British Society of Gastroenterology Inflammatory Bowel Disease section and IBD Clinical Research Group position statement on SARS-CoV2 Vaccination

James L. Alexander[1,2], Gordon Moran[3], Daniel R. Gaya[4,5], Tim Raine[6], Ailsa Hart[1,7], Nicholas A. Kennedy[8,9], James O. Lindsay[10,11], Jonathan MacDonald[12], Jonathan P. Segal[1,13], Shaji Sebastian[14], Christian Selinger[15], Miles Parkes[6], Philip J. Smith[16], Anjan Dhar[17], Sreedhar Subramanian[18], Ramesh Arasaradnam[19], Christopher A. Lamb[20,21], Tariq Ahmad[8,9], Charlie Lees[22,23], Liz Dobson[24], Ruth Wakeman[25], Ian Arnott[23], Nick Powell[1,2] on behalf of the IBD section of the British Society of Gastroenterology and the CRG.

1. Imperial College London, London, UK
2. Imperial College Healthcare NHS Trust, London, UK
3. University of Nottingham, Nottingham, UK
4. Glasgow Royal Infirmary, Glasgow, UK
5. University of Glasgow, Glasgow, UK
6. Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK
7. St Mark's Hospital, London, UK
8. Royal Devon and Exeter NHS Foundation Trust, Exeter, UK
9. University of Exeter, Exeter, UK
10. Barts and the London School of Medicine and Dentistry, London, UK
11. The Royal London Hospital, Barts Health NHS Trust, London, UK
12. Queen Elizabeth University Hospital, Glasgow, UK
13. The Hillingdon Hospitals NHS Foundation Trust, Uxbridge, UK
14. Hull University Teaching Hospitals NHS Trust, Hull, UK
15. Leeds Teaching Hospitals NHS Trust, Leeds, UK
16. Liverpool University Hospitals NHS Foundation Trusts, Liverpool, UK
17. County Durham & Darlington NHS Foundation Trust, Durham, UK
18. The Royal Liverpool and Broadgreen University Hospitals NHS Trust, Liverpool, UK
19. University Hospitals Coventry & Warwickshire NHS Trust, Coventry, UK
20. Newcastle University, Newcastle upon Tyne, UK
21. Newcastle upon Tyne Hospitals NHS Foundation Trust, Newcastle upon Tyne, UK
22. University of Edinburgh, Edinburgh, UK
23. Western General Hospital, Edinburgh, UK
24. IBD Registry Limited, London, UK
25. Crohn’s & Colitis UK, Hatfield, UK

The Inflammatory Bowel Disease (IBD) Section of the BSG and the IBD Clinical Research Group have agreed the following key recommendations:

1. **We strongly support SARS-CoV2 vaccination for patients with IBD.**

2. **The risks of SARS-CoV2 vaccination in IBD patients are anticipated to be very low.**

3. **In IBD patients taking immunosuppressive drugs, including biologics and small molecule inhibitors, the key concerns are related to the theoretical risk of sub-optimal vaccine responses rather than vaccine side effects.**

4. **We recommend that IBD patients accept whichever approved SARS-CoV2 vaccination is offered to them, in accordance with UK Department of Health and Social Care and the Medicines and Healthcare products Regulatory Agency (MHRA) guidance.**

5. **It is important that patients with IBD are offered consistent and unbiased advice. This will be disseminated through the BSG and Crohn's & Colitis UK.**

6. **We recommend a third dose (or booster dose) of SARS-CoV2 vaccine for all patients with IBD receiving immunosuppressive treatment and all patients with IBD that are extremely clinically vulnerable.**

Position Statement Review: this document was updated on 10th May 2021 and 14th September 2021.

Summary of changes (10th May 2021):

- FAQ 2: updated to reflect changes to advice on vaccination in pregnancy.
- FAQ 3: updated to include recent safety data (mRNA-1273 and ChAdOx1 nCoV-19).
- FAQ 4: updated to reflect data emerging from the CLARITY-IBD study.
- Addition of FAQ 14: Has guidance changed on whether IBD patients can have the AstraZeneca/Oxford vaccine?

