check

Independent learning program for GPs

Unit 482 May 2012

Immunisation

The Royal Australian College of General Practitioners

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Immunisation

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The five domains of general practice

- Communication skills and the patient-doctor relationship
- Applied professional knowledge and skills
- Population health and the context of general practice
- Professional and ethical role
- Organisational and legal dimensions

The Royal Australian College of General Practitioners

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Many vaccine preventable diseases have been eradicated or reduced in prevalence through the widespread implementation of immunisation programs. However, several vaccine preventable diseases still exist and a conscientious approach to immunisation is required to prevent outbreaks in the community or prevent infection in those at particular risk. The issue of vaccination arises in consultations when children present for scheduled childhood immunisations and when adults have specific medical or lifestyle factors, immigrate or travel overseas. In addition to these situations, children and adults should be immunised opportunistically where possible.

This unit of *check* looks at immunisation of children and adults, catch-up immunisation, dealing with parental concerns regarding immunisation, adverse events following immunisation and maintaining the cold chain. The authors bring a myriad of experience to this unit.

The authors of this unit are:

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- Nigel Crawford MBBS, FRACP, MPH, a consultant paediatrician and Medical Head of Immunisation Services at the Royal Children's Hospital and the Deputy Director of Surveillance of Adverse Events Following Vaccination In the Community (SAEFVIC) based at the Murdoch Childrens Research Institute, Melbourne. His research interests include immunosuppressed populations; his University of Melbourne PhD thesis titled 'Optimising immunisation in special risk groups'. Nigel is also interested in vaccine safety, including the clinical follow-up and discussion of adverse events following immunisation
- Debi Feldman MBBS, a paediatric registrar at the Royal Children's Hospital, Melbourne. Her special interests include child development and immunisation
- Alissa McMinn RN, an accredited nurse immuniser and study coordinator at Murdoch Childrens Research Institute. Her clinical and research interests are vaccine development, safety and surveillance.

The objectives of this unit are to:

- develop increased confidence in conducting the consultation that involves childhood immunisation. This includes assessing contraindications to vaccination, obtaining informed consent, administering vaccinations and completing procedures following vaccination
- identify the common and significant adverse events following immunisation
- develop increased confidence in dealing with parental concerns regarding immunisation and in managing conscientious objection to immunisation
- develop increased confidence in identifying the immunisation requirements of adults
- appropriately identify the immunisation requirements of special groups such as premature infants
- develop increased knowledge of the processes involved in dealing with a disruption to the cold chain
- develop increased awareness of the resources available in the area of immunisation.

We hope that this unit of *check* will help you to confidently assess and manage the immunisation requirements of your patients.

Kind regards

Catherine Dodgshun MBBS, DRANZCOG, FRACGP

Medical Editor

CASE 1

OLIVIA PRESENTS FOR HER ROUTINE IMMUNISATIONS

Olivia, aged 4 years, is brought in by her mother Julie for her routine immunisations. Olivia and her family have recently moved into the area and have not previously been patients at your clinic. According to the National Immunisation Program (NIP) Schedule, Olivia is due for vaccination against diphtheria, tetanus, pertussis, polio (DTPa-IPV), and measles-mumps-rubella (MMR).

QUESTION 1

What further information do you need before giving these routine vaccines to Olivia?

FURTHER INFORMATION

Prior to Olivia's consultation with you, your receptionist provided Julie with a pre-vaccination screening checklist (see *Table 1*). Julie ticked that Olivia 'is unwell today' on this checklist, and mentioned that her daughter has felt 'a bit hot'. During today's consultation, you ask Julie further questions and establish that Olivia has had a runny nose and a cough for the last few days and her temperature has reached 37.8˚C (tympanic). Olivia tells you she is scared about 'having a needle'. Julie also mentions that she is currently 15 weeks pregnant.

QUESTION 2

Will the fact that Olivia is unwell and Julie is pregnant change your management?

Table 1. Pre-vaccination screening checklist

This checklist helps your doctor/nurse decide about vaccinating you or your child. Please tell your doctor/nurse if the person about to be vaccinated:
☐ is unwell today
☐ has a disease that lowers immunity (eg. leukaemia, cancer, human immunodeficiency virus [HIV], acquired immune deficiency syndrome [AIDS]), or is having treatment, that lowers immunity (eg. oral steroid medicines such as cortisone and prednisone, radiotherapy, chemotherapy)
☐ has had a severe reaction following any vaccine
☐ has any severe allergies (to anything)
☐ has had any vaccine in the past month
☐ has had an injection of immunoglobulin, or received any blood products or a whole blood transfusion within the past year
☐ is pregnant
☐ has a past history of Guillain-Barré syndrome
☐ was a preterm infant
☐ has a chronic illness
☐ has a bleeding disorder
A different vaccine schedule may be recommended if the person to be vaccinated:
☐ identifies as an Aboriginal or Torres Strait Islander
☐ does not have a functioning spleen
☐ is planning a pregnancy or anticipating parenthood
☐ is a parent, grandparent or carer of a newborn
☐ lives with someone who has a disease that lowers immunity (eg. leukaemia, cancer, HIV/AIDS), or lives with someone who is having treatment that lowers immunity (eg. oral steroid medicines such as cortisone and prednisone, radiotherapy, chemotherapy)
Note: Please ask your doctor/nurse questions about this information or any other matter relating to vaccination before the vaccines are given. Before any vaccination takes place, the immunisation service provider will ask you:
☐ did you understand the information provided to you about immunisation?
☐ do you need more information to decide whether to proceed?
☐ did you bring you/your child's vaccination record card with you?
☐ it is important for you to receive a personal record of your or your child's injections. If you do not have a record, ask your immunisation service provider to give you one. Bring this record with you every time you or your child visit for vaccination. Make sure your doctor/nurse records all vaccinations on it. Your child may need this record to enter childcare, preschool or school.
Reproduced with permission from Australian Immunisation Handbook.[1] Available at www.health.gov.au/internet/immunise/publishing.nsf/Content/handbook-prevaccination-screening#t131

QUESTION 3

In general, how do you obtain consent for vaccination?

QUESTION 4

What could you do to reduce Olivia's anxiety?

QUESTION 5

How should Olivia be positioned during the vaccination?

QUESTION 6

How will you give the injections and what sites will you use?

QUESTION 7

What are your procedures immediately following vaccination?

CASE 1 ANSWERS

ANSWER 1

Further information is needed about Olivia's current health status and past medical history. This includes her previous vaccinations and any past reactions to vaccines or allergies. It is also necessary to obtain information about the medical history of any household contacts. This information is needed to ensure there is no contraindication to being vaccinated and that Olivia receives any additional vaccines that may be indicated.

To assist in collecting these details, information can be obtained using a pre-vaccination screening checklist provided to parents. If a parent identifies a positive response to any item refer to the *Australian Immunisation Handbook* for further details about appropriate management (refer to *Table 1.3.2 Australian Immunisation Handbook* 9th edn).[1]

As an example, a history of immune deficiency may contraindicate live attenuated vaccines such as MMR. Olivia may also require additional immunisation if she has a chronic illness such as cystic fibrosis or insulin dependent diabetes, or was born prematurely (<28 weeks gestation). If this were the case, additional pneumococcal vaccines should be administered and a yearly seasonal influenza vaccine (starting at a chronological age of 6 months) is recommended (refer to *Table 1.3.2 Australian Immunisation Handbook* 9th edn).[1]

ANSWER 2

Having a minor illness is not a contraindication to immunisation. Julie has indicated that Olivia 'is unwell'. Your management should include examining Olivia for any signs of a systemic illness or high temperature. If Olivia has a low grade temperature, but is otherwise well you can proceed with immunisation.

In the setting of an acute febrile illness (temperature greater than or equal to 38.5°C), or an acute systemic illness, immunisation should be deferred until the child is well. You can consult the *Australian Immunisation Handbook* for further information about contraindications to immunisation when unwell.

Julie being pregnant is not a contraindication to giving a live attenuated vaccine to Olivia, as MMR vaccine virus is not transmissible.[1] it is important to ensure Olivia is fully vaccinated to reduce the risk of disease transmission to her mother.

(Refer to *Table 1.3.2* and Appendix 5, pp 347–351, *Australian Immunisation Handbook* 9th edn for contraindications to vaccination.)

ANSWER 3

Informed consent for immunisation is obtained when a person provides voluntary agreement for the vaccination to be given after understanding the risks and benefits. In the case of a child, it is generally accepted that a parent can provide this consent. You should provide Julie with information about the vaccines, explain any relevant risks and benefits in a way she will be able to understand, and respond to any questions or concerns. Most complaints from patients arise from poor communication or not addressing the patient's concerns.

Consent can be obtained verbally or in writing. If verbal consent is obtained, written documentation of the consent should be recorded (for example, by documenting in the patient medical record).[1,2]

ANSWER 4

Olivia's anxiety regarding 'having a needle' could be reduced using distraction and relaxation techniques. The exact techniques will depend on the developmental level of the child. For a typically developing 4 year old child, these could include talking with a calm parent, having a book read, blowing bubbles or listening to music during the vaccination.

Topical anaesthetic agents could also be used, but they need to be placed on the skin 30–60 minutes prior to vaccination to have an effect. Giving Olivia a small reward, such as a sticker or stamp, following her vaccination could provide a positive recollection of the visit.

In infants, oral sucrose can be used prior to injection together with distraction with a toy. Holding or cuddling the child securely would also be helpful.[1,3,4]

ANSWER 5

Olivia can be positioned to feel safe while being securely held for her vaccinations. She can be positioned seated sideways on Julie's lap. The arm being injected should be exposed and held close to her body by Julie, with Olivia's other arm and legs also secured by her mother. Alternatively, Olivia could be positioned sitting in Julie's lap but facing her mother and giving her a hug, with Julie's return hug securing her arms for vaccination.

ANSWER 6

For intramuscular injections, a needle 25 mm in length is recommended in most cases, either 23 or 25 gauge. The needle should be inserted at a 90 degree angle to the skin, being aware that a slower injection technique should be used for the narrower 25 gauge needle.

The preferred site for intramuscular injection for a 4 year old child is into the deltoid muscle. As Olivia needs two injections this visit, she can have one into each deltoid muscle. The anterolateral thigh or ventrogluteal area (not the dorsogluteal site) are alternative sites for vaccination in this age group.[1]

FEEDBACK

For a child who is 12 months of age or older and who requires multiple injections at the one visit (eg. for catch-up immunisations), two single injections into each deltoid muscle can be given, each separated by 2.5 cm, provided there is sufficient muscle mass to do this. If the deltoid muscle is too small, two single injections can be given into each anterolateral thigh, each separated by 2.5 cm. Alternatively, a single injection could be given into each ventrogluteal area.

ANSWER 7

The vials and needles should be disposed of immediately following vaccination. A cottonball and tape can be applied to the site of injection if necessary, applying pressure for 1–2 minutes before exposing the site to air. However, it is suggested not to rub the site, as this encourages leakage of the vaccine and possible local irritation.

It is recommended that Julie and Olivia remain in an appropriate nearby location (eg. in an observed play or waiting area) for 15 minutes after being vaccinated. Julie should be informed of the date Olivia will be due her next vaccination. According to the current National Immunisation Program, this will not be until age 10–13 years.

Information should be provided about common adverse events following vaccination and their management. The parent should be aware of who to contact, or where to obtain advice if any concerning reaction occurs. After hours this may include the Health Direct or Nurse On Call telephone advice lines.

There is no recommendation for routine use of paracetamol, but this can be used for subsequent discomfort or fever. Details of vaccinations should be recorded in the clinic record, as well as in a record for the parents. This should include details of the vaccination (dose, brand, batch number and administration site), the immunisation provider's name and the current date.

Details of both NIP and private vaccinations should be forwarded to the Australian Childhood Immunisation Register (ACIR). This is a national database for recording vaccinations for children aