabricius D et al (2021). mRNA Vaccines Enhance Neutralizing Immunity against SARS-CoV-2 Variants in Convalescent and ChAdOx1-Primed Subjects. Vaccines.
https://www.mdpi.com/2076-393X/9/8/918

He J et al (2020). Proportion of asymptomatic coronavirus disease 2019: A systematic review and meta-analysis. J Med Virol. https://europepmc.org/article/pmc/pmc7404334

Health Protection Surveillance Centre (2020). Epidemiology of COVID-19 in Ireland.
https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/casesinireland/epidemiologyofcovid-19inireland/

Health Protection Surveillance Centre (2021). Variants of Concern (VOC): Interim guidance for Clinicians, Hospitals and Public Health.
https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/sars-cov-2variantsofconcern/Variants_guidance.pdf

Health Protection Surveillance Centre (2021). Summary of COVID-19 virus variants in Ireland.
https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/surveillance/summaryofcovid-19virusvariantsinireland

Health Service Executive (2020). The National Renal Office position on provision of COVID 19 vaccine to patients with End Stage Kidney Disease (ESKD) 09/12/2020
https://www.hse.ie/eng/about/who/cspd/ncps/renal/resources/covid-19-vaccine-for-patients-with-end-stage-kidney-disease-eskd.pdf

Health Service Executive (2021). Communication to Healthcare Professionals: reports of myocarditis/pericarditis after mRNA COVID19vaccination. https://www.hse.ie/eng/health/immunisation/hcpinfo/covid19vaccineinfo4hps/prog1215/risk-myocarditis-or-pericarditis-post-covid19-mrna-vaccination.pdf

HIQA (2020). Evidence summary of potential for children to contribute to transmission of SARS-CoV-2
https://www.hiqa.ie/sites/default/files/2020-08/Evidence-Summary-for-spread-of-Covid-19-by-children-.pdf

HIQA (2020). Evidence-summary-for-airborne-transmission-of-SARS-CoV-2-via-aerosols
https://www.hiqa.ie/reports-and-publications/health-technology-assessment/evidence-summary-airborne-transmission-sars

HIQA (2021). Duration of protective immunity (protection from reinfection) following SARS-CoV-2 infection
https://www.hiqa.ie/reports-and-publications/health-technology-assessment/duration-protective-immunity-protection

Health Service Executive (2020). The National Renal Office position on provision of COVID 19 vaccine to patients with End Stage Kidney Disease (ESKD) 09/12/2020
https://www.hse.ie/eng/about/who/cspd/ncps/renal/resources/covid-19-vaccine-for-patients-with-end-stage-kidney-disease-eskd.pdf

Immunization Action Coalition (2021). Ask The Experts-COVID-19.
https://www.immunize.org/askexperts/experts_cov.asp#recommendations

Knoke L et al. (2021). More complaints than findings - Long-term pulmonary function in children and adolescents after COVID-19
https://www.medrxiv.org/content/10.1101/2021.06.22.21259273v1.full.pdf

Logunov D et al (2021). Safety and efficacy of an rAd26 and rAd5 vector-based heterologous prime-boost COVID-19 vaccine: an interim analysis of a randomised controlled phase 3 trial in Russia. The Lancet.
https://doi.org/10.1016/S0140-6736(21)00234-8

Lopez Bernal J et al. (2021) Effectiveness of COVID-19 vaccines against the B.1.617.2 variant. medRxiv preprint doi: https://doi.org/10.1101/2021.05.22.21257658 posted May 24 2021

Lopez-Leon S et al (2021). More than 50 Long-term effects of COVID-19: a systematic review and meta-analysis. medRxiv. (Preprint)
https://www.medrxiv.org/content/10.1101/2021.01.27.21250617v2

Ludvigsson J (2020). Case report and systematic review suggest that children may experience similar long-term effects to adults after clinical COVID-19 17 November 2020 Acta Paediatr. 2021; 110:914–921. https://doi.org/10.1111/apa.15673

Medical and Healthcare products Regulatory Agency (2021). Coronavirus vaccine - weekly summary of Yellow Card reporting
https://www.gov.uk/government/publications/coronavirus-covid-19-vaccine-adverse-reactions/coronavirus-vaccine-summary-of-yellow-card-reporting
Moderna (2020). COVID-19 vaccine(mRNA-1273)
www.modernatx.com/sites/default/files/content_documents/mRNA-1273-Update-11-16-20-Final.pdf

Ogimi C et al (2019). Characteristics and Outcomes of Coronavirus Infection in Children: The Role of Viral Factors and an Immunocompromised State. J Pediatric Infect Dis Soc. 28;8(1).
https://academic.oup.com/jpids/article/8/1/21/4856016?login=true

Oran DP, Topol E. (2021). The proportion of SARS-CoV-2 infections that are asymptomatic. Annals of Internal Medicine. https://www.acpjournals.org/doi/10.7326/M20-6976t

Osmanov IM et al. (2021).Risk factors for long covid in previously hospitalised children using the ISARIC Global follow-up protocol: A prospective cohort study
https://erj.ersjournals.com/content/early/2021/06/10/13993003.01341-2021

Public Health England (2021). COVID-19 vaccination programme. Information for healthcare practitioners
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/999527/COVID-19_vaccination_programme_guidance_for_healthcare_workers_6July2021_v3.9.pdf

Radtke T et al. (2021). Long-term Symptoms After SARS-CoV-2 Infection in Children and Adolescents JAMA. https://jamanetwork.com/journals/jama/fullarticle/2782164

Vasileiou E et al (2021). Interim findings from first dose mass Covid-19 vaccination roll-out and Covid-19 hospital admissions in Scotland: a national prospective cohort study.
https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)00677-2/fulltext

Vasileiou E et al. Effectiveness of first dose of COVID-19 vaccines against hospital admissions in Scotland: national prospective cohort study of 5.4 million people
(preprint available at
https://ssrn.com/abstract=3789264 accessed 05.03.2021)

Voysey M Costa Clemen SA et al. (2020). Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomised controlled trials in Brazil, South Africa, and the UK. Lancet
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7723445/pdf/main.pdf

Voysey, M et al. (2021) Oxford COVID Vaccine Trial, Single dose administration and the influence of the timing of the booster dose on immunogenicity and efficacy of ChAdOx1 nCoV-19 (AZD1222) vaccine.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3777268

Walsh EE et al.(2020). Safety and Immunogenicity of Two RNA-Based Covid-19 Vaccine Candidates NEJM
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7583697/

Wang B, et al. (2020). Does comorbidity increase the risk of patients with Covid-19: Evidence from meta-analysis. Aging. https://pubmed.ncbi.nlm.nih.gov/32267833/

WHO (2020). Draft landscape of Covid-19 candidate vaccines
https://www.who.int/publications/m/item/draft-landscape-of-covid-19-candidate-vaccines

WHO (2020). SAGE roadmap for prioritizing uses of covid-19 vaccines in the context of limited supply
https://www.who.int/publications/m/item/who-sage-roadmap-for-prioritizing-uses-of-covid-19-vaccines-in-the-context-of-limited-supply

WHO (2020). SAGE values framework for the allocation and prioritization of COVID-19 Vaccination https://apps.who.int/iris/handle/10665/334299

Zhang J, et al (2020). Associations of hypertension with the severity and fatality of SARS-CoV-2 infection: a meta-analysis. Epidemiol Infect.148.
https://doi.org/10.1017/S095026882000117X