Summary of changes (14th September 2021):

- Key recommendation 6 on vaccine third dose (or booster).
- FAQ 2: updated with latest guidance on vaccination for children and young people with IBD (courtesy of Dr Jochen Kammermeier).
- FAQ 10: updated with new information on efficacy of vaccines against COVID-19 variants.
- FAQ 13: updated in line with JCVI/MHRA guidance on co-administration of influenza and SARS-CoV2 vaccines.
- Addition of FAQ 15: Should IBD patients receive a SARS-CoV2 booster vaccine?
- Addition of FAQ 16: Should antibody testing be performed to check immunity against SARS-CoV2?

Introduction

- The COVID-19 pandemic has caused significant mortality across the globe, with wide-ranging impacts across all sectors of society.
- Patients with IBD may have increased susceptibility to infectious diseases.
- The introduction of SARS-CoV2 vaccines is the first opportunity to suppress the virus over the long term and to protect individuals from COVID-19.
- Several SARS-CoV2 vaccines are in advanced clinical development, and currently there are three that are approved/awaiting approval in the UK (see table 1). It is likely that additional vaccines will become available in the future.
- The BNT162b2 *(*Pfizer/BioNTech)[1], ChAdOx1 nCoV-19 (Oxford/AstraZeneca)[2], mRNA-1273 (Moderna)[3] and Ad26.COV2.S (Janssen) vaccines[4] have been given authorisation for temporary supply by the UK Department of Health and Social Care and the Medicines and Healthcare products Regulatory Agency under Regulation 174 of the Human Medicine Regulations 2012[a,b,c,d,e].

[a]https://www.legislation.gov.uk/uksi/2012/1916/contents/made

[b]https://www.gov.uk/government/publications/regulatory-approval-of-pfizer-biontech-vaccine-for-covid-19/information-for-healthcare-professionals-on-pfizerbiontech-covid-19-vaccine

[c]https://www.gov.uk/government/publications/regulatory-approval-of-covid-19-vaccine-astrazeneca/information-for-healthcare-professionals-on-covid-19-vaccine-astrazeneca

[d]https://www.gov.uk/government/publications/regulatory-approval-of-covid-19-vaccine-moderna/information-for-healthcare-professionals-on-covid-19-vaccine-moderna

[e]https://www.gov.uk/government/publications/regulatory-approval-of-covid-19-vaccine-janssen/summary-of-product-characteristics-for-covid-19-vaccine-janssen

Table 1: Overview of SARS-CoV2 vaccines

	Pfizer/BioNTech	**Moderna**	**Oxford/AstraZeneca**	**Janssen**
Name	*BNT162b2*	*mRNA-1273*	*ChAdOx1 nCoV-19*	*Ad26.COV2.S*
Dosing schedule	2 doses, between 3 weeks and 12 weeks apart	2 doses, between 4 weeks and 12 weeks apart	2 doses, between 4 weeks and 12 weeks apart	Single dose
Mechanism	mRNA encoding a genetically modified SARS-CoV2 spike	mRNA encoding a genetically modified SARS-CoV2 spike	Non-replicating adenovirus vector, containing SARS-CoV-	Non-replicating adenovirus vector, containing SARS-CoV-

	protein	protein	2 spike protein	2 spike protein
Storage (long term)	-80°C to -60°C	-20°C	+2°C to +8°C	+2°C to +8°C
Safety	No serious concerns.	No serious concerns	No serious concerns**	No serious concerns***

*****pooled data from two trials - 62% efficacy in one study and 90% in another study in which first vaccination was given at half dose.

**there have been very rare reports (4 per million people vaccinated) of serious thromboembolic events with concurrent thrombocytopenia including fatal cases (1 per million people vaccinated) in post-authorisation use[f].

***there have been very rare reports (1.9 per million people vaccinated) thromboembolic events with concurrent thrombocytopenia including fatal cases in post-authorisation use in U.S.A.

