COVID-19 (C-19) Vaccination – Intramuscular (IM) injection technique

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Key points:

- Nurses are the driving force behind the C-19 mass vaccination programme
- Correct IM injection technique will ensure vaccinee safety and generate the most effective immune response
- Nurses should ensure they utilise the contemporary evidence base to avoid ritualistic practices in relation to IM vaccine administration
- A robust understanding of C-19 vaccines will ensure practitioners are able to provide informed information and support to vaccinees

Reflective questions

- What factors should be considered prior to administering the C-19 vaccination to the individual?
- Regarding IM injection technique procedure, what areas of your practice have changed or been enhanced in relation to C-19 vaccination procedure?
- What are the differences and similarities between the available vaccines?
- How would you describe the technique for C-19 vaccination to a potential vaccinee or a colleague you are supervising?

Introduction / overview

COVID-19 (C-19) vaccinations are a key strategy to facilitate emergence from the current pandemic and the most effective way to protect the population, saving thousands of lives. It is hoped that the programme will expand, with a view to offering vaccination to all adults by the autumn of 2021

(Department of Health and Social Care, 2021). The current C-19 vaccination programme is the largest seen in NHS history (NHS England, 2020), with an estimated 80,000 strong workforce recruited, a significant number of those from fields of nursing. As such, effective and evidence-based intramuscular (IM) injection technique is an essential training requirement for all of those involved in vaccine administration within the programme.

To date, 3 vaccines have been approved for use within the UK, a comparison of the vaccines is found in table 1. It should be noted that at the time of writing, that whilst approved, the Moderna vaccine is not currently available within the UK and as such, PHE will update the programme guidance for healthcare workers once available (PHE, 2021a).

Practitioners should be aware of their individual role within the vaccination programme and should complete all required training alongside the practical assessment of competency. Not all vaccinators will draw up and those drawing up may not give the vaccine, depending on local arrangements. The COVID-19 vaccinator competency assessment tool (PHE, 2020b) details the required competencies based on the practitioner's role within the vaccination programme and should be completed prior to commencing vaccination procedures.

IM injection ensures deposition of medication beyond the sub cutaneous tissue into the deep muscle; due to the vascular nature of muscle tissue, this enables rapid absorption (Grafton *et al,* 2020). IM administration of C-19 vaccines generates effective immune response as appropriate cells are present in the muscle tissue, to initiate the response (PHE, 2021a). It is vital to avoid ritualistic practices when carrying out IM vaccination; nurses should utilise appropriate evidence to inform their practice (Greenway , 2014).

Table 1: Comparison of C-19 vaccines for administration (adapted from PHE, 2021a and PHE, 2021b)

Vaccine preparation	**Vaccine type**	**Vaccine composition (of note)**	**Storage and shelf life**	**Reconstitution**	**Doses per vial**	**Dosage (ml)**	**Dosing schedule***
AstraZeneca ChAdOx1 nCoV-19 (AZD1222) (UK)	Adenovirus viral vector (non-live – cannot cause infection)	No preservatives No animal products	+2°C and +8°C. Use within 6 hours of vial puncture and then discard. Vial can be stored between at +2°C to +25°C after first puncture	No reconstitution required	8 doses of 0.5ml *or* 10 doses of 0.5ml	0.5ml via IM injection via 1ml dose sparing syringe with 23g or 25g needle	2 doses with a minimal interval of 28 days
Pfizer (BioNTech) BNT162b2 (USA / Germany)	mRNA (non-live – cannot cause infection)	Contains Polyethylene glycol (PEG) – allergy to PEG is rare but contraindicates vaccination No preservatives No animal products	-80°C to -60 °C (6 months). Thawed at 2°C to 8 °C (5 days) Additional 2 hours up to 25°C in preparation for dilution	1.8ml of Sodium Chloride 0.9% Solution for Injection via 2ml syringe with green needle	6 doses of 0.3ml	0.3ml via IM injection via 1ml combined 23g/25mm blue hub needle (supplied)	2 doses with a minimal interval of 21 days
Moderna mRNA-1273 (USA)	mRNA (non-live – cannot cause infection)	Contains Polyethylene glycol (PEG) – allergy to PEG is rare but contraindicates vaccination No preservatives No animal products	-25°C to -15°C (7-month shelf life at this temperature. Once thawed, store at 2°C to 8°C for up to 30 days. Unopened vial stable for 12 hrs at +8°C to +25°C	No reconstitution required	10 doses of 0.5ml	0.5ml via IM injection via a 1ml syringe with a 23g / 25g needle (supplied)	2 doses with a minimal interval of 28 days

* It is recommended that the second dose of vaccines should be routinely scheduled between four and 12 weeks after the first dose. This will allow more people to benefit from the protection provided from the first dose during the roll out phase and will have a greater impact in reducing mortality, severe disease, and hospitalisation. Evidence from Phase 3 trials indicate high levels of protection against serious disease and death from around 2 weeks after the first dose. Longer term protection will then be provided by the second dose.

