# Evidence check

28 April 2021

Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

## Immunocompromised patients and COVID-19 vaccines

### Evidence check question

What is the evidence on COVID-19 vaccination for immunocompromised patients including risks and adverse events, efficacy and advice from professional colleges?

### In brief

- Evidence on COVID-19 vaccination in immunocompromised patients is limited. Small studies suggest that immunosuppression may be associated with attenuated immune response to SARS-CoV-2 in some patients after the first (1-3) and second vaccine dose.(4-7)
    - A pre peer review publication in haemodialysis patients showed dialysis patients had significantly lower SARS-COV-2 S antibody titres than healthy control patients 21 days after vaccination with BNT162b2.(5)
    - Three studies (including one pre peer review) in kidney transplant recipients found immunocompromised patients have a weaker anti-SARS-CoV-2 antibody response after vaccination.(2, 3, 7)
    - A study of solid organ transplant recipients observed expected, typically mild, minimal peri vaccine reactogenicity after the first dose, similar to reported rates in non-organ transplant recipients.(3)
    - In patients with chronic inflammatory diseases, messenger ribonucleic acid (mRNA) vaccines result in development of antibodies without considerable side effects or induction of disease flares, however immunoglobulin G titres were significantly lower compared with controls.(6)
    - In patients with rheumatic and musculoskeletal diseases, most participants (74%) had detectable anti-SARS-CoV-2 antibodies; however, patients on regimens including mycophenolate or rituximab were less likely to develop an antibody response.(8)
- One systematic review found inclusion of people with immunocompromised kidney disease in completed and ongoing COVID-19 vaccine trials was very low (6.5%) thus, vaccine immunogenicity is largely unknown.(9)



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- Other articles included in this evidence check are mainly based on experience with vaccinations for other infectious diseases such as influenza, and on expert consensus from international professional societies.(13-17)
- The World Health Organization currently advises that it is safe to vaccinate immunocompromised patients with the Pifzer-BioNTech (BNT162b2) vaccine, Moderna mRNA-1273 vaccine, and AstraZeneca AZD1222 vaccine.(15)
- Expert consensus from international professional societies generally recommends vaccination for immunocompromised patients, as they are at increased risk of severe COVID-19 infection and benefits likely outweigh harms. Vaccination response may be reduced compared to non-immunocompromised people.(17, 19-25)
- Inactivated, nucleic acid and protein subunit vaccines are considered safe, while special considerations are needed for live-attenuated vaccines. Non-replicating and replicating viral vector-based vaccines are considered safe by some professional groups, however a literature review concluded special considerations are needed for this type of vaccine.(23)
- Vaccination does not replace the need for other public health measures such as physical distancing.(27-30)

## Recommendations for specific patient groups

- Cancer: professional societies internationally recommend cancer patients, including those receiving active treatment, to be prioritised for vaccination. For patients undergoing certain therapy specific recommendations on timeframes between treatment and vaccination are suggested, including three months after haematopoietic cell transplantation or cell therapy, after the recovery of absolute neutrophil count for those receiving intensive cytotoxic chemotherapy, vaccinate before immunosuppressive chemotherapy, and whenever the vaccine becomes available for patients with solid tumour malignancies receiving cytotoxic chemotherapy, targeted therapy, checkpoint inhibitors and other immunotherapy, and radiation therapy.(31-37)
- Inflammatory bowel disease: vaccination should be prioritised as benefits are likely to outweigh harms. Inactivated vaccines, such as mRNA, are safer than live-attenuated vaccine.(35-37)
- Kidney disease: most candidates (93.5%) with immunocompromised kidney disease were unqualified for participation in COVID-19 vaccine trials, so the vaccine immunogenicity is not well understood.(9) Guidance and recommendations regarding efficacy and timing of vaccination mainly rely on evidence from other vaccines.(27, 38) A recent cohort study found that the anti-SARS-CoV-2 antibody titres in haemodialysis patients were significantly lower than those healthy participants after the second vaccination.(5)
- Liver diseases: vaccination is recommended to be given to patients prior to liver transplant or three to six months after. Success of vaccination depends on the staging of chronic liver disease at the time of immunisation.(28, 38-40)
- Multiple sclerosis: reduced vaccine responses are expected, window period for vaccination in patients receiving B cell-depleting therapies, such as Alemtuzumab, should be optimised in consultation with treating physicians.(2, 3) A case study reported the attenuated immune response to SARS-CoV-2 in a patient with relapsing-remitting multiple sclerosis after two doses of Pfizer vaccination.(4)
- Neuromuscular disorders: potential for reduced efficacy of vaccination, however benefits likely to outweigh risks.(42)

- Rheumatic diseases: the German Society for Rheumatology recommends not to discontinue or delay anti-rheumatic therapies in patients with well-controlled disease, while the Australian Rheumatology Association has provided the guidelines for surgery and vaccination is best to defer after rituximab infusion as advised by the individual's rheumatologist.(13, 46) A prospective study showed that certain lymphocyte-modulating therapies were associated with diminished humoral vaccine response to SARS-CoV-2 in immunocompromised rheumatic patients.(8) A survey of patients found the response to the first dose of COVID-19 mRNA vaccine was generally localised and mild.(44)
- Transplant: guidance generally supports the benefits of vaccination and recommends adjustment to treatment agents for kidney transplantation.(15, 16) Two studies found that immunosuppression may be associated with a weaker anti-SARS-CoV-2 antibody response in kidney transplant recipients after the first mRNA vaccine dose.(1, 2) In another study, transplant recipients mainly experienced mild adverse events after receiving the first dose of mRNA vaccine.(3)

## Limitations

Currently available evidence on this topic is low quality and based on one systematic review, eight small studies and multiple commentaries. Evidence is continuing to emerge on these patients. Guidance on vaccinating immunocompromised people should be interpreted in the context of individual disease staging and underlying comorbidities. The literature search strategy for this evidence check focused on immunosuppression, but not on individual conditions.

## Background

To date, 13 vaccines have been registered in one or more countries, including two in Australia.(47, 48) COVID-19 vaccine studies are still emerging, however the immune response and efficacy of protection against SARS-CoV-2 among the immunosuppressive or immunocompromised population remain unknown.(50) Immunocompromised individuals are often excluded from participating in the vaccine clinical trials due to the risk of potential immune dysregulation inherent to their disease or the immunosuppressive therapy.(9, 50) Guidance on the safety and effectiveness of COVID-19 vaccines for these people often relies on past experiences with other well-known vaccines such as influenza and polio, and a careful risk assessment weighing the benefits and harms of vaccination for the individual.(50) Moreover, vaccine immunogenicity may not yield protection or sustained immune responses in some immunocompromised people.(1, 6, 9, 38, 50)

## Methods

PubMed and Google Scholar were searched on 10 March 2021. Six additional studies published after this date were included on the 30 March 2021. Of these six, five studies were identified through the Critical Intelligence Unit Daily Evidence Digest process and one study was found during expert review. These were included after the initial review date as they reported on empirical data in this cohort of patients.