[f]https://www.gov.uk/government/news/mhra-issues-new-advice-concluding-a-possible-link-between-covid-19-vaccine-astrazeneca-and-extremely-rare-unlikely-to-occur-blood-clots

Vaccination logistics in IBD patients

- The Joint Committee on Vaccination and Immunisation (JCVI) is responsible for advising which sectors of society are prioritized in national vaccination programmes. As of 30th December 2020 (updated 6th January 2021), priority sequencing is based on providing protection to the persons most at risk of morbidity and mortality from COVID-19[g]. Since mortality from COVID-19 increases exponentially with age, the initial JCVI prioritisation is primarily age-based. The order of priority for phase 1 of the vaccination programme is listed:

    1. Residents in a care home for older adults and their carers
    2. All those 80 years of age and over and frontline health and social care workers
    3. All those 75 years of age and over
    4. All those 70 years of age and over, and clinically extremely vulnerable individuals
    5. All those 65 years of age and over.
    6. All individuals aged 16 years to 64 years with underlying health conditions which put them at higher risk of serious disease and mortality.
    7. All those 60 years of age and over

8. All those 55 years of age and over
9. All those 50 years of age and over

[g]https://www.gov.uk/government/publications/priority-groups-for-coronavirus-covid-19-vaccination-advice-from-the-jcvi-30-december-2020/joint-committee-on-vaccination-and-immunisation-advice-on-priority-groups-for-covid-19-vaccination-30-december-2020

- The British Society of Gastroenterology has produced guidance for clinicians regarding COVID-19 risks for people with IBD. In keeping with the BSG risk grid[5], it is anticipated that people with IBD who are under the age of 65 years and in the moderate BSG risk category will fall into **category 6.** It is anticipated that people with IBD identified as high risk in the BSG risk grid will fall into **category 4.**
- Irrespective of their position in the BSG risk grid, IBD patients who are resident in care homes **(category 1),** are frontline health and social care workers (**category 2**) or are aged 75 years or older (**category 3**) will be further prioritized.
- In the context of the rapidly worsening epidemiology of COVID-19 in the UK in late 2020, and given data indicating high efficacy from the first dose of both the BNT162b2 vaccine *(*Pfizer/BioNTech) and the ChAdOx1 nCoV-19 vaccine (Oxford/AstraZeneca), the JCVI is prioritising the delivery of the first dose of vaccine to as many eligible individuals as possible**.** The second dose of vaccine can be delivered between 3 to 12 weeks after the first dose of the Pfizer/BioNTech vaccine and between 4 to 12 weeks after the first dose of the Oxford/AstraZeneca and Moderna vaccines[g].
- In May 2021, in the context of the rapid spread of the B1.617.2 (Delta) variant in the UK, the JCVI updated its guidance such that, where vaccine supply allows, particularly in areas where B1.617.2 is a major threat, the second dose of vaccine should be brought forward to 8 weeks post first dose.
- JCVI further advises that the same vaccine should be used for both doses and that switching between vaccines or missing the second dose is not advised.

Concerns of the IBD patient community

Patients with IBD will have many questions regarding vaccination and specific data to inform many of these concerns are not yet available. However, there are several factors that can offer some reassurance:

- There is a robust and comprehensive regulatory process in place and approval is only given when there are compelling safety data.

- Standards for testing and monitoring of vaccines are generally higher than for most other medical interventions due to their intended use in healthy individuals, in whom the level of acceptable risk is lower.
- The SARS-CoV2 vaccines have been tested in tens of thousands of patients with safety profiles comparable to other vaccines commonly used in IBD patients.
- Data are emerging that demonstrate low rates of adverse events in IBD patients following vaccination, which are comparable to the general population[6].

Frequently asked questions

In collaboration with Crohn's & Colitis UK, we have identified a number of questions that are commonly asked about vaccination against COVID-19. We would recommend that patients are directed to the Crohn's & Colitis UK webpage (www.crohnsandcolitis.org.uk). Healthcare providers can help to answer such questions and we have provided some answers below:

1. Can patients with IBD have vaccination against COVID-19?

Yes. Although MHRA guidance will be given separately and independently for each of the vaccines, at the time of writing the Pfizer/BioNTech BNT162b2 vaccine, the Oxford/AstraZeneca ChAdOx1 nCoV-19 vaccine, the Moderna 1273 vaccine and the Janssen Ad26.COV2.S vaccine have received approval from the MHRA. Importantly, for the four vaccines immunosuppression is not a contraindication.

