Autoinjectors are generally not appropriate for inclusion in first aid kits for general use, due to several limitations:

- they are single-use only
- they are dose-specific
  - » EpiPen Jr or Anapen Jr containing 150 μg of adrenaline are recommended for children weighing between 10 kg and 20 kg
  - » EpiPen or Anapen containing 300 μg of adrenaline are recommended for children and adults weighing over 20 kg
- multiple pens would be required to allow for repeat dosing and varying ages/weights of patients, and shelf-life is limited to 1 to 2 years maximum.

Autoinjectors are not recommended for use in children weighing less than 10 kg.

Common adverse events following immunisation and their management

Commonly occurring AEFI are described in the table *Comparison of the effects of diseases and the side effects of NIP vaccines* inside the back cover of this *Handbook* and in the disease-specific chapters in Part 4.

The most commonly encountered adverse events are local reactions related to vaccine injection(s), such as pain, redness, itching, swelling or burning at the injection site. These are to be expected, are generally mild and usually last for 1 to 2 days. Injection site nodules are also relatively common. They are fibrous remnants of the body's interaction with the vaccine components (usually an adjuvant) in the muscle. They may remain for many weeks after vaccination and do not require any specific treatment.

Low-grade fever and tiredness (malaise), lasting a few days, are also common after many vaccines. These responses are usually mild and self-limiting, and generally do not require specific treatment.

Routine use of paracetamol at the time of, or immediately after, vaccination is not recommended. However, if an infant, child or adult has a fever of >38.5°C following vaccination or has pain at the injection site, paracetamol can be given. The dose of paracetamol for an infant or child up to 12 years of age is 15 mg/kg/dose, up to a maximum dose of 60 mg/kg per day in four divided doses. Adults and children aged ≥12 years can receive 500 to 1000 mg every 4 to 6 hours; dosage must not exceed 4 g in 24 hours. Paracetamol should not be given for more than 48 hours without seeking medical advice.[15]

If patients exhibit unexpected, serious or prolonged adverse symptoms or signs following immunisation, medical advice should be sought. The symptoms and signs from medical illness unrelated to vaccination can sometimes be attributed to a recent immunisation and should be investigated and managed accordingly.

Uncommon/rare adverse events following immunisation

Some vaccines have been shown to cause uncommon or rare serious adverse events, although the rate of vaccine adverse events is usually hundreds to thousands times less frequent than the disease complications. Information on the benefits compared with risks of immunisation is always taken into account when making recommendations for vaccine use. It is important to provide persons to be vaccinated or their parent/carer with advice regarding known, but rare, adverse events following immunisation, and to place the advice in the context of the benefits of vaccination (see 3.3.1 *Vaccination of persons who have had an adverse event following immunisation*).

If a patient has experienced a serious or uncommon/rare AEFI, it is important that they or their immunisation service provider seek advice from a specialist immunisation clinic or contact state/territory health authorities for more information regarding the need for further investigation and management (see Appendix 1 *Contact details for Australian, state and territory government health authorities and communicable disease control*). This will enable an assessment to determine the relationship to vaccination, consideration of the benefits and risks of further vaccination, and planning for receiving additional doses of that or other vaccines, as appropriate. Persons who have had a serious adverse event following immunisation (other than a contraindication, such as the confirmed identity of the vaccine component that triggered anaphylaxis) can usually subsequently be vaccinated under close medical supervision. For more detailed information see 3.3.1 *Vaccination of persons who have had an adverse event following immunisation.*

Examples of uncommon and rare adverse events are given below. It is important to remember that, although these events are uncommon or rare, they are still not necessarily causally related to vaccination, even if they occur following vaccination.

- Febrile convulsions are a relatively common response to fever of any cause in young children, particularly in those aged <3 years, with a peak incidence at 14–18 months of age. Overall, by the age of 5 years, approximately 3% of all children will have experienced a febrile convulsion, irrespective of vaccination. Febrile convulsions are rare following immunisation. They do, however, occur more commonly, but still at a low rate, after some vaccines. For example, MMR and MMRV vaccines are associated with an increased risk of febrile convulsions approximately 7 to 12 days after the 1st vaccine dose (see 4.9 *Measles* for more information). Co-administration of trivalent influenza vaccine and 13-valent pneumococcal conjugate vaccine may also be associated with an increased risk of febrile convulsions (see 4.7 *Influenza* and 4.13 *Pneumococcal disease*). In 2010, there was an increased incidence of high fevers and febrile convulsions (estimated at 4.4 per 1000 doses in Western Australia) following administration of one brand of seasonal influenza vaccine (Fluvax and Fluvax Junior, CSL Limited) in children aged <5 years in