## Results

**Table 1**a. Peer reviewed sources: Cancer

| Source | Summary |
|---|---|
| **Peer reviewed sources** | |
| SARS-CoV-2 vaccination and phase 1 cancer clinical trials<br>Yap, et al. 2021 (50) | • Commentary<br>• Describes the potential effects of anticancer drugs (in the context of clinical trials) on the efficacy and toxic effects of COVID-19 vaccines.<br>• The efficacy of SARS-CoV-2 vaccines is likely to vary between patients depending on cancer type, disease burden, comorbidities, and intrinsic or therapy-induced immunosuppression.<br>• Drawing on other respiratory illness and international expertise, two recommendations were made.<br>  ○ 'Avoid starting trial investigational medicinal product until 2-4 weeks after the second dose of SARS-CoV-2 vaccine is administered safely for trial investigational medicinal product with cytokine release syndrome risk.'<br>  ○ 'Administer SARS-CoV-2 vaccine during the phase 1 trial but avoid vaccination on days of parenteral investigational medicinal product dosing and the dose-limiting toxicity period.'<br>• Further data are needed to address concerns regarding the effects of malignancies and anticancer drugs on vaccine efficacy. |
| Challenges and opportunities for COVID-19 vaccines in patients with cancer<br>Kuderer, et al. 2021 (51) | • Commentary<br>• Describes the efficacy and safety of the two mRNA-based vaccines, BNT162b2 and mRNA-1273, in cancer patients.<br>• Among the completed trials and ongoing trials reporting interim results, there is extremely limited information related to the safety and efficacy of SARS-CoV-2 vaccines in patients with active cancer or receiving cancer treatment. The limit is due to the eligibility restrictions often imposed on pivotal studies for regulatory approval of new therapies.<br>• Three American oncology professional organisations recommend cancer patients, including those receiving active therapy, be prioritised for vaccination.(31, 33, 37) |

| Source | Summary |
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| **Peer reviewed sources** | |
| | • Further research is needed to assess the efficacy of SARS-CoV-2 vaccines in these patients. |
| COVID-19, the future vaccine and what it means for cancer patients on immunotherapy<br><br>El-Shakankery, et al. 2021 (52) | • Commentary<br>• Reviews the role of T cells in vaccination, immunotherapy, and COVID-19 vaccination.<br>• One study comprehensively summarised available information relating to the controversial use of immune checkpoint inhibitors in cancer patients with viral infections, including COVID-19. Evidence shows immune checkpoint inhibitors should not be considered highly immunosuppressive and their use is not an independent risk factor for COVID-19 susceptibility.<br>• Studies investigating the interaction between immunotherapy and coronaviruses are not available and effects of immunisation on cancer patients are still unknown. |
| COVID-19 and cancer: From basic mechanisms to vaccine development using nanotechnology<br><br>Han, et al. 2021 (54) | • Review<br>• Describes the clinical perspectives and association between COVID-19 and cancer, and the vaccine development using nanotechnology.<br>• Cancer patients are more vulnerable to SARS-CoV-2, in particular those with blood malignancies such as leukaemia, myelomas, lymphomas and aplastic anaemia due to an alternated immune system.<br>• Previous studies concern the safety of using live attenuated vaccines in cancer and immunocompromised patients due to the possible reactivation of virus that could lead to an infection.<br>• To make the non-live virus-based vaccines more effective, the application of nano-based formulations suggests several advantages. Advantages include reduced adverse effects, controlled kinetic release, site specific delivery of antigens, improved intracellular uptakes, and enhanced immunity. However results are based on an unreported number of SAR-CoV-2 nano-based vaccine participants and are yet to be affirmed in future studies.<br>• Conclusion: proposed nano-based vaccine formulations could be vital in reducing the adverse effects and improve |

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| **Peer reviewed sources** | |
| | the efficacy of COVID-19 vaccines in cancer patients with altered immune responses. |
| COVID-19 vaccination options for immunosuppressed cancer patients<br>Dwipayana, et al. 2021 (23) | • A literature review of 13 articles on COVID-19 vaccination options for immunosuppressed cancer patients.<br>• Generally, vaccine should be administered prior to immunosuppressive chemotherapy.<br>• Inactivated vaccines should be administered two weeks prior to, or three months after, completion of immunosuppressive therapy.<br>• Live-attenuated vaccines<br>  ○ Generally contraindicated until the patient regained immune competency.<br>  ○ Can be administered four weeks prior to immunosuppressive therapy and at least three months after cessation of therapy.<br>  ○ For patients undergoing chimeric antigen receptor T cell therapy, live vaccines may be contraindicated for at least 6-12 months after treatment is completed.<br>• Conclusion: immunosuppressed cancer patients may be vaccinated with inactivated, nucleic acid and protein subunit vaccines. Special considerations are needed for live-attenuated, non-replicating and replicating viral vector-based vaccines. |
| SARS-CoV-2 vaccines in patients with multiple myeloma<br>Gavriatopoulou, et al. 2021 (54) | • Commentary<br>• Patients with multiple myeloma are at a higher risk of severe COVID-19.<br>• Vaccination against SARS-CoV-2 is highly recommended if not contraindicated.<br>• mRNA vaccines are safer than live attenuated vaccines in these patients although the efficacy of vaccination is unknown. |
| The SIOG COVID-19 working group recommendations on the rollout of COVID-19 vaccines among older adults with cancer<br>Mislang, et al. 2021 (24) | • Letter<br>• Older adults with cancer are often excluded from vaccine trials.<br>Recommendations |

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| **Peer reviewed sources** | |
| | • Vaccination should be prioritised and based on the risk-benefit assessment.<br>• Older patients receiving anticancer therapy may be vaccinated when the bone marrow function has recovered, and a few days before the next cycle to minimise any potential side effects from the treatment.<br>• Continue to practise precautionary measures such as physical distancing and hand hygiene. |
| COVID-19 vaccines for patients with cancer: benefits likely outweigh risks<br>Hwang, et al. 2021 (25) | • Review<br>• Summary of data from COVID-19 vaccine development and vaccination of patients undergoing immunomodulatory cancer treatments.<br>Recommendations<br>• Live vaccines are generally not recommended in patients undergoing targeted, cytotoxic, or lymphodepleting therapies.<br>• International consensus supports the benefits of vaccination are likely outweigh risks.<br>• Caregivers should be vaccinated.(31, 32, 37)<br>• All vaccine recipients continue to practise precautionary measures, e.g. social distancing, hygiene, and mask wearing.<br>• Establish a national registry to monitor clinical trials and efficacy of vaccine. |

**Table 1b. Peer reviewed sources: Immunocompromised patients generally**

| Source | Summary |
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| **Peer reviewed sources** | |
| COVID-19 vaccination in immunocompromised patients<br>Sonani, et al. Jan 2021 (19) | • Commentary<br>• Describes the two mRNA-based vaccines, BNT162b2 and mRNA1273, and how immunocompromised patients were excluded from these vaccine trials, so we have unknown vaccine efficacy in these patients.<br>• Medications such as rituximab and methotrexate can suppress the production of neutralising antibodies to |