2. Are there any groups of IBD patients, such as children and young people, who will not be eligible to receive SARS-CoV2 vaccination?

Yes. Vaccination is not yet approved in those aged under 12 years. The JCVI has updated its guidance to advise vaccination for children and young people aged 12 years and over with specific underlying health conditions that put them at risk of serious COVID-19, including immunosuppression, and children and young people aged 12 years and over who are household contacts of persons who are immunosuppressed[h]. Further information regarding children and young people can be found on the Royal College of Paediatrics and Child Health website[i].

[h]https://www.gov.uk/government/news/jcvi-issues-advice-on-covid-19-vaccination-of-children-and-young-people

[i]https://www.rcpch.ac.uk/resources/covid-19-vaccination-children-young-people

3. Are the SARS-CoV2 vaccines safe in IBD patients?

Although there are no safety data regarding SARS-CoV2 vaccination in IBD patients, MHRA approval is based on safety data generated from monitoring over 19,000 vaccine recipients for at least two months after their second dose (serious side effects from vaccines are very rare beyond this point). Side effect profiles from SARS-CoV2 vaccines are in line with events observed with other commonly used vaccines. Data from the BNT162b2 phase 3 trial, which enrolled >40,000 subjects, the ChAdOx1 nCoV-19 phase 3 trials, which enrolled >23,000 subjects, and the mRNA-1273 phase 3 trial, which enrolled more than 30 000 individuals, demonstrated that mild local injection site reactions (e.g. pain, redness and swelling) and systemic features (fatigue, headache, chills) were common, but serious adverse events were rare[2, 3, 7]. For instance, there were 4 serious adverse events in BNT162b2 recipients (shoulder injury related to vaccine administration, right axillary lymphadenopathy, ventricular arrhythmia, and right leg paraesthesia). Serious adverse events occurred in 79 participants who received ChAdOx1 nCoV-19, and 89 in those who received placebo. Very rare events of neuroinflammatory disorder have been reported with the ChAdOx1 nCoV-19 vaccine, but a causative role has not been established. There were 2 deaths in BNT162b2 recipients and 4 deaths in placebo recipients, which were considered to be unrelated to the vaccine or placebo. There were four non-COVID-19 related deaths in ChAdOx1 nCoV-19 trials, three in controls and one in the vaccine recipients. All were considered unrelated. Five deaths occurred in the mRNA-1273 trial, three in the placebo group (one from intra-abdominal perforation, one from cardiopulmonary arrest, and one from severe systemic inflammatory syndrome in a participant with chronic lymphocytic leukaemia and diffuse bullous rash) and two in the vaccine group (one from cardiopulmonary arrest and one by suicide); none were considered related to vaccination.

On 7th April 2021, the MHRA updated its guidance on the ChAdOx1 nCoV-19 vaccine, following very rare reports (79 cases following 20.2 million vaccine doses) of serious thromboembolic events with concurrent thrombocytopenia and sometimes bleeding, including life-threatening and fatal cases (1 case per million), following vaccination during post-authorisation use[f]. Further information on the implications of this update for IBD patients can be found below in FAQ 14.

4. What effect does immunosuppression have on SARS-CoV2 vaccines?

Although the MHRA does not list immunosuppression as a contraindication to the BNT162b2 vaccine or the ChAdOx1 nCoV-19 vaccine, it does indicate that there is a theoretical possibility that immunosuppressive drugs could reduce the effectiveness of the vaccines. This is likely to be based on evidence from studies looking at the impact of immunosuppression on the immunogenicity of other commonly used vaccines. Infliximab

