2.2 ADMINISTRATION OF VACCINES

2.2.1 Occupational health and safety issues

The standard principles of infection prevention and control should always be followed during vaccination to prevent the transmission of infectious organisms. These principles include recommendations for routine hand hygiene, the use of personal protective equipment as appropriate, the handling and disposal of sharps, and routine cleaning of the work environment (refer to the National Health and Medical Research Council’s Australian guidelines for the prevention and control of infection in healthcare).1

All immunisation service providers must be familiar with, and adhere to, the National Health and Medical Research Council’s Australian guidelines for the prevention and control of infection in healthcare.1 This publication can be accessed free of charge from www.nhmrc.gov.au/node/30290

If exposure to blood or body fluids does occur, appropriate guidelines for post-exposure prophylaxis should be followed.

2.2.2 Equipment for vaccination

Preparing for vaccination

Depending on the vaccine(s) that are to be administered, and the age and size of the person to be vaccinated, decide on the appropriate injection site and route, and the injection equipment required (e.g. syringe size, needle length and gauge).

The equipment chosen will vary depending on whether the vaccine is a reconstituted vaccine, a vaccine from an ampoule or vial, or a vaccine in a pre-filled syringe. Unless the vaccine is provided in a pre-filled syringe, a new, sterile, disposable syringe and needle must be used for each injection.

Gloves and protective eyewear are not routinely recommended for immunisation service providers, unless the person administering the vaccine is at risk of coming into contact with body fluids or has open lesions on their hands.2

Equipment may include:

- medical waste (sharps) container that meets Australian standards (always keep sharps containers out of the reach of children)
- vaccine, plus diluent if reconstitution is required
- 2 or 3 mL syringe (unless vaccine is in pre-filled syringe)
- appropriate drawing-up needle (19 or 21 gauge needle if required, to draw up through rubber bung and for reconstitution of vaccine)
- appropriate injecting needle (refer to Table 2.2.2 Recommended needle size, length and angle for administering vaccines)
- clean cotton wool and hypoallergenic tape to apply to injection site after vaccination
- a rattle or noisy toy for distraction after the injection.

Preparing the vaccine

- Ensure that the minimum/maximum thermometer displays temperatures within the +2°C to +8°C range before removing vaccine from the refrigerator.
- Ensure that the correct vaccine is taken from the refrigerator and that it is within the expiry date.
- Ensure that the diluent container is not damaged and potentially contaminated.
- Shake vaccine (either vial/pre-filled syringe or reconstituted vaccine) to ensure a homogeneous suspension is obtained. Check for particulate matter or colour change in the vaccine. If either is apparent, refer to the vaccine product information.
- Wash hands with soap and water (if visibly soiled) or use a waterless alcohol-based hand rub.1,3
- Prepare the appropriate injection equipment for the vaccine to be administered.
Injectable vaccines that do not require reconstitution

- If the vaccine is in a vial, remove the cap carefully to maintain sterility of the rubber bung. There is no need to wipe the rubber bung of single-dose vials with an alcohol swab if it is visibly clean. If there is visible contamination, the bung should be cleaned with a single-use swab, allowing time to dry before drawing up the contents.
- Use a new, sterile, disposable 19 or 21 gauge needle to draw up the recommended dose through the bung (or through the top of the ampoule), if required.
- Change the needle after drawing up from a vial with a rubber bung or ampoule, before giving the injection. If using a safety needle system, once the vaccine has been drawn up, draw back on the syringe to ensure as much vaccine as possible is removed from the tip of the needle, and then eliminate any air to the tip of the syringe without re-priming the needle.

Injectable vaccines that require reconstitution

- Reconstitute the vaccine as needed immediately before administration.
- Use a new, sterile, disposable 21 gauge needle for reconstitution. Use a separate new, sterile, disposable 23 or 25 gauge needle, 25 mm in length, for administration of the vaccine in most circumstances.
- Use only the diluent supplied with the vaccine; do not use sterile water for injection instead of a supplied diluent. Ensure that the diluent and vaccine are completely mixed.
- Check reconstituted vaccines for signs of deterioration, such as a change in colour or clarity, and if apparent refer to the vaccine product information.
- Administer reconstituted vaccines as soon as practicable after they have been reconstituted as they may deteriorate rapidly. Refer to individual vaccine product information for recommended times from vaccine reconstitution to administration.
- Never freeze a vaccine after it has been reconstituted.