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| **Peer reviewed sources** | |
| | neoantigens and have been shown to reduce humoral responses to seasonal influenza and pneumococcal vaccines. Previously, the seasonal influenza vaccine has been shown to be significantly improved by temporarily discontinuing methotrexate for two weeks post-vaccination.<br>• The effects of immunosuppressive medications, especially methotrexate and rituximab, on a SARS-CoV-2 vaccine response are yet to be determined.<br>• Planning the COVID-19 vaccination of immunocompromised patients to ensure maximum possible seroprotection will be needed, and considerations can be given to hold methotrexate for two weeks after the vaccination, and scheduling rituximab a few weeks after the vaccination until further clinical trials can answer this question. |
| Immunosuppressants, immunomodulators and COVID-19 vaccines: anticipating patient concerns<br>Rick, et al. 2021 (18) | • Commentary<br>• Describes the interactions of immunomodulators and immunosuppressants on the adaptive immune cascade after administration of mRNA1273 vaccine (Moderna, NIAID, BARDA).<br>• Some considerations for COVID-19 vaccination in patients treated with immunomodulators or immunosuppressants are as follows.<br>o Live-attenuated vaccines are avoided in immunosuppressed patients.<br>o Given that mRNA-based vaccines only encode for specific antigenic epitopes, and not the infectious elements of SARS-CoV-2, they are not contraindicated in these patients.<br>o It is believed that many immunomodulators allow for an appropriate host response to vaccination.<br>o Based on previous studies on non-COVID-19 vaccines, mRNA vaccines are likely to behave similarly to other recombinant or subunit vaccines in these patients.<br>Recommendations |

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| **Peer reviewed sources** | |
| | • mRNA COVID-19 vaccination should be recommended to all patients receiving immunosuppressants or immunomodulators.<br>• Most patients should continue their oral or biologic therapies during the vaccination period, patients on immunosuppressants, such as methotrexate and cyclosporine, should consult their physician before vaccination.<br>• The impact of holding methotrexate to boost vaccine efficacy remains unclear and flare up of disease during drug cessation should be considered.<br>• Build registries and large-scale collaborations to monitor the efficacy and long-term safety of mRNA vaccines in these patients. |
| COVID-19 vaccine-readiness for anti-CD20-depleting therapy in autoimmune diseases<br>Baker, et al. 2020 (22) | • Commentary<br>• Describes the pathobiology of COVID-19, and the association between CD20-B cell-depleting agents and COVID-19-related vaccine responses.<br>• Evidence has suggested that CD20-B cell-depleting agents do not expose people to life-threatening COVID-19 as B cell depletion is unlikely to influence the vascular pathology and hypercoagulopathy in COVID-19 that contribute to the acute respiratory distress syndrome, cardiovascular, cerebrovascular and other non-pulmonary morbidities.<br>• Live and attenuated viruses remain contraindicative in immunosuppressed people, leaving SARS-CoV-2 DNA- or RNA-based vaccines the next option. However future research is yet to determine the vaccine responses in patients with autoimmune diseases. |
| SARS-CoV-2 vaccine development: An overview and perspectives<br>Liu, et al. 2020 (21) | • An overview of the various SARS-CoV-2 vaccine development and their use in patients with pre-existing comorbid conditions and those who are taking immunosuppressive medications.<br>• To date, three main types of SARS-CoV-2 vaccines are available for administration. Whole-virus (live-attenuated or inactivate), viral protein-based (subtype protein and peptide-based) and nucleic acid-based (DNA- or RNA-based) vaccines, all provide durable protection against a |

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| **Peer reviewed sources** | |
| | variety of diseases by directly mimicking the natural infection without causing the disease.<br>• Whole virus vaccines have inherent immunogenicity and ability to stimulate toll-like receptors. However, it may be problematic to estimate the safety of these vaccines, especially in immunosuppressed patients.<br>• Viral protein-based vaccines only contain the essential antigens related to infection, so the side effects are milder than whole-virus vaccines. No comments on its implementation in cancer patients and those taking immunosuppressive therapies.<br>• Nucleic acid-based vaccines initiate the endogenous production of viral antigens that mimic the natural pathogenic infection. DNA- or RNA-based vaccines such as mRNA have been found to induce both cytotoxic T cell response responses and antibody responses to diverse antigens. The efficacy of mRNA vaccines in diverse populations is still not fully understood, prompting the need for further research. |
| Immunogenicity and safety of anti-SARS-CoV-2 mRNA vaccines in patients with chronic inflammatory conditions and immunosuppressive therapy in a monocentric cohort<br>Geisen, et al. 2021 (6) | • This cohort study evaluated the efficacy and safety of anti-SARS-CoV-2 mRNA vaccines in 26 immunosuppressed patients with various chronic inflammatory diseases and 42 health care professionals.<br>• Five patients were immunised with Moderna while others received BioNtech/Pfizer with an interval of 35 days between the two doses.<br>• Results<br>  ○ Antibodies and anti-SARS-CoV-2 Immunoglobulin G were detected in all participants after the second vaccination. They all presented with an antibody titre above the enzyme-linked immunosorbent assay cut-off.<br>  ○ Patients with chronic inflammatory disease have significantly lower levels of immunoglobulins against the SARS-CoV-2 spike protein seven days after the second dose.<br>  ○ Inflammatory disease activity remained stable throughout the six weeks study period. No patient |

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| **Peer reviewed sources** | |
| | needed to adjust disease modifying anti-rheumatic drug or glucocorticoid therapy.<br>• Conclusion: strongly recommend vaccination in immunosuppressed patients however, anti-SARS-CoV-2 antibodies should be monitored after vaccination since the antibody titre persistency is uncertain in this small cohort of non-randomised participants. |

**Table 1**c. Peer reviewed sources: Inflammatory bowel disease

| Source | Summary |
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| **Peer reviewed sources** | |
| Winter is coming! Clinical, immunologic, and practical considerations for vaccinating patients with inflammatory bowel disease during the coronavirus disease-2019 pandemic<br>Melmed, et al. 2021 (29) | • Commentary<br>• Describes key aspects on preparing patients with inflammatory bowel disease for influenza season during the COVID-19 pandemic.<br>• Studies have shown that vaccine efficacy may be blunted by immunomodulators, some biologics, and corticosteroids however, partial protection is better than none. Therefore, vaccines should not be withheld just because a patient is receiving immunosuppressive treatment for their inflammatory bowel disease.<br>• Predictors of efficacy relevant to the general population are also applicable to those with inflammatory bowel disease. These may include age, gender, body mass index, prior infection, immune compromise and genetic polymorphisms.<br>• Published evidence to date does not suggest an association between any specific vaccine and exacerbation of inflammatory bowel disease.<br>• It is unclear whether rare immune-mediated reactions, such as immune complex-related phenomena or antibody-dependent enhancement, in patients with ongoing systemic inflammation or receiving immunosuppressants.<br>• No evidence that prior infection with SARS-CoV-2 will increase the likelihood of vaccine-related adverse events.<br>• For patients with inflammatory bowel disease on immunosuppressive therapies, any inactivated vaccine |

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| **Peer reviewed sources** | |
| | would be appropriate, but the live-attenuated intranasal formulation is not. High-dose and quadrivalent influenza vaccines have been evaluated in patients with inflammatory bowel disease, and should be considered, especially among those older than 65.<br>• Other effective prevention strategies will also include continued hygiene practices, handwashing, masking and physical distancing. |
| SARS-CoV-2 vaccination in IBD: more pros than cons<br>D'Amico, et al. 2021 (11) | • Commentary<br>• Addresses several advantages and disadvantages regarding SARS-CoV-2 vaccination for patients with inflammatory bowel disease based on the experience from other vaccines or immune-mediated inflammatory disorders.<br>• Studies, which evaluated the response to pneumococcal and influenza vaccines in people with inflammatory bowel disease undergoing immunosuppressive therapy, rheumatoid arthritis and psoriasis, support the administration of SARS-CoV-2 vaccine though the efficacy is unknown. This is in line with the recommendation by the British Society of Gastroenterology, which also recommends SARS-CoV-2 vaccination for patients with inflammatory bowel disease, as the benefits of vaccination outweigh the risks of any vaccine-related adverse events and uncertainty.(55)<br>• Managing patients with inflammatory bowel disease who have already experienced SARS-CoV-2 infection remains to be defined and the efficacy and safety of vaccination in this specific setting must be investigated. |
| SARS-CoV-2 vaccination for patients with inflammatory bowel disease: a British Society of Gastroenterology Inflammatory Bowel Disease section and IBD Clinical Research Group position statement<br>Alexander, et al. 2021 (41) | • Position statement endorsed by the British Society of Gastroenterology Inflammatory Bowel Disease.<br>Recommendations<br>• Patients aged over 16 years with inflammatory bowel disease should be vaccinated, as the risks are expected to be very low. Some patients will need a benefit-risk assessment prior.<br>• Three approved vaccines: BNT162b2, ChAdOx1 nCoV-19, and mRNA-1273 are applicable to patients with inflammatory bowel disease. |

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| | • Immune responses to SARS-CoV-2 vaccination may be diminished in some patients with inflammatory bowel disease, including those taking anti-tumour necrosis factor; however, benefits of vaccination likely outweigh risks. |
| COVID-19 vaccinations in patients with inflammatory bowel disease<br>Kumar, et al. 2020 (56) | • Commentary<br>• The safety and efficacy of COVID-19 vaccination in patients with inflammatory bowel disease are largely unknown as they are often unqualified for vaccine trials.<br>• The outcomes of phase I and phase II COVID-19 vaccine trials were evaluated on young and healthy volunteers, so authors assume that such data cannot address the immunity concerns in patients with inflammatory bowel disease.<br>• Policy makers and national health services should consider these uncertain factors when developing the COVID-19 vaccination programs. |
| SARS-CoV-2 vaccination for patients with inflammatory bowel diseases: recommendations from an international consensus meeting<br>Siegel, et al. 2021 (11) | • Patients with irritable bowel disease should be vaccinated against SARS-CoV-2.<br>• mRNA vaccines, replication-incompetent vector vaccines, inactivated vaccines and recombinant vaccines are safe for people with irritable bowel disease.<br>• Vaccination is a priority and should not be deferred.<br>• Vaccinated patients should be counselled regarding the reduced vaccine efficacy when receiving systemic corticosteroids. |
| COVID-19 vaccination in patients with inflammatory bowel disease: communiqué from the Canadian Association of Gastroenterology<br>Tse, et al. 2021 (37) | • Commentary<br>• The risk factors for severe COVID-19 outcomes (hospitalisation or death) in patients with inflammatory bowel disease, including those on non-steroid immunomodulatory therapies, appear similar to those without the disease.<br>• The efficacy and safety data support a positive balance between benefits and harms for BioNTech/Pfizer and Moderna COVID-19 vaccines.<br>• Recommendations from the clinical practice guideline and international expert consensus on vaccinating patients with inflammatory bowel disease were as follows. |

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| **Peer reviewed sources** | |
| | ○ Individuals with underlying medical conditions may be vaccinated if not contraindicated.<br>○ Immunocompromising patients may still receive COVID-19 vaccination if not contraindicated, with a careful risk assessment tailored to each individual. |

**Table 1d. Peer reviewed sources: Kidney disease**

| Source | Summary |
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| **Peer reviewed sources** | |
| Systematic review of safety and efficacy of COVID-19 vaccines in patients with kidney disease<br>Glenn, et al. 2021 (9) | • Systematic review<br>• To determine the efficacy of COVID-19 vaccine in people with kidney disease and those who require dialysis or transplantation receiving immunosuppressive therapies.<br>• One hundred and twenty-three COVID-19 vaccine clinical trials were reviewed.<br>• Completed (Pfizer and Moderna) and ongoing (Novavax) phase 3 vaccine trials only included participants with stable kidney disease, excluding 93.5% of candidates with immunocompromising kidney disease.<br>• Inclusion of people with immunocompromised kidney disease in COVID-19 vaccine trials remains low. Vaccine immunogenicity is largely unknown in this population.<br>• Future studies should consider evaluating the vaccine immunogenicity of existing observational cohorts of patients receiving immunosuppression therapies. |
| Recommendations for the use of COVID-19 vaccines in patients with immune-mediated kidney diseases<br>Kronbichler, et al. 2021 (30) | • Position statement from the European immunonephrology working groups.<br>Recommendations<br>• Immunocompromising individuals may receive COVID-19 vaccination if not contraindicated, as vaccination benefits outweigh the risk of relapse or recurrence induced by the vaccine.<br>• BNT162b2, mRNA-1273 or potentially Gam-COVID-Vac are recommended for patients with immune-mediated kidney diseases. |

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| **Peer reviewed sources** | |
| | • Data on administering a single vaccine dose of BNT162b2 or mRNA-1273 in individuals with previous exposure to SARS-CoV-2 and the optimal time for vaccination are scarce.<br>• Immunosuppressants such as rituximab may impair vaccine responses thus, vaccinate patients until steroid doses are tapered to below 20mg of prednisone and six months after rituximab is administered.<br>• Continue to practise safety measures such as wearing masks and physical distancing. |
| COVID-19 vaccines and kidney disease<br>Windpessl, et al. 2021 (38) | • Commentary<br>• No data is available regarding short-term and long-term safety of COVID-19 vaccine, immunogenicity and protective efficacy in patients with autoimmune kidney diseases.<br>• Recommendations are made based on the evidence from other inactivated vaccines such as influenza.<br>• Timing of vaccination<br>  ○ Non-urgent anti-CD20 therapy (e.g. rituximab) may be deferred for possible relapse of autoimmune disease.<br>  ○ Treatment for patients with active autoimmune disease should continue and delay vaccination.<br>  ○ Vaccination regimens for transplant recipients should be modified.<br>  ○ No evidence to show vaccines provoke potentially fatal disease relapses or acute rejection episodes.<br>• Conclusion<br>  ○ Patients with kidney diseases should be prioritised for COVID-19 vaccination.<br>  ○ MRNA and viral-vectored vaccines are safe to use. |