monotherapy is linked to impaired induction of protective immunity following hepatitis B[8], hepatitis A[9], pneumococcal[10, 11] and influenza[12-14] vaccination, which may be more pronounced when anti-TNF therapy is combined with immunomodulators including thiopurines or methotrexate[15, 16]. Vedolizumab, however, which has a gut specific mechanism of action, does not hinder hepatitis B or influenza vaccination, but is associated with impaired antibody responses to cholera toxin, administered orally[17]. There is a lack of data for some of the newer drugs used in IBD, although lessons have been learned in other immune-mediated inflammatory diseases. For instance, in psoriasis, antibody responses to pneumococcal and tetanus vaccines are preserved, and possibly even enhanced in patients treated with ustekinumab, a monoclonal antibody that blocks the p40 subunit of IL12 and IL23[16]. In rheumatoid arthritis, tofacitinib results in diminished induction of protective immune responses to pneumococcal vaccination, but responses to influenza vaccination are maintained[18]. Now that the UK SARS-CoV2 vaccination program has started, observational studies need to be implemented in order to quantify immunity and efficacy in IBD patients. SARS-CoV2 vaccine responses in IBD patients are being assessed in the CLARITY IBD study (https://www.clarityibd.org) and the VIP study (https://www.vipstudy.uk). In CLARITY, following a single dose of either BNT162b2 or ChAdOx1 nCoV-19 SARS-CoV-2 vaccines, significantly attenuated immunogenicity was observed in Infliximab-treated patients in comparison with vedolizumab-treated patients[19]. Vaccine-induced immunogenicity was particularly diminished in patients on combination infliximab /immunomodulator therapy. There was also reduced vaccine-induced immunogenicity in vedolizumab treated patients concomitantly taking immunomodulators. Furthermore, in a multivariable logistic regression model, immunomodulators were identified as independent predictors of reduced vaccine-induced antibody formation. It will now be critical to determine whether these observations are still observed following administration of a second dose of vaccine. Reassuringly, in the small number of patients who had received a second dose of vaccine in CLARITY, most patients seroconverted, including those prescribed infliximab.

5. Are there specific data on the effect of SARS-CoV2 vaccines on patients with IBD?

To date there are no studies reporting the effect of any SARS-CoV2 vaccine specifically in IBD patients, as these patient groups have been excluded from the phase 3 vaccination studies. Nevertheless, insights into how different IBD therapies impact host immunity can be inferred from serological responses to other vaccination programs, as discussed in question 4. Notably, other commonly used vaccines (e.g. influenza, HBV, HAV, etc) are also very low risk in IBD patients, although they were never specifically trialled in IBD patients prior to approval.

6. When will people with IBD get SARS-CoV2 vaccination?

IBD patients will be vaccinated based on the phase 1 prioritization list defined by the JCVI (see above).

7. Will vaccination have any effect on Crohn's disease or ulcerative colitis?

At this stage it is not possible to answer this question directly. No serious gastrointestinal side-effects to SARS-CoV2 vaccinations have yet been reported. Furthermore, data from other commonly employed vaccination programs are reassuring, with no serious gastroenterological side-effects and low rates of increased IBD disease activity reported[10, 12, 20].

8. Should the SARS-CoV2 vaccination be timed around IBD treatment (e.g. biologic infusions)?

The main priority with timing is delivery of the vaccine at the earliest opportunity. This is especially important with the NHS under considerable strain during vaccine roll out and we would recommend accepting the first available vaccine appointment if/when offered. Neither IBD disease activity, nor the timing of subcutaneous/intravenous IBD medications should delay vaccination. There is some evidence with annual influenza vaccination that the timing of anti-TNF administration does not significantly impact on vaccination immunogenicity[21]*. High dose systemic corticosteroids, particularly in combination with other immunosuppressants, may reduce vaccine immunogenicity, as has been observed with annual influenza vaccination*[16]*. Where possible, SARS-CoV2 vaccination should be administered whilst patients are taking the lowest dose of systemic corticosteroid.*

The JCVI currently advises an 8-12 week interval between first and second doses of vaccines delivered by two-dose schedule. The key exception to the 8-week lower interval is in those people commencing immunosuppressive treatment. In such cases, an accelerated dosing schedule (21-day interval for the BNT162b2 vaccine; 28-day interval for ChAdOx1 nCoV-19 and mRNA-1273 vaccines) is advised to allow immunisation to take place whilst the immune system is best able to respond[i]*.*

9. What should be done about vaccination in people who have had COVID-19 already?

We advise that IBD patients should receive SARS-CoV2 vaccination at invitation, even if they have previously been affected by COVID-19. This is because data on whether individuals acquire sufficient immunity following COVID-19 are currently lacking, as are data on the duration and strength of any acquired immunity. The MHRA advises waiting at least

four weeks after onset of COVID-19 symptoms or four weeks from the first PCR positive specimen in those who are asymptomatic.