For all injectable vaccines

- Do not extrude small air bubbles through the needle for injection. However, in the rare instance of a large air bubble in a pre-filled syringe, first draw back on the needle to ensure no vaccine is expelled along with the air, and then expel the air through the needle, taking care not to prime the needle with any of the vaccine, as this can lead to increased local reaction.
- **Never** mix other vaccines together in the one syringe (unless that is the manufacturer’s registered recommendation, e.g. Infanrix hexa).
- **Never** mix a local anaesthetic with a vaccine.

Vaccines in multi-dose vials

Multi-dose vials are not routinely used in Australia. The current exception is bacille Calmette-Guérin (BCG) vaccine (refer to 4.20 Tuberculosis). Single-dose preparations are now available for all other vaccines currently on the NIP.

However, where mass vaccination of a population is required, such as during the 2009–2010 H1N1 influenza pandemic, multi-dose vials have some advantages over single-dose vaccines. The production of vaccines in multi-dose vials is more cost effective and can also mean that the vaccine takes less time to manufacture. Multi-dose vials also take up less storage room in a vaccine fridge.

The primary risk with use of multi-dose vials is a breach in infection control through user error, for example, an unsterile needle is inserted into the vial or a contaminated syringe is re-used. It is recognised that there are multiple reports of instances of transmission of bacteria or blood-borne viruses through inappropriate use of multi-dose vials; however, the majority of these have been in high-risk settings such as haemodialysis units or with use of anaesthetics and did not involve immunisations. When only multi-dose vials are available, the risk of infectious disease transmission may be mitigated by following advice in the Australian guidelines for the prevention and control of infection in healthcare (refer to 2.2.1 Occupational health and safety issues).

### 2.2.3 Route of administration

Most vaccines available in Australia are given intramuscularly. Only a few vaccines are given subcutaneously, orally or intradermally.

Rotavirus vaccines are only available for oral administration and must never be injected.

Special training is required for intradermal administration, which is important for several vaccines (refer to 4.15 *Q fever* and 4.20 *Tuberculosis*).

Table 2.2.1 summarises the route of administration for vaccines used in Australia.
Table 2.2.1: Route of administration for vaccines used in Australia

<table>
<thead>
<tr>
<th>Intramuscular (IM) injection*</th>
<th>Subcutaneous (SC) injection*</th>
<th>IM or SC injection</th>
<th>Intradermal</th>
<th>Oral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria-tetanus vaccine (dT)</td>
<td>Inactivated poliomyelitis vaccine (IPV)†</td>
<td>Inactivated poliomyelitis vaccine (IPV)†</td>
<td>Bacille Calmette-Guérin (BCG) vaccine‡</td>
<td>Rotavirus vaccine Cholera vaccine Typhoid vaccine</td>
</tr>
<tr>
<td>Diphtheria-tetanus-acellular pertussis vaccine (DTPa and dTpa)</td>
<td>Quadrivalent meningococcal polysaccharide vaccine (4vMenPV)</td>
<td>Measles-mumps-rubella vaccine (MMR) (Priorix only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DTPa- and dTpa-combination vaccines</td>
<td>Varicella vaccine (VV)</td>
<td>Measles-mumps-rubella-variella vaccine (MMRV) (Priorix-tetra only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis A vaccine and Hepatitis A combination vaccines</td>
<td>Japanese encephalitis vaccine (Imojev)</td>
<td>23-valent pneumococcal polysaccharide vaccine (23vPPV)‡</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hepatitis B vaccine† and Hepatitis B combination vaccines</td>
<td>Q fever vaccine§</td>
<td>Rabies vaccine (HDCV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Haemophilus influenzae</em> type b (Hib) vaccine</td>
<td></td>
<td>Yellow fever vaccine</td>
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<tr>
<td>Human papillomavirus (HPV) vaccine</td>
<td></td>
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<td></td>
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<tr>
<td>IPV-containing combination vaccines†</td>
<td></td>
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<tr>
<td>Japanese encephalitis vaccine (JEspect)</td>
<td></td>
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<tr>
<td>10-valent pneumococcal conjugate vaccine (10vPCV)</td>
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<tr>
<td>13-valent pneumococcal conjugate vaccine (13vPCV)</td>
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<tr>
<td>Typhoid Vi polysaccharide vaccine</td>
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<tr>
<td>Meningococcal B vaccine (MenBV)</td>
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<tr>
<td>Meningococcal C conjugate vaccine (MenCCV)</td>
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<td></td>
<td></td>
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<tr>
<td>Quadrivalent meningococcal conjugate vaccine (4vMenCV)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Rabies vaccine (PCECV)</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