**Table 1e. Peer reviewed sources: Multiple sclerosis**

| Source | Summary |
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| **Peer reviewed sources** | |
| Potential risks and benefits of multiple sclerosis immune therapies in the COVID-19 era: clinical and immunological perspectives<br><br>Bhise, et al. 2021 (39) | • Perspective<br>• Review of the immunological treatments and their impact on COVID-19, as well as the current recommendations for the use of disease-modifying treatments in multiple sclerosis patients, based on the experience with other vaccines.<br>• Example recommendations for optimal timing for vaccination<br>  ○ Vaccinate patients toward the end of the cycle and one month before the next cycle of B cell-depleting therapy ocrelizumab.<br>  ○ The specific choice of therapy may also affect the duration of B cell depletion. Memory B cell repletion can take up to 18 months after discontinuation of ocrelizumab, but up to 12 months for rituximab and ofatumumab.<br>  ○ Therapies that do not deplete or suppress immune cells are less likely to interfere with vaccine efficacy.<br>  ○ Therapies that deplete T cells, B cells, or both could interfere with vaccine efficacy. |
| Multiple sclerosis disease-modifying therapy and the COVID-19 pandemic: Implications on the risk of infection and future vaccination<br><br>Zheng, et al. 2020 (58) | • Review of the effect of multiple sclerosis disease-modifying therapies on the immune system based on published infection rates, potential impact on SARS-CoV-2 susceptibility, and vaccine-related implications.<br>• Recommended disease-modifying therapies to use during the COVID-19 pandemic<br>  ○ Ocrelizumab is perhaps the safest but should be used sparingly given its potential negative impact on infection risk and the immune response to the SARS-CoV-2 vaccine.<br>  ○ Natalizumab is a relatively safe, high-potency disease-modifying therapy for patients who are John Cunningham virus immunoglobin G-negative, but its monthly intravenous administration carries a high exposure risk.<br>  ○ Cladribine may be relatively safer than alemtuzumab given the oral route of administration, however both agents may increase the potential for infection-related risks and negatively impact the |

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| | efficacy of the SARS-CoV-2 vaccine during the lymphocyte depletion phase of treatment.<br>○ Sphingosine-1-phosphate modulators are likely safe to continue ongoing treatment provided the absolute lymphocyte count is higher than 200/mm$^3$ and is likely safe for multiple sclerosis patients infected with COVID-19.<br>○ Teriflunomide is likely safe to continue in asymptomatic or mildly symptomatic patients but its safety in patients infected with COVID-19 is unclear.<br>○ Fumarates may increase the susceptibility to SARS-CoV-2 in patients with moderate to severe lymphopenia, but are likely safe in patients without lymphopenia or with mild lymphopenia (absolute lymphocyte count >800/mm$^3$).<br>○ Glatiramer acetate is unlikely to impact the early or delayed immune response against SARS-CoV-2 or increase infection susceptibility, thus it is likely safe to continue ongoing treatment with this agent.<br>• Vaccine-related implications<br>○ Conventional injectables probably have the safest immune profile and may need to be considered more frequently in patients with mild multiple sclerosis.<br>○ The non-cell-depleting oral agents are likely safer than cell-depleting agents, and safer than all intravenous agents. Nevertheless, their disadvantages are related to either low potency (teriflunomide), idiosyncratic lymphopenia (the fumarates), or a potential negative impact on future vaccine response (sphingosine-1-phosphate modulators). |
| Effects of MS disease-modifying therapies on responses to vaccinations: A review<br>Ciotti, et al. 2020 (40) | • Review of the impact of multiple sclerosis disease-modifying therapies on immune responses to existing vaccinations.<br>Methods<br>• Publications between 1 January 1995 and 1 May 2020 were retrieved from PubMed and Google search using MeSH terms multiple sclerosis, vaccine and disease- |

| Source | Summary |
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| **Peer reviewed sources** | |
| | modifying therapy. No report on numbers of included and excluded articles.<br>Results<br>• Several studies showed preserved immune responses to multiple vaccine types in multiple sclerosis patients treated with beta-interferons. Limited data suggest vaccine responses to be preserved with dimethyl fumarate treatment.<br>• Reduced vaccine responses in patients treated with glatiramer acetate, teriflunomide, sphingosine-1-phosphate receptor modulators, and natalizumab.<br>• Timing of vaccination is important for those treated with alemtuzumab.<br>• B cell depleting anti-CD20 monoclonal antibody therapies significantly impair humoral vaccine responses.<br>• No data on vaccine responses in multiple sclerosis patients taking cladribine and high-dose corticosteroids.<br>• Most studies only focused on humoral responses, with few examining cellular immune responses to vaccination.<br>Conclusion<br>• Clinicians should weigh the disease-modifying therapy efficacy against individual multiple sclerosis patient versus potential response to vaccination. |
| COVID-19 vaccine failure in a patient with multiple sclerosis on ocrelizumab<br>Chilimuri, et al. 2021 (4) | • This case study describes a multiple sclerosis patient who tested positive for COVID-19 through a reverse transcription polymerase chain reaction nasopharyngeal swab and multiple serological tests, approximately 19 days after two doses of Pfizer-BioNTech COVID-19 vaccination and two weeks after ocrelizumab administration.<br>• The patient was treated with casirivimab, imdevimab, and a monoclonal antibody cocktail against SARS-CoV-2 with desirable effect.<br>• Conclusion<br>  ○ This care report of attenuated immune response in a patient with relapsing-remitting multiple sclerosis on ocrelizumab provides evidence on issues relating to dose interruption in patients receiving B cell depleting therapy. |

| Source | Summary |
|---|---|
| **Peer reviewed sources** | |
| | ○ Further studies are required to determine the optimal timing of vaccination for COVID-19. |
| Multiple sclerosis, B cell therapy, and the COVID-19 vaccine<br>Seachrist 2021 (41) | • Commentary<br>• Multiple sclerosis patients with comorbidities and receiving B cell depleting therapies are potentially at a higher risk for severe COVID-19 infection.<br>• B cell depleting therapies may diminish the efficacy of COVID-19 vaccines differently by vaccine types and timing for administration.<br>• Vaccination is best to occur before starting B cell depleting therapy, if not feasible, delaying the therapy may allow for a better vaccine response.<br>• The benefits of protecting immunosuppressed multiple sclerosis patients with non-live vaccines are expected to outweigh the possible risk of vaccination. |

**Table 1f. Peer reviewed sources: Neuromuscular disorders**

| Source | Summary |
|---|---|
| **Peer reviewed sources** | |
| Doctor – should I get the COVID-19 vaccine? Infection and immunization in individuals with neuromuscular disorders<br>Živković, et al. 2021 (42) | • Practice topic article<br>• There is potential for reduced efficacy of immunisations in patients with neuromuscular disorders.<br>• Neuromuscular disorder patients have not been listed as high risk for COVID-19 and are not considered in the early-phase vaccinations.<br>• Recommendations<br>○ Individuals with neuromuscular disorders who are not taking immunosuppressive agents should be vaccinated because the risk of COVID-19 infection likely outweighs the potential risks of vaccine.<br>○ No data on safety or efficacy of COVID-19 vaccines for individuals with neuromuscular disorders who are taking immunosuppressive or |

| Source | Summary |
|---|---|
| **Peer reviewed sources** | |
| | immunomodulating agents but benefits likely outweigh potential risks.<br>○ No data on safety or efficacy of mRNA COVID-19 vaccines for individuals with autoimmune neuromuscular disorders. Increased risk of developing autoimmune or inflammatory disorders not observed in trial participants, therefore persons with an autoimmune condition with no contraindications to vaccination may have mRNA vaccine. |

**Table 1g. Peer reviewed sources: Rheumatic and musculoskeletal diseases**

| Source | Summary |
|---|---|
| **Peer reviewed sources** | |
| Safety of the first dose of mRNA SARS-CoV-2 vaccines in patients with rheumatic and musculoskeletal diseases<br>Connolly, et al. 2021 (44) | • Letter<br>• An online survey assessed the tolerability and peri-vaccination reactogenicity of 325 immunocompromised patients with rheumatic and musculoskeletal diseases.<br>• One hundred and sixty-six participants received BioNTech/Pfizer and 159 received Moderna vaccine. All participants responded to survey questions detailing any reactions experienced within the first week following their first vaccine dose.<br>• Eighty-nine percent of participants reported having mild local symptoms such as pain, swelling and erythema, while 69% experienced systemic symptoms, mostly mild, including fatigue, headache, myalgia and fever.<br>• Overall, the observed local and systemic adverse events were mild and consistent with the expected vaccine reactogenicity reported in other vaccine trials.<br>• Study results are useful guidance for rheumatology clinicians, especially regarding vaccine hesitancy or refusal. |
| Antibody response to a single dose of SARS-CoV-2 mRNA | • Letter<br>• This prospective study investigated the immune response to SARS-CoV-2 in 123 patients with rheumatic and |

| Source | Summary |
|---|---|
| **Peer reviewed sources** | |
| vaccine in patients with rheumatic and musculoskeletal diseases<br>Boyarsky, et al. 2021 (8) | musculoskeletal diseases who received their first dose of SARS- CoV-2 mRNA vaccination between January and February 2021.<br>• Most participants (74%) had detectable anti-SARS-CoV-2 antibodies; however, patients on regimens including mycophenolate or rituximab were less likely to develop an antibody response.<br>• Almost all patients (94%) receiving anti-tumour necrosis factor inhibitor therapy had detectable antibodies against SARS-CoV-2.<br>• This study has proven that certain lymphocyte-modulating therapies were associated with diminished humoral vaccine response, suggesting the need for adjustment in immunomodulatory therapy and timing around vaccination. |

**Table 1h. Peer reviewed sources: Transplant**

| Source | Summary |
|---|---|
| **Peer reviewed sources** | |
| Safety of the first dose of SARS-CoV-2 vaccination in solid organ transplant recipients<br>Boyarsky, et al. 2021 (3) | • Letter<br>• One hundred and eighty-seven solid organ transplant recipients.<br>• They received their first SARS-CoV-2 vaccination dose between 16 December 2020 and 16 January 2021. 64% were frontline health workers.<br>• Participants received the Pfizer/BioNTech (50%) or Moderna (50%) mRNA vaccines.<br>• There were no self-reported cases of polymerase chain reaction-confirmed SARS-CoV-2 diagnoses between vaccination and study participation, nor were there any reported cases of acute rejection, neurological diagnoses or allergic reactions requiring epinephrine.<br>• Two participants developed a new infection requiring treatment.<br>• Local site reactions included mild pain, mild redness and mild swelling. |

| Source | Summary |
|---|---|
| **Peer reviewed sources** | |
| | • Adverse events were largely consistent with expected vaccine reactogenicity. |
| Poor anti-SARS-CoV-2 humoral and T-cell responses after 2 injections of mRNA vaccine in kidney transplant recipients treated with belatacept<br>Chavarot, et al. 2021 (7) | • Letter (preproof on 8 April 2021)<br>• Assessed the humoral and T cell post-vaccinal responses in 101 belatacept-treated kidney transplant recipients.<br>• Participants received two doses of BNT162b2 mRNA COVID-19 vaccine (Pfizer-BioNTech) at 28 days apart. Vaccine and belatacept injections were performed the same day.<br>• Serology tests against SARS-CoV-2 antibodies performed at 28 and 60 days after the first vaccination.<br>• Only two (2%) patients developed anti-spike antibodies 28 days after the first vaccine dose, and 35 (34.7%) patients developed antibodies one month after the second vaccination.<br>Results<br>• The timing between vaccination and belatacept injection did not impact the seroconversion rate.<br>• 'Seroconversion occurred in very few patients and T cell response in less than one-third of patients.'<br>• Recommends kidney transplant recipients receiving belatacept to maintain barrier measures (e.g. household members to get vaccinated). |
| SARS-CoV-2 vaccines in kidney transplant recipients: will they be safe and effective and how will we know?<br>Heldman, et al. 2021(46) | • Commentary<br>• Overview of recommendations for SARS-CoV-2 vaccination in solid organ transplant recipients.<br>• The benefits of selected SARS-CoV-2 vaccines such as mRNA (Pfizer and Moderna) are anticipated to outweigh the vaccination risks. Live vaccines are generally contraindicated in immunocompromised individuals.<br>• The immunogenicity of SARS-CoV-2 vaccines is expected to be lower in immunocompromised kidney transplant recipients.<br>• Timing for vaccination<br>  ○ Recipients should be vaccinated before transplantation. |

| Source | Summary |
|---|---|
| **Peer reviewed sources** | |
| | ○ Vaccines are not recommended immediately after transplantation, but three months after transplant or until after receiving T cell or B cell ablative therapies.<br>○ For patients who had their first vaccine dose before transplant, the second dose should be delayed until at least four weeks after transplant. |
| COVID-19 vaccination in our transplant recipients: The time is now<br>Aslam, et al. 2021 (58) | • Commentary<br>• Describes different concerns on the safety and efficacy of SARS-CoV-2 vaccines in transplant recipients, including the reduced efficacy in immunocompromised patients, unknown duration of immune response, and the potential for vaccine-associated allograft rejection.<br>• Current advice is based on experience with other vaccines against contagious diseases such as influenza and zoster vaccine.<br>• Transplant clinicians should counsel transplant recipients regarding the significant vaccine-related benefits based on empirical study results to eliminate fears and encourage vaccination of transplant recipients. |
| Kidney transplant recipients rarely show an early antibody response following the first COVID-19 vaccine administration<br>Yi, et al. 2021 (1) | • Letter<br>• This prospective study compared the antibody response of 145 kidney transplant recipients and 31 non-immunosuppressed patients with end stage renal disease after their first mRNA vaccine dose (Pfizer or Moderna).<br>• Serological tests on anti-SARS-CoV-2 antibodies were evaluated for all participants at the time of the second dose.<br>• Seventy-three percent of kidney transplant recipients demonstrated total SARS-CoV-2 antibodies, while 87% of those with end stage renal disease developed an antibody response.<br>• Kidney transplant recipients and immunocompromised patients were mostly unable to develop an early antibody response as compared to those non-immunocompromised end stage renal disease patients on the waiting list. |