10. Will vaccines be effective against the new COVID variants?

The largest study to date in the U.K. (currently in preprint: https://doi.org/10.1101/2021.08.18.21262237) suggests that, after two doses, both the BNT162b2 vaccine and ChAdOx1 nCoV-19 vaccine are highly effective at preventing infection with the alpha variant, which was dominant in early 2021, and the delta variant, which is currently dominant in September 2021. Protection against hospitalisation for both alpha and delta is estimated to be >90% after two doses of either vaccine[i].

11. Is vaccination safe in those with a history of allergy or adverse reactions to IBD medication?

A previous history of allergy or adverse reactions to IBD medication is not a contraindication to vaccination. The MHRA states that the BNT162b2 vaccine, ChAdOx1 nCoV-19 vaccine, the mRNA 1273 vaccine and the Ad26.COV2.S vaccine are contraindicated if there is a history of hypersensitivity to the active substance or any of the specific vaccine excipients. Guidance on allergies for other SARS-CoV2 vaccines will be issued by the MHRA as the vaccines are approved.

12. For those who were previously in a high-risk group and receive the vaccine, what does that mean for their occupational risk?

The JCVI statement on priority groups for vaccination advises that clinically extremely vulnerable groups should continue to follow Government advice on reducing their risk of infection after vaccination[g]. Further information on matters relating to occupation and finance can be found at https://www.crohnsandcolitis.org.uk/news/coronavirus-work-and-finance.

13. Can patients have both the flu vaccine and SARS-CoV2 vaccine and can they be administered together?

IBD patients should be encouraged to have both the annual influenza and the SARS-CoV2 vaccinations. For practical reasons, the JCVI is advising that booster doses of SARS-CoV2 vaccine (see FAQ 15) be offered alongside the annual influenza vaccine to maximise uptake of both vaccines. The MHRA reports there is no evidence of safety concerns with this approach, but studies are ongoing to support co-administration of COVID-19 vaccines with influenza in the 2021-2022 season[i].

14. Has guidance changed on whether IBD patients can have the AstraZeneca/Oxford vaccine?

Since vaccine roll-out, there have been reports of extremely rare adverse events of concurrent thrombosis and thrombocytopenia associated with use of the AstraZeneca COVID-19 vaccine. Reassuringly, the risk of such events is estimated at just 1 in 100,000 people vaccinated, compared to, for example, a risk of more than 1 in 5000 people who will develop a DVT from a single long-haul flight[22].

The JCVI has advised that it is preferable for adults aged under 40 years without underlying health conditions that put them at higher risk of severe COVID-19 disease, to be offered an alternative vaccine to AstraZeneca COVID-19 vaccine where available. This advice on vaccine preference is more strongly emphasised in those aged 18 to 29 years. This is because the available data suggest that there is a trend for increasing incidence of this adverse event with decreasing age and the risks of severe disease with COVID-19 in young adults is low. The BSG advises that IBD patients under 40 years who fall in the moderate or high risk categories of the BSG risk grid may still be offered the AstraZeneca COVID-19 vaccine because the benefits of prompt vaccination far outweigh the risks, but in line with JCVI advice, low risk IBD patients under 40 years should be offered an alternative vaccine when no barrier to vaccination would otherwise arise.