* In the instance where a vaccine is inadvertently administered via an alternative route, refer to 2.2.5 Vaccine injection techniques below for advice on the need for revaccination.
† IPV-containing combination vaccines are administered by IM injection; IPV (IPOL) is administered by SC injection.
‡ The IM route is preferred to the SC route because it causes fewer local adverse events. However, if administered by SC injection, the vaccine does not need to be re-administered.
§ Q fever skin testing and BCG vaccine should be administered only by specially trained immunisation service providers.
¶ The intradermal route may be considered for the administration of additional doses of hepatitis B vaccine to HBsAg-negative healthcare workers who are non-responders to a primary course of vaccination and to subsequent additional IM doses (refer to 4.5 Hepatitis B).
2.2.4 Preparation for vaccine administration

Skin cleaning
Provided the skin is visibly clean, there is no need to wipe it with an antiseptic (e.g. alcohol wipe).

If the immunisation service provider decides to clean the skin, or if the skin is visibly not clean, alcohol and other disinfecting agents must be allowed to dry before vaccine injection (to prevent inactivation of live vaccines and to reduce the likelihood of irritation at the injection site).

Distraction techniques
The routine use of distraction, relaxation and other measures have been shown to reduce distress and pain following vaccination in young children. Reducing children’s distress may enhance parents’ timely attendance for subsequent vaccinations.

Distraction measures that may decrease discomfort following vaccination in young children include:

- swaddling and holding the infant securely (but not excessively)
- shaking a noisy toy (for infants and very young children)
- playing music
- encouraging an older child to pretend to blow away the pain using a windmill toy or bubbles
- breastfeeding the infant during administration of the vaccine.

Discomfort may also be decreased by administering sweet-tasting fluid orally immediately before the injection (with parental consent). In infants, 15–25% sucrose drops have been used.

Topical anaesthetic agents, including vapocoolant sprays, are available but, to be effective, must be applied at the correct time before vaccine administration. Topical anaesthetics, such as EMLA, are not recommended for routine use, but could be considered in a child with excessive fear or dislike of needles; they require application 30 to 60 minutes before an injection.

Vapocoolant sprays are applied 15 seconds before vaccination. These sprays have been shown to be more effective in adults than children as children can perceive coldness as painful and spray application may also focus the child more on the procedure. Topical lignocaine/prilocaine is not recommended for children <6 months of age due to the risk of methaemoglobinaemia.

Administration of paracetamol at the time of, or immediately after, vaccination in an effort to reduce the likelihood of fever is not routinely recommended, with the exception of specific recommendations for prophylactic administration of paracetamol with meningococcal B vaccine in infants <2 years of age (refer to 2.3.2 Adverse events following immunisation).

2.2.5 Vaccine injection techniques

Intramuscular injection technique

- For intramuscular (IM) injection, use a 25 mm needle in most cases (refer to Table 2.2.2).
- Depending on the injection site, position the limb so as to relax the muscle into which the vaccine is to be injected.
- Pierce the skin at an angle of 90° to the skin, so the needle can be safely inserted to the hub. Provided an injection angle of >70° is used, the needle should reach the muscle layer.
- If using a 25 gauge needle for an IM vaccination, ensure the vaccine is injected slowly over a count of 5 seconds to avoid injection pain and muscle trauma (refer to Table 2.2.2).
- If you have drawn back on the syringe plunger before injecting a vaccine (which is not considered necessary), and a flash of blood appears in the needle hub, withdraw the needle and select a new site for injection.

Studies have demonstrated that, for most vaccines, local adverse events are minimised and immunogenicity is enhanced by ensuring vaccine is deposited into the muscle and not into the subcutaneous layer. However, some vaccines (e.g. inactivated poliomyelitis, varicella and meningococcal polysaccharide vaccines) are only registered for SC administration (refer to Table 2.2.1).