**Table 2**a. Grey literature: Immunocompromised patients generally

| Source | Summary |
|---|---|
| **Grey literature** | |
| COVID-19 weekly epidemiological update<br><br>World Health Organization, 21 February 2021 (15) | • An update of who can be vaccinated with which vaccine against COVID-19.<br><br>Recommendations<br><br>• Pfizer-BioNTech BNT162b2 vaccine<br>  ○ Suitable from age 16<br>  ○ Suitable for pregnant women, breastfeeding mothers, people with compromised immune systems, HIV and previously infected with SARS-CoV-2.<br>  ○ Not suitable for people with a history of anaphylaxis.<br>• Moderna mRNA-1273 vaccine and Astra Zeneca AZD1222 vaccine<br>  ○ Suitable from age 18<br>  ○ Suitable for pregnant women, breastfeeding mothers, people with compromised immune systems, HIV and previously infected with SARS-CoV-2.<br>  ○ Not suitable for people with a history of, or linked to, anaphylaxis.<br>• All individuals continue to practise precautionary safety measures regardless of vaccination status. |
| Interim clinical considerations for use of COVID-19 vaccines currently authorised in the United States<br><br>Centers for Disease Control and Prevention, 3 March 2021 (20) | • Immunocompromised people might be at increased risk for COVID-19.<br>• No data available on vaccine safety or efficacy in immunocompromised patients.<br>• Currently authorised COVID-19 vaccines are not live and can be safely administered to immunocompromised people.<br>• Ideally COVID-19 vaccination should be completed at least two weeks prior to therapy. |
| Clinical guidance on use of COVID-19 vaccine in Australia in 2021 | • COVID-19 vaccine recommended for immunocompromised people as they are at increased risk of severe COVID-19. |

| Source | Summary |
|---|---|
| **Grey literature** | |
| Australian Technical Advisory Group on Immunisation, 5 February 2021 (19) | • No data on the safety and efficacy of COVID-19 vaccines in immunocompromised people.<br>• No theoretical safety concerns as the vaccine is not live, however the immune response to vaccination may be reduced compared to non-immunocompromised people.<br>• Immunocompromised people should continue to protect against COVID-19 even after vaccine. |
| British Society for Immunology statement on COVID-19 vaccines for patients who are immunocompromised or immunosuppressed<br>British Society for Immunology, 19 January 2021 (14) | • All three United Kingdom approved COVID-19 vaccines (Pfizer, AstraZeneca, Moderna) are safe for immunocompromised or immunosuppressed people.<br>• COVID-19 vaccination response may be reduced compared to non-immunocompromised people.<br>• Immunocompromised or immunosuppressed people should continue to follow social distancing and hand washing guidelines even after vaccination. |

**Table 2b. Grey literature: Kidney disease**

| Source | Summary |
|---|---|
| **Grey literature** | |
| Hemodialysis patients show a highly diminished antibody response after COVID-19 mRNA vaccination compared to healthy controls<br>Simon, et al. 2021 (5) | • Preprint on 26 March 2021<br>• This prospective cohort study examined the efficacy and safety of mRNA vaccine BionTech/Pfizer BNT162b2 in 81 haemodialysis patients and 80 healthcare professionals as controls.<br>• All participants received two doses of vaccine with an interval of 21 days. Anti-SARS-CoV-2 antibody titres were measured three weeks after the second vaccination.<br>Results<br>• The antibody response in dialysis patients was significantly lower than those in the control group.<br>• Mild and severe adverse events post-vaccination in the control group were significantly higher than the dialysis group, possibly related to the more noticeable immune response in those healthy participants. |

| Source | Summary |
|---|---|
| **Grey literature** | |
| | Further studies are needed to evaluate the potential causal relationship between the immune response and adverse effects in haemodialysis patients. |

**Table 2c. Grey literature: Liver diseases**

| Source | Summary |
|---|---|
| **Grey literature** | |
| EASL position paper on the use of COVID-19 vaccines in patients with chronic liver diseases, hepatobiliary cancer and liver transplant recipients<br>Cornberg, et al. 2021 (12) | • Position paper from the European Association for the Study of the Liver Diseases.<br>• Review on efficacy and safety of vaccines in patients with chronic liver diseases, hepatobiliary cancer and liver transplant recipients.<br>Results<br>• Chronic liver disease<br>o Patients with chronic liver disease may have an impaired response to vaccination, impacted by aetiology, comorbidity, co-medication and disease stage.<br>o Success of vaccination depends on stage of chronic liver disease at time of immunisation.<br>o No confirmed information yet on the tolerability, immunogenicity and safety of novel COVID-19 vaccines in patients with chronic liver disease, including patients with hepatobiliary cancer.<br>• Solid organ transplant<br>o Immunogenicity of vaccines in solid organ transplant recipients is lower than immunocompetent individuals.<br>o Timing of vaccination is important and should be completed prior to transplantation.<br>o Live attenuated vaccines are usually avoided after transplantation.<br>o Vaccination not recommended in first three to six months after transplant. Household contacts and |

| Source | Summary |
|---|---|
| **Grey literature** | |
| | healthcare workers should be vaccinated, this applies to COVID-19 vaccines.<br>○ No confirmed information on the tolerability, reactogenicity, immunogenicity and overall safety of COVID-19 vaccines in solid organ transplant patients.<br>• COVID-19 vaccines<br>○ Few patients with mild to moderate liver disease included in trials and immunosuppressive conditions excluded.<br>○ Cancer patients should be prioritised for vaccination against SARS-CoV-2 given high concomitant chronic liver disease and delayed treatment due to COVID-19.<br>○ Influenza and pneumococcal vaccines are recommended in chronic liver disease patients despite reduced immunogenicity.<br>Conclusion<br>• Long term safety date on vaccination in chronic liver disease patients not yet available, so need to weigh benefits against risks. No specific evidence against safety and protective immunity of current vaccines in chronic liver disease patients so should be prioritised for vaccination.<br>• More data needed on COVID-19 vaccination in transplant recipients. Vaccination should be three to six months after transplantation and household and healthcare worker vaccination should be prioritised.<br>• No evidence to contradict the safety and immunogenicity of currently approved vaccines in patients with chronic liver disease, hepatobiliary cancer or in immunocompromised patients after liver transplantation. |
| AASLD expert panel consensus statement: vaccines to prevent COVID-19 infection in patients with liver disease<br>Fix, et al. 2021 (13) | • Review of the use of COVID-19 vaccines in patients with chronic liver disease and liver transplant recipients.<br>• Patients with chronic liver disease have increased risk of complications after infection and vaccinations is recommended.<br>• Vaccines should be given to transplant patients prior to transplant or three to six months after. |

| Source | Summary |
|---|---|
| **Grey literature** | |
| | Results<br>• Live-attenuated vaccines are not recommended for use in immunocompromised patients.<br>• Patients with high-risk comorbidities, including chronic liver disease, should be prioritised for vaccination.<br>• COVID-19 vaccination should proceed in transplant patients, even if liver transplant is likely to occur before the second dose can be administered.<br>• Patients with chronic liver disease, who are receiving antiviral therapy for hepatitis B or C, or medical therapy for primary biliary cholangitis, or autoimmune hepatitis, should not withhold their medications while receiving the COVID-19 vaccines.<br>• Patients with hepatocellular carcinoma should be considered for vaccination without interruption of their treatment. However, patients with recent infections or fever should not receive the COVID-19 vaccine until they are medically stable.<br>Conclusion<br>• COVID-19 vaccines should be given to all adult patients with chronic liver disease and liver transplant recipients. Available mRNA COVID-19 vaccines do not contain live or attenuated virus so are unlikely to pose a safety concern for immunosuppressed patients.<br>Limitations<br>• Efficacy of immune response to vaccine unknown for transplant recipients.<br>• Duration of vaccine-conferred immunity and whether it defers from immunocompetent individuals unknown.<br>• Patients with advanced chronic liver disease and liver transplant recipients have not been included in vaccine studies. |