Australia.[16] This vaccine is no longer registered for use in this age group. An excess risk of fever and febrile convulsions was not observed with the other influenza vaccines given to children.[16,17]

- Brachial neuritis (inflammation of a nerve in the arm, causing weakness or numbness) has been described following the administration of tetanus toxoid-containing vaccines, with an estimated excess risk of approximately 0.5–1 in 100 000 doses in adults.[5,18] Case reports of brachial neuritis following administration of other vaccines, including HPV vaccines,[19] are rare and a causal relationship has not been established.[20]
- Oral rotavirus vaccines are associated with a small increased risk of intussusception (IS), a rare form of bowel blockage caused by telescoping of the intestine into itself. This risk appears to be particularly in the 7 days following the 1st vaccine dose; however, a smaller increased risk in the week following the 2nd dose has also been reported.[21-23] It is not currently clear whether there is an overall increase in the risk of IS above that which would be expected in the 1st year of infancy without vaccine use. The increased risk represents approximately 6 additional cases of intussusception among every 100 000 infants vaccinated, or 18 additional cases per year in Australia.[23] Children who have had IS are recommended to not receive rotavirus vaccine (see 4.17 *Rotavirus*).
- Anaphylaxis following receipt of vaccines has been reported, but generally occurs very rarely.[24] For example, the estimated incidence rate of anaphylaxis following 4vHPV vaccine in Australia as at June 2010 was 2.6 anaphylaxis episodes per million doses of vaccine distributed.[25] This is within the same rate range as for other vaccines given to children and adolescents in international studies, such as hepatitis B vaccine, which is associated with anaphylaxis in approximately 1 in 1.1 million doses distributed.[26] (For more information on the management of immediate AEFI/anaphylaxis, see above.)
- Hypotonic-hyporesponsive episode (HHE) is the sudden onset of pallor or cyanosis, limpness (muscle hypotonia), and reduced responsiveness or unresponsiveness occurring after vaccination, where no other cause is evident such as a vasovagal episode or anaphylaxis. The episode usually occurs 1 to 48 hours after vaccination and resolves spontaneously. There are no known long-term side effects from HHE.[27,28] In Australia during 2009, 3.2 cases of HHE were reported per 100 000 doses of DTPa-containing vaccine given to children <1 year of age.[29]
- Guillain-Barré syndrome (GBS) is a rare autoimmune condition with acute onset of a rapidly progressive, ascending, symmetrical flaccid paralysis, with or without sensory loss. Diagnosis of GBS is complex and must be made by a physician. A small increased risk of GBS was associated historically with one influenza vaccine in the United States in 1976, but since then close surveillance has shown that GBS has occurred at a very low rate of up to 1 in 1 million doses of influenza vaccine, if at all.[30]

Events where evidence demonstrates no causal link with immunisation

Since vaccines are mainly given to healthy people, a range of conditions that occur after a vaccine dose may be attributed to vaccination. This is particularly so for illnesses that are complex and have an unknown or unclear cause. As many of these illnesses are rare and/or manifest months to years after vaccination, they are difficult to study in randomised controlled clinical trials, which are typically conducted before vaccines are registered for use. However, there is strong epidemiological evidence, usually derived from multiple well-conducted post-marketing studies, that indicates there is no causal association between immunisation and many diseases/conditions in which vaccines were suggested to have been involved.

Examples of events unrelated to vaccination include:

- sudden infant death syndrome (SIDS) and any vaccine[31-33]
- autism and MMR vaccine[34-39]
- multiple sclerosis and hepatitis B vaccine[40-43]
- inflammatory bowel disease and MMR vaccine[44]
- diabetes and Hib vaccine[45-47]
- asthma and any vaccine.[48]

Despite this evidence, patients/parents seeking further advice should discuss this with their immunisation provider or could be referred to a specialist immunisation clinic for further reassurance (see Appendix 1 *Contact details for Australian, state and territory government health authorities and communicable disease control*).