In the instance where a vaccine that is registered for administration only via the IM route (refer to Table 2.2.1) is inadvertently administered via the SC route, check the vaccine product information and the ‘Vaccines’ section in relevant disease-specific chapters in Part 4 for additional information. Some vaccines may still be immunogenic when given via the SC route, and as such, would not need to be repeated. One vaccine that should be considered invalid and that therefore needs to be repeated is Rabipur Inactivated Rabies Virus Vaccine (PCECV) (refer to 4.16 Rabies and
other lyssaviruses (including Australian bat lyssavirus)). In general, hepatitis B vaccines should also be repeated if inadvertently given SC. However, in special circumstances, for example, in persons with bleeding disorders, some hepatitis B vaccines may be given via the SC route (refer to 3.3.5 Vaccination of persons with bleeding disorders).

A clinical trial demonstrated that for infant vaccination long (25 mm) needles (with the skin stretched flat and the needle inserted at 90°) were associated with significantly fewer local adverse events, while achieving comparable immunogenicity. Little difference in local adverse events or immune response was found between needles of the same length but with different gauges.19

Subcutaneous injection technique

For subcutaneous (SC) injection, administer the injection at a 45° angle to the skin. The standard needle for administering vaccines by SC injection is a 25 or 26 gauge needle, 16 mm in length.

In the instance where a vaccine that is registered for administration only via the SC route (refer to Table 2.2.1) is inadvertently administered via the IM route, the immune response to vaccines is unlikely to be affected. Therefore it is usually not necessary to repeat doses.

Intradermal Injection technique

For intradermal injection of BCG vaccine, Q fever skin test or, if indicated, hepatitis B vaccine, a 26 or 27 gauge, 10 mm needle is recommended. The intradermal injection technique requires special training, and should be performed only by a trained provider (refer to 4.20 Tuberculosis and 4.15 Q fever).

Two influenza vaccines from the same manufacturer, presented in a purpose-designed syringe for intradermal administration, were registered for use in Australia in 2009 but are no longer available.

### Table 2.2.2: Recommended needle size, length and angle for administering vaccines

<table>
<thead>
<tr>
<th>Age or size of child/adult</th>
<th>Needle type</th>
<th>Angle of needle insertion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant, child or adult for IM vaccines</td>
<td>23 or 25 gauge,* 25 mm in length†</td>
<td>90° to skin plane</td>
</tr>
<tr>
<td>Preterm babies (&lt;37 weeks gestation) up to 2 months of age; and/or very small infants</td>
<td>23 or 25 gauge,* 16 mm in length</td>
<td>90° to skin plane</td>
</tr>
<tr>
<td>Very large or obese patient</td>
<td>23 or 25 gauge, 38 mm in length</td>
<td>90° to skin plane</td>
</tr>
<tr>
<td>Subcutaneous injection in all persons</td>
<td>25 or 26 gauge, 16 mm in length</td>
<td>45° to skin plane</td>
</tr>
</tbody>
</table>

* If using a narrow 25 gauge needle for an IM vaccination, ensure vaccine is injected slowly over a count of 5 seconds to avoid injection pain and muscle trauma.

† The use of short needles for administering IM vaccines may lead to inadvertent SC injection and increase the risk of significant local adverse events, particularly with aluminum-adjuvanted vaccines (e.g. hepatitis B, DTPa, DTPa-combination or dT vaccines).

**Interruption to a vaccination**

If the process of administration of a vaccine given parenterally (IM or SC) is interrupted (e.g. by syringe–needle disconnection) and most of the dose has not been administered, the whole dose should be repeated as soon as practicable.

If most of an oral rotavirus vaccine dose has been spat out or vomited within minutes of administration, a single repeat dose can be administered during the same visit. If an infant regurgitates or vomits only a small part of a dose of oral rotavirus vaccine, it is not necessary to repeat the dose. Therefore, the regurgitated (and incomplete volume) dose is still considered as the valid dose (refer to 4.17 Rotavirus).

### 2.2.6 Recommended injection sites

The choice of injection sites depends primarily on the age of the person to be vaccinated. The two anatomical sites recommended as routine injection sites are the anterolateral thigh (Figures 2.2.5 and 2.2.6) and the deltoid muscle (Figure 2.2.8). Immunisation service providers should ensure that they are familiar with the landmarks used to identify any anatomical sites used for vaccination. Photographs and diagrams are provided in this section, but are not a substitute for training. Further detail on identifying the recommended injection sites is provided in 2.2.8 Identifying the injection site.

**Infants <12 months of age**

The vastus lateralis muscle in the anterolateral thigh is the recommended site for IM vaccination in infants <12 months of age, due to its larger muscle size (refer to Figures 2.2.5 and 2.2.6 in 2.2.8 Identifying the injection site).
The ventrogluteal area (refer to Figure 2.2.7 in 2.2.8 Identifying the injection site) is an alternative site for IM vaccination of infants. It is important that vaccine providers who choose to use this site are familiar with the landmarks used to identify it. The reactogenicity and immunogenicity of vaccines given in this site are comparable to those of vaccines given in the anterolateral thigh.27,29

The deltoid muscle is not recommended for IM vaccination of infants <12 months of age.

**Children ≥12 months of age**

The deltoid muscle is the recommended site for IM vaccination in children ≥12 months of age (refer to Figure 2.2.8 in 2.2.8 Identifying the injection site).

The ventrogluteal area is an alternative site for IM vaccination of children ≥12 months of age (refer to Figure 2.2.7 in 2.2.8 Identifying the injection site). However, vaccine providers should be familiar with the landmarks used to identify this site.

The vastus lateralis in the anterolateral thigh may also be used in children ≥12 months of age (refer to Figures 2.2.5 and 2.2.6 in 2.2.8 Identifying the injection site), but, if this site is used, the less locally reactogenic vaccines (e.g. MMR) should be given in the thigh.

**Children with congenital limb malformation or children in spica casts**

Children with congenital limb malformation(s) should receive their vaccines in an unaffected limb where possible. The ventrogluteal area can also be considered (refer to Figure 2.2.7 in 2.2.8 Identifying the injection site).30

Administration of vaccines to children in spica casts can be timed to occur when the cast is being changed. Parents should be informed of the importance of looking for any signs of swelling that may compromise circulation and, if this occurs, to seek advice from their physiotherapist or doctor as soon as possible.30 Some resources suggest the use of the deltoid muscle as an alternative route for children in spica casts. If using this site, it is important to be aware of the radial nerve, which is located superficially near the deltoid in children <12 months of age.

**Precaution:**

Vaccine injections should not be given in the dorsogluteal site or upper outer quadrant of the buttock because of the possibility of a suboptimal immune response.31,32 Immunoglobulin can be administered intramuscularly into the upper outer quadrant of the buttock, but care must be taken to ensure that the other quadrants are not used.

**Adolescents and adults**

The deltoid muscle is the recommended site for IM vaccination in adolescents and adults (refer to Figure 2.2.8 in 2.2.8 Identifying the injection site).

The anterolateral thigh can also be used in older children and adults (refer to Figure 2.2.5 in 2.2.8 Identifying the injection site). However, it is important to administer the least reactogenic vaccine in this muscle to decrease the likelihood of local injection site reactions.

The ventrogluteal area is an alternative injection site (refer to Figure 2.2.7 in 2.2.8 Identifying the injection site). However, vaccine providers should be familiar with the landmarks used to identify this site.

**Patients undergoing treatment for breast cancer or patients with lymphoedema**

It has been routine practice for many years to avoid giving injections, including vaccination, into a person’s arm(s) affected by lymphoedema.33-35 This recommendation is based on the potential for arm swelling related to vaccination to lead to, or exacerbate, lymphoedema, although there is limited evidence to support this. Where possible, use an alternative site, such as the other arm or thigh.33-35 For further information about vaccination of persons undergoing cancer treatment, refer to 3.3 Groups with special vaccination requirements.

**2.2.7 Positioning for vaccination**

It is important that infants and children do not move during injection of vaccines. However, excessive restraint can increase their fear and result in increased muscle tension. The following section describes a variety of positions that may be used for vaccinating different age groups.

**Infants <12 months of age**

**Cuddle position for infants**

Position the infant in a semi-recumbent cuddle position on the lap of the parent/carer (refer to Figure 2.2.1). The infant’s inside arm adjacent to the parent/carer should be restrained underneath the parent/carer’s arm or against the parent/carer’s chest. The infant’s outside arm must also be held securely. The parent/carer’s hand should restrain the
infant’s outside leg and the knee should be flexed to encourage relaxation of the vastus lateralis for IM vaccinations. This position can also be used for young children.

**Figure 2.2.1: Positioning a child <12 months of age in the cuddle position**

Positioning an infant on an examination table

An alternative is to lay an infant on his/her back on an examination table, with the infant’s feet towards the immunisation service provider, and the parent/carer beside the provider to immobilise and distract the baby (refer to Figure 2.2.2).

Keep the infant’s hip and knee flexed by cupping the patella in the non-injecting hand.

The thumb and index finger of the non-injecting hand may be used to stabilise the hub of the needle once the needle has been inserted.

Although the exact mechanism is unclear, recent studies have shown that placing a child in the supine position may result in more pain than if the child is held in an upright position.\(^\text{16}\)

**Figure 2.2.2: Positioning an infant on an examination table for vaccination**

Prone position across the lap for ventrogluteal vaccination

For ventrogluteal injection, position the child face-down across the parent/carer’s lap (refer to Figure 2.2.7 below). This allows the hips to be flexed and provides access to the ventrogluteal area.
**Children ≥12 months of age**

**Cuddle position for an older child**

Sit the child sideways on the lap of the parent/carer, with the arm to be injected held close to the child’s body while the other arm is tucked under the armpit and behind the back of the parent/carer.

The child’s exposed arm should be secured at the elbow by the parent/carer, and the child’s legs should also be secured by the parent/carer (refer to Figure 2.2.3).

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**Figure 2.2.3: Positioning an older child in the cuddle position**

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**Straddle position**

An older child may be positioned facing the parent/carer with the legs straddled over the parent/carer’s lap. The child’s arms should be folded in front, with the parent/carer hugging the child’s body to the parent/carer’s chest. Alternatively the child may be positioned to ‘hug’ the parent/carer with the parent/carer’s arms holding the child’s arms in a reciprocal hug (refer to Figure 2.2.4). This position allows access to both deltoids and both anterolateral thighs.

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**Figure 2.2.4: Positioning a child in the straddle position**

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Prone position across the lap for ventrogluteal vaccination

For ventrogluteal injection, position the child face-down across the parent/carer’s lap (refer to Figure 2.2.7 below).

Older children, adolescents and adults

Solo sitting position for deltoid injections

Most vaccines can be administered into the deltoid area. Adults should sit in a straight-backed chair, feet resting flat on the floor with forearms and hands in a relaxed position on the upper thighs. Keep the arms flexed at the elbow to encourage the deltoid muscle to relax.

Encourage the shoulders to drop by asking the person to raise the shoulders up while taking a deep breath in and to drop them while breathing out fairly forcefully. Use distraction to keep muscles relaxed during the procedure, for example, have an interesting poster or similar for the person to concentrate on during the procedure and ask him/her to give you a detailed description of what can be seen.

The ventrogluteal and vastus lateralis are alternative sites if needed (adapting guidance provided in 2.2.6 Recommended injection sites and 2.2.8 Identifying the injection site).

2.2.8 Identifying the injection site

The choice of injection site depends on the age of the person to be vaccinated, and is discussed in 2.2.6 Recommended injection sites.

The anterolateral thigh (vastus lateralis)

- Make sure the infant’s nappy is undone to ensure the injection site is completely exposed and the anatomical markers can be easily identified by sight and palpation.
- Position the leg so that the hip and knee are flexed and the vastus lateralis is relaxed (refer to Figure 2.2.6).
- Identify the following anatomical markers: the upper marker is the midpoint between the anterior superior iliac spine and the pubic tubercle, and the lower marker is the upper part of the patella.
- Draw an imaginary line between the two markers down the front of the thigh. The correct site for IM vaccination is lateral to the midpoint of this line, in the outer (anterolateral) aspect (refer to Figures 2.2.5 and 2.2.6).
- Do not inject into the anterior aspect of the thigh where neurovascular structures can be damaged.

Figure 2.2.5: Anatomical markers used to identify the vastus lateralis injection site (X) on the anterolateral thigh
The ventrogluteal area

*Note:* This area should not be confused with the dorsogluteal area (buttock).

The ventrogluteal area provides an alternative site for administering vaccines to a child of any age (as well as older children, adolescents and adults, adapting the guidance provided below), especially when multiple injections at the same visit are required. The ventrogluteal area is relatively free of major nerves and blood vessels, and the area provides the greatest thickness of gluteal muscle. \(^{36,37}\) There is a relatively consistent thinness of subcutaneous tissue over the injection site. \(^{37,38}\)

- Make sure the child’s nappy is undone to ensure the injection site is completely exposed and the anatomical markers can be easily identified by sight and palpation. Anatomical markers are the anterior superior iliac spine (ASIS), the greater trochanter of the femur and the iliac crest (refer to Figure 2.2.7).
- Place the child in a prone position (face-down) on the parent/carer’s lap or on the clinic table/bed, with the child’s arms tucked against their chest. Allow the child’s legs to dangle towards the floor (refer to Figure 2.2.7).
- Ensure the knee and hip are turned inwards to encourage muscle relaxation at the injection site.
- Use the injection site that is closest to you.
- Place the palm over the greater trochanter (the uppermost bony prominence of the thigh bone), with the thumb pointing towards the umbilicus. Point the index finger towards the anterior superior iliac spine, and spread the middle finger so it aims at the iliac crest, thus creating a ‘V’ outlining the ventrogluteal triangular area. The injection site is at the centre of this area as shown in the diagram in Figure 2.2.7. *Note:* In small children and infants, the placement of the hand in relation to these anatomical markers may vary, as shown in the photograph in Figure 2.2.7.
The deltoid area

To locate the deltoid site for injection:

- Expose the arm completely, from the top of the shoulder to the elbow; roll up the sleeve or remove the shirt if needed.
- Locate the shoulder tip (acromion) and the muscle insertion at the middle of the humerus (deltoid tuberosity).
- Draw an imaginary inverted triangle below the shoulder tip, using the identified anatomical markers (refer to Figure 2.2.8).

The deltoid site for injection is halfway between the acromion and the deltoid tuberosity, in the middle of the muscle (triangle).
Subcutaneous injection sites

Subcutaneous injections should be administered either over the deltoid muscle or over the anterolateral thigh. There are no studies that describe any specific differences in the technique used for an ‘SC injection’ compared with a ‘deep SC injection’. Figure 2.2.9 demonstrates the recommended technique for any SC injection.

Figure 2.2.9: A subcutaneous injection into the deltoid area of the upper arm using a 25 gauge, 16 mm needle, inserted at a 45° angle

2.2.9 Administering multiple vaccine injections at the same visit

When sequentially administering multiple vaccines to children, give the most painful vaccine last (e.g. pneumococcal conjugate vaccine). Evidence suggests that this may decrease the overall pain response.

The location of each separate injection given should be recorded, so that if a local adverse event occurs, the implicated vaccine(s) can be identified.

Infants <12 months of age

The suitable sites for this age group are the anterolateral thighs (preferred) and the ventrogluteal areas. For the routine schedule where only two vaccines are required, one can be given in each thigh.

When three or four injectable vaccines are to be given at the same visit, the options are:

- two injections in the same anterolateral thigh, separated by at least 2.5 cm (refer to Figure 2.2.10, injection numbers 1 and 2); further IM vaccines can be given in this way in the other thigh (injection number 3), or
- one injection into each anterolateral thigh and one injection into each ventrogluteal area (only one injection should be given into each ventrogluteal area).
Children ≥12 months of age, adolescents and adults

A single injection can be given into each deltoid muscle.

When three or four IM vaccines are to be given to a child at the same visit, the options will depend on the muscle mass of the child’s deltoid.

- If the deltoid mass is adequate, give a further injection into each deltoid muscle (separated by 2.5 cm from the initial injection site).
- If the deltoid muscle mass is small:
  - give further injections into either anterolateral thigh (2.5 cm apart if two vaccines are given in the same thigh), or
  - give one injection into each ventrogluteal area.

For younger children, the cuddle or straddle positions (Figures 2.2.3 and 2.2.4) are suitable for accessing multiple limbs during the one vaccination encounter.

Simultaneous injections by two immunisation providers

Currently there is insufficient evidence for or against having two immunisation providers administer vaccines at the same time rather than one vaccine after the other. Two studies were unable to demonstrate a difference in pain response in the child between simultaneous administration and sequential administration. If multiple immunisation providers are available, the technique has been explained to the parent and the parent gives consent, then the vaccines may be administered simultaneously, providing different sites can be safely accessed.

References

A full reference list is available on the electronic Handbook or website www.immunise.health.gov.au.