Informed consent

NMC (2018) outlines the need to always act in the best interests of people, ensuring informed consent is obtained and documented prior to carrying out any action; this includes the administration of vaccines. There is no legal requirement for consent to vaccination to be in writing, consent must be given freely, the premise of 'informed' being justified by the individual being aware of the process, benefits, risks and be able to communicate that decision (PHE, 2013). Vaccinators must ensure they have obtained informed consent from the individual or person legally able to act on the persons behalf. Where there is a lack of capacity, a decision to vaccinate can be made in the persons best interests (PHE, 2021a). It is good practice to reconfirm consent prior to each vaccination.

Contraindications and considerations for dosing

Contraindications to vaccination should be assessed prior to administration.

- Previous systemic allergic reaction to a previous dose of the same vaccine
- Previous systemic allergic reaction to any excipients of the vaccine, including PEG (Pfizer and Moderna vaccines only)
- Individuals with localised urticarial (itchy) skin reactions (without systemic symptoms) to the first dose, should receive the second dose with prolonged observation (30 minutes) in a setting with full resuscitation facilities.
- Individuals with previous history of anaphylaxis not related to components of C-19 vaccines *can* be vaccinated
- Localised injection site reaction to first dose is *not* a contraindication to further dosing
- Individuals with bleeding disorders can be immunised if this is deemed reasonably safe by a doctor familiar with the persons bleeding risk
- There is insufficient evidence to routinely recommend C-19 vaccination in pregnancy, but pregnant women should receive vaccination if benefits outweigh the risks; for example, those with co-morbidities. Within the UK, the UK vaccine in pregnancy surveillance programme

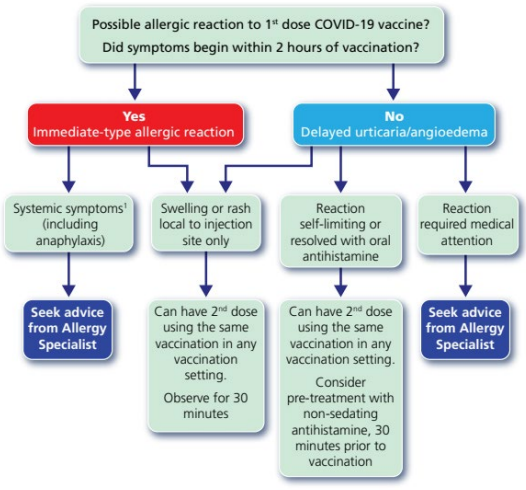
seeks to compile additional information about women who are immunised with specified vaccines whilst pregnant to monitor the outcome of such exposures. This data being utilised to gain further information to guide practice and provide information. All COVID-19 vaccines given from the first day of last menstrual period to any time in pregnancy should be reported to the UK vaccine in pregnancy surveillance programme (PHE, 2021c)

- Minor illnesses without fever or systemic upset are not valid reasons to postpone immunisation, unless acutely unwell. Vaccination should be postponed avoiding wrongly attributing symptoms to adverse effects of vaccination
- C-19 vaccination should not be given within 7 days of another vaccine – again, to avoid wrongly attributing side effects to either vaccine
- There is no evidence of safety concerns for vaccinating individuals with previous history of C-19 infection. Vaccination should be deferred for 4 weeks after positive tests / symptoms.

(adapted from PHE, 2021a, PHE, 2021b, JCVI, 2020; RCOG, 2020)

Figure 1 provides a flowchart for managing patients who have allergic reactions to the first dose of vaccine (PHE, 2021b)

Figure 1:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/961287/Greenbook_chapter_14a_v7_12Feb2021.pdf



Infection prevention and control (IPC)

All those attending for vaccination and those delivering vaccination should wear appropriate personal protective equipment (PPE) as described in the infection prevention and control (IPC) advice current at the time of administering the vaccine. Gloves are not necessary for vaccine clinics unless there is a risk of contact with blood or bodily fluids (PHE, 2020b) but vaccinators should follow PHE guidance for IPC regarding appropriate PPE in their area (Brown and Nickalls, 2021). Hand hygiene is critical to prevent the spread of infection and hands should be cleaned with alcohol-based gel or soap and water before vaccine preparation, and between patients. Those preparing and administering the vaccine should maintain good hand hygiene throughout and should take care not to touch the vial bung with their fingers (PHE, 2021a).

Drawing up

Manufacturers of all 3 approved UK vaccines recommend the use of 23g (blue) or 25g (orange) needles, 25mm in length. Some will come with the required needles and syringes (see table 1). Longer length needles (38mm) are recommended for morbidly obese individuals to ensure the vaccine is injected into muscle; Greenway (2014) cites needle length (rather than width) is critical to the effectiveness of IM injection.

If dose sparing needles and syringes are used, it should be possible to obtain the full 6, 8 or 10 doses from the vial (see table 1 – 'doses per vial'). Care should be taken to ensure the full dose is withdrawn from the vial, where a full dose cannot be extracted, the remaining contents should be discarded.

The vial should be wiped with an alcohol swab and allowed to fully air dry. The required dose should be removed from the vial, taking care to ensure the correct dose is drawn up. Air bubbles should be removed *before* removing the needle from the vial to avoid losing any vaccine dose. The needle must not be changed between drawing up and administering the vaccine unless it is contaminated or damaged. (PHE, 2021a)

Injection site

The area for injection should be clearly visible and accessible. Garments with long or tight sleeves may need to be removed. COVID-19 vaccines should be administered by intramuscular (IM) injection, preferably into the deltoid muscle of the upper arm. Individuals who have minimal muscle mass in the deltoid area of the upper arm, or a particular reason to avoid immunisation in the deltoid muscle, can be given their vaccine in the vastus lateralis muscle in the thigh if necessary. Utilising the deltoid requires stretching of the skin whereas, the vastus lateralis requires pinching of the muscle away from the bone during vaccination (see figure 2 and 3) (PHE, 2021a, 2021b). The central and thickest portion of the deltoid muscle should be utilised; above the level of the armpit and approximately 2-3 fingerbreadths below the acromion process. On exposure of the arm, advice should be sought if there is bruising, cellulitis or skin irritation at the intended injection site.

Figure 2 – Deltoid site Both images are from eLFH so will require a stock image or redo.

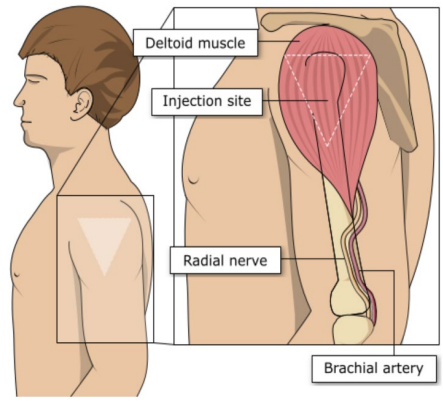
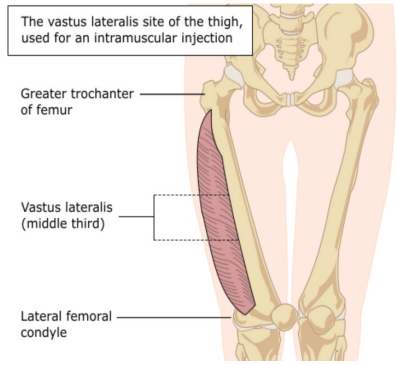


Figure 3 – Vastus lateralis site



Injection technique

1. Gather the required equipment; Box 1 outlines required equipment, however, ensure local guidelines are followed as equipment will vary depending on the vaccine administered and the local procedure for administration (i.e.: drawing up and dosing / dosing only).

Box 1:

Cleaned receptacle
Gauze swab / cotton wool
Vaccine vial
Alcohol wipe (for vial stopper if drawing up)
Appropriately sized syringe (1ml)
Appropriately sized needle
Sharps box – placed in close proximity to the vaccinator (Health and Safety Executive, 2013)
Access to resus / anaphylaxis equipment

2. Ensure privacy and dignity, decontaminate hands, and apply PPE as per local policy
3. Apron and gloves are not usually required for vaccine dosing but adherence to PPE requirements for C-19 measures must be followed
4. The injection site does not need to be cleaned unless visibly dirty. If cleaning is required, water should be used, and the area dried with a gauze swab. It is not necessary to disinfect the skin.
5. Stretch the skin at the site of injection - this displaces the subcutaneous tissue and aids needle entry (Grafton *et al*, 2020). This is a straight IM injection technique and Z-track should not be used (Brown and Nickalls, 2021)
6. Using a swift, dart like motion, insert the needle at a 90-degree angle, far enough to ensure the vaccine is delivered into the muscle. The is no requirement to leave a length of needle exposed, this has been demonstrated as ritualistic practice (Greenway, 2014). Clinical judgement should be utilised to ensure the needle is located within the muscle – **this is a**

single-handed technique. Do not rest the thumb on the plunger whilst inserting. See figure 4. Figure 4 is from eLFH training, will require a redo or permission to use

7. Aspiration of the plunger is *not* required due to the absence of large blood vessels at designated injection sites for C-19 vaccination. Aspiration is only required when the dorsogluteal site is used, which is no longer recommended for IM injection due to proximity to large blood vessels and the sciatic nerve (Greenway, 2014; Shepherd, 2018; Ogston-Tuck, 2014).

8. Depress the plunger - Ensure the full dose is administered as a partial dose will not evoke a full immune response

9. Gently remove the needle

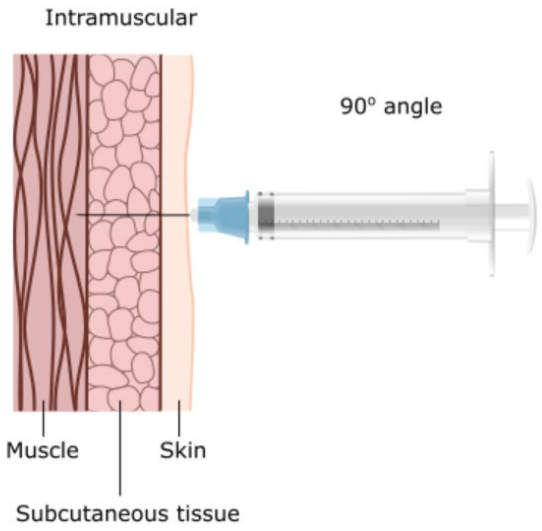
10. Apply light pressure with gauze / cotton wool if bleeding occurs – *do not rub*. If the individual has a bleeding disorder, apply firm pressure to the site for at least 2 minutes without rubbing.

11. Discard used needle and syringe immediately in to sharps container, which should be in close proximity to the vaccination site

12. Discard all used equipment appropriately and decontaminate as per local procedure

(Adapted from Brown and Nickalls, 2021; Grafton *et* al, 2020; Greenway, 2014; Ogston-Tuck, 2014; PHE, 2021a, 2021b; Shepherd, 2018)

Figure 4 – IM injection technique for C-19 vaccination



Post vaccination observation and documentation

The vaccinee should be provided with printed information in an accessible format following vaccination, alongside a date for further vaccination (for first dosing).

The vaccinee should be observed for 15 minutes (30 minutes for an individual with previous urticarial reaction).

Documentation of vaccination should include:

- Vaccine name
- Product name
- Batch number
- Expiry date
- Dose administered
- Date vaccination given
- Route/site used

- Name and signature of vaccinator (PHE, 2021a, 2021b)

Following dosing any suspected side effects should be reported via the yellow card scheme https://coronavirus-yellowcard.mhra.gov.uk/. Overall reporting is approximately 3-4 yellow cards per 1,000 doses given, the majority relating to injection site reactions and 'flu-like' symptoms, an expected immune response. Severe allergies are very rare, of the order of 1-2 per 100,000 doses (MHRA, 2021).

Overall, given the millions of exposures to C-19 vaccines, it is clear that approved vaccines are safe and well tolerated.

Conclusion

Effective, evidence-based injection technique of C-19 vaccines will ensure a maximal immune response for the individual, which will confer benefits to the wider population as the rate of vaccination increases. The reader should continue to refer to national guidelines and publications which are subject to frequent updates based on latest data, research findings and the emergence of new vaccines. The 'Green Book – chapter 14a' and the 'COVID-19 programme guidance for healthcare workers' contains up to date guidance on C-19 vaccines, the dose and schedule for the UK and recommendations for use of the vaccine (PHE, 2021a, 2021b).

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