Reporting adverse events following immunisation

Surveillance for adverse events following immunisation is an integral part of the Australian National Immunisation Program, and underpins the safe use of all vaccines in Australia. Surveillance of AEFI aims to detect changes in the rates of known adverse events, any unrecognised or unexpected adverse events, or adverse events that result from program errors, such as incorrect vaccine schedule, delivery or storage. It is very important that all immunisation service providers report AEFI, particularly if serious or unexpected, as this will enable vaccine safety issues to be identified and managed appropriately as soon as possible. For example, reporting of AEFI by immunisation service providers in Australia in 2010 resulted in the detection of an unexpectedly high rate of fever and febrile convulsions in young children, associated with the use of one brand of seasonal influenza vaccine.[49,50] All reported AEFI are included in the Adverse Drug Reactions System (ADRS) database of the Therapeutic Goods Administration (TGA). For details on how to report AEFI, see the next section below.

Any serious or unexpected adverse event following immunisation should be promptly reported. Providers should use clinical judgment in deciding which adverse events to report and parents/carers should be encouraged to notify the immunisation service provider or health authorities of any untoward medical occurrence that follows immunisastion.

No time limit has been set to report AEFI; however, timely notification of adverse events, particularly rapid reporting of serious events, is important to identify any potential concerns. Notification does not necessarily imply a causal association with vaccination, as some events may occur coincidentally following vaccination. Any event that is suspected of being related to vaccination can be reported. All identifying information relating to the reporter and patient is kept strictly confidential. Any person, medical or non-medical, including providers who did not give the vaccine(s), can report an AEFI; however, it is very important that as much detail as possible is provided on all reports.

In addition to reporting of AEFI, immunisation service providers may need to provide additional clinical management and advice regarding future vaccination(s) for their patient and may require expert advice. Information about specialist immunisation clinics, or the contact details for paediatricians or medical specialists with experience in management of patients with AEFI, are usually available from state and territory health authorities (see Appendix 1 *Contact details for Australian, state and territory government health authorities and communicable disease control*) and from the Immunise Australia website (www.immunise.health.gov.au). For more information on managing common and rare AEFI, see above and also 3.3.1 *Vaccination of persons who have had an adverse event following immunisation*.

How to report adverse events following immunisation

AEFI are notifiable via different routes; immunisation service providers should be aware of the method of reporting for their location. In most jurisdictions (the Australian Capital Territory, New South Wales, the Northern Territory, Queensland, South Australia, Victoria and Western Australia), AEFI should be reported directly to the relevant state/territory health authority (see Table 2.3.3). AEFI notified to these state and territory health departments are then forwarded to the TGA, who manage the ADRS database, which includes all adverse reaction reports related to drugs and vaccines. Reporting can also be done directly to the TGA as described below.

Table 2.3.3: Contact information for notification of adverse events following immunisation

State/Territory	Report adverse events to	Contact information
Australian Capital Territory	ACT Health Department	02 6205 2300
New South Wales	NSW Public Health Units	1300 066 055 (for connection to Public Health Unit)
Northern Territory	NT Department of Health	08 8922 8044
Queensland	Queensland Health	Complete an AEFI initial report form, available at: www.health.qld.gov.au/immunisation or by phoning 07 3328 9888. Fax the completed form to the number provided on the form.
South Australia	SA Health	1300 232 272 www.sahealth.sa.gov.au
Tasmania	Direct to the TGA	1800 044 114 or complete the 'Blue card' reporting form (see below)
Victoria	SAEFVIC	03 9345 4143 or online at www.saefvic.org.au
Western Australia	State Health Department, WAVSS	08 9321 1312 or online at wavss.health.wa.gov.au

Alternatively, reporting directly to the TGA can be done by any person in any jurisdiction. Reports are submitted using the 'Blue card' adverse reaction reporting form. Paper copies of the 'Blue card' are available from:

Office of Product Review
Therapeutic Goods Administration
Reply Paid 100
Woden ACT 2606
Telephone: 1800 044 114

or online at www.tga.gov.au/safety/problem-medicines-forms-bluecard.htm.

Alternatively, the adverse reaction reporting form can be completed and submitted online via the TGA website at www.ebs.tga.gov.au/ebs/ADRS/ADRSRepo.nsf?OpenDatabase.