There are circumstances in which IBD patients are at increased risk of thrombosis, including in the setting of active disease, during pregnancy and with the use of Tofacitinib. However, there is no evidence to suggest that these IBD-related circumstances are associated with a higher risk of concurrent thrombosis and thrombocytopenia following the administration of COVID-19 Vaccine AstraZeneca. Therefore, in line with MHRA advice for the general population, the BSG advises continued use of the AstraZeneca COVID-19 vaccine in IBD patients unless they fall into the following groups in whom continued use should only be considered when the potential benefit outweighs any potential risks:

- *a history of cerebral venous sinus thrombosis or*
- *acquired or hereditary thrombophilia or*
- *heparin-induced thrombocytopenia or*
- *antiphospholipid syndrome*

IBD patients who have experienced major venous and arterial thrombosis occurring with thrombocytopenia following vaccination with any COVID-19 vaccine should not receive a second dose of COVID-19 Vaccine AstraZeneca.

15. Should IBD patients receive a SARS-CoV2 vaccine third dose or 'booster'?

The JCVI has advised that those who were severely immunosuppressed at the time of their first or second vaccine doses should receive a third primary dose of vaccine, citing preliminary evidence from the OCTAVE study (currently under peer review) that immune responses to vaccination in such individuals were poorer than in the general population[k]. The third dose in these individuals should ideally be given at a time of minimum immunosuppression to increase the likelihood of favourable immune response to vaccination. The timing of the third dose in this group should be given at least 8 weeks after the second dose.

The UK government has subsequently announced that a SARS-CoV2 vaccine booster programme will begin in September 2021 to include the following[l]:

- *those living in residential care homes for older adults*
- *all adults aged 50 years or over*
- *frontline health and social care workers*
- *all those aged 16 to 49 years with underlying health conditions that put them at higher risk of severe COVID-19.*
- *adult household contacts of immunosuppressed individuals*

Booster doses in these groups should be given no earlier than six months after the second dose.

The BSG therefore recommends that all IBD patients who are on immunosuppressive treatments including corticosteroids, thiopurines, methotrexate, anti-TNF therapy, anti-integrin therapy, anti-IL-23 therapy, JAK-inhibitors or clinical trials of treatments that suppress the immune system and IBD patients living in residential care homes for older adults, or aged 50 years or over or who are otherwise considered clinically extremely vulnerable (e.g. on parenteral nutrition or with intestinal failure) should receive a third or booster dose of vaccine. Adult household contacts of immunosuppressed IBD patients should also be offered a booster dose.

16. Should antibody testing be performed to check immunity against SARS-CoV2?

Antibody testing to check for prior COVID-19 infection, or for an immune response following SARS-CoV2 vaccination, is not currently recommended in routine clinical practice. This is because antibody test results are of uncertain significance. Although the presence of detectable circulating antibodies is likely to mitigate against severe disease, a positive result does not necessarily imply immunity against infection and antibody titres decay and so risk may change over time.

17. Are IBD patients who are pregnant or breastfeeding eligible for vaccination?

Although clinical trials on the use of COVID-19 vaccines during pregnancy are not advanced, the available data do not indicate any harm to pregnancy. JCVI has therefore advised that women who are pregnant should be offered vaccination at the same time as non-pregnant women, based on their age and clinical risk group. Over 50,000 women have been vaccinated while pregnant in the U.K and there is now extensive post-marketing experience of the use of the BNT162b2 and mRNA-1273 vaccines with no safety signals so far. These vaccines are therefore the preferred vaccines to offer to pregnant women. The JCVI advises that breastfeeding is not a contraindication to vaccination. The clinical need for immunisation should be considered and women informed about the absence of full safety data for the vaccine[g].

[j] *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1007737/Greenbook_chapter_14a_30July2021.pdf*

[k] *https://www.gov.uk/government/publications/third-primary-covid-19-vaccine-dose-for-people-who-are-immunosuppressed-jcvi-advice/joint-committee-on-vaccination-and-immunisation-jcvi-advice-on-third-primary-dose-vaccination*

[l] *https://www.gov.uk/government/publications/jcvi-statement-september-2021-covid-19-booster-vaccine-programme-for-winter-2021-to-2022/jcvi-statement-regarding-a-covid-19-booster-vaccine-programme-for-winter-2021-to-2022*

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