**Table 2d. Grey literature: Rheumatic diseases**

| Source | Summary |
|---|---|
| **Grey literature** | |
| COVID-19 vaccination for rheumatology patients<br><br>Australian Rheumatology Association, January 2021 (43) | • Position statement on COVID-19 vaccination for rheumatology patients in Australia.<br>• Pfizer and AstraZeneca vaccines are not live and are safe for people with arthritis and people taking immunosuppressant drugs.<br>• Patients on immunosuppressant drugs may be advised to continue avoiding exposure to COVID-19 after vaccination, as they might not respond as strongly to the vaccine, but patients should not stop their treatment.<br>• Vaccination should occur as far away as possible from rituximab infusion.<br>• Surgery guidelines recommend no major surgery within one week of vaccine. |
| Vaccination against SARS-CoV-2 in immunosuppressed patients with rheumatic diseases: Position statement of the Greek Rheumatology Society<br><br>Greek Rheumatology Society and Professional Association of Rheumatologists, 2020 (59) | • Summary of position statement from the Greek Rheumatology Society.<br>• Key recommendations on safety and efficacy of mRNA vaccines in immunosuppressive patients with rheumatic diseases<br>  ○ All immunosuppressed patients with rheumatic conditions should be vaccinated against SARS-CoV-2.<br>  ○ Health authorities to determine the prioritisation of immunosuppressed patients for vaccination, with advice from rheumatologists.<br>  ○ Vaccinated patients should continue practising existing guidelines for protective measures such as wearing masks and physical distancing.<br>• Limited data on safety and efficacy of vaccines against SARS-CoV-2 in immunocompromised patients thus far. |
| Updated recommendations of the German Society for Rheumatology for the care of patients with inflammatory rheumatic diseases in times of SARS-CoV-2 – methodology, key | • An update of the March 2020 recommendations by the German Society for Rheumatology.<br>• Expert consensus on preventive measures, such as hygiene measures or vaccinations, and the use of immunosuppressive therapies in patients with inflammatory rheumatic diseases through a systematic |

| Source | Summary |
|---|---|
| **Grey literature** | |
| messages and justifying information<br><br>Schulze-Koops, et al. 2021 (13) | review of emerging literature and a modified Dephi process.<br><br>Updates<br>• Patients with inflammatory rheumatic diseases are recommended to follow the behavioural and precautionary measures to avoid infections.<br>• Anti-rheumatic therapy should not be changed or paused in patients with well-controlled disease, to avoid potential destabilisation of disease.<br>• To interrupt infection chains and contain a new possible wave of infection, patients are recommended to use digital tracking devices.<br>• Medical certificate may be used to justify the patient's ability to work based on an assumed risk from underlying rheumatic disease.<br>• Validated risk factors for infections in patients with an inflammatory rheumatic disease, such as multimorbidity and immunosuppressive therapies, should be considered when determining an individual risk.<br>• Treatment for patients with inflammatory rheumatic diseases should be in line with the rheumatologic standards that apply under normal conditions and should not be changed during the COVID-19 pandemic.<br>• Treatment of SARS-CoV-2 infection should be managed by rheumatologists, general practitioners (mild cases), pneumologists or in severe cases, intensive care physicians.<br>• The initiation or adjustment of anti-rheumatic therapies should not be discontinued or delayed during the COVID-19 pandemic.<br>• In inflammatory rheumatic disease patients without signs of infection, even with contact with SARS-CoV-2-positive individuals, the existing anti-rheumatic therapy should be unchanged. If patients present with signs of infection, follow the recommended testing and treatment regimens.<br>• In inflammatory rheumatic disease patients who test positive for SARS-CoV-2 by polymerase chain reaction without signs of infection, consider pausing or delaying targeted synthetic or biological disease-modifying antirheumatic drug therapy for the duration of the mean incubation period (e.g. five to six days). |

| Source | Summary |
|---|---|
| **Grey literature** | |
| | • In patients with confirmed, active COVID-19, disease-modifying antirheumatic drug therapy should be paused. Continue any long-term glucocorticoid therapy <10 mg/day used for treatment of the underlying inflammatory rheumatic disease.<br>• Patients with inflammatory rheumatic diseases and a positive test for SARS-CoV-2 (polymerase chain reaction and/or antibodies) should be documented in the *COVID19-rheuma.de* registry. |

**Table 2e. Grey literature:** Transplant

| Source | Summary |
|---|---|
| **Grey literature** | |
| Weak anti-SARS-CoV-2 antibody response after the first injection of an mRNA COVID-19 vaccine in kidney transplant recipients<br>Benotmane, et al. 2021 (2) | • Preprint on 12 March 2021<br>• This study analysed the serological response to SARS-CoV-2 in 241 kidney transplant recipients after their first Moderna mRNA-1273 vaccination between 12 and 28 January 2021.<br>• The anti-SARS-CoV-2 antibody response was assessed at 28 days after injection.<br>• Only 26 kidney transplant recipients had a positive serology and one patient developed mild COVID-19 symptoms seven days after their first vaccine dose.<br>• Immunosuppression may be associated with a weaker anti-SARS-CoV-2 antibody response in kidney transplant recipients after the first injection of an mRNA COVID-19 vaccine. |

# Appendix

## PubMed search terms

("2019-nCoV"[Title/Abstract] OR "ncov*"[Title/Abstract] OR "covid-19"[Title/Abstract] OR "covid19"[Title/Abstract] OR "covid-19"[Title/Abstract] OR "coronavirus"[MeSH Terms] OR "coronavirus"[Title/Abstract] OR "sars-cov-2"[Title/Abstract] OR "severe acute respiratory syndrome coronavirus 2"[Supplementary Concept]) AND ("vaccin*"[Title/Abstract] OR "immuniz*"[Title/Abstract] OR "vaccination"[MeSH Terms]) AND ((host, immunocompromised[MeSH Terms]) OR (immunocomp*[Title/Abstract]) OR (immunosup*[Title/Abstract])) AND (english[Filter]) AND (2020:2021[pdat])

## Google Scholar search terms

- "COVID-19 vaccine" and "immunocompromised patients"
- ("COVID-19 vaccine" OR "coronavirus") AND (immunosuppression OR immunocompromised) AND ("guidelines" OR "systematic review")

## Inclusion and exclusion criteria

| Inclusion | Exclusion |
|---|---|
| • Population: Immunocompromised people<br>• Intervention: COVID-19 vaccine<br>• Any study design | • Publications not in English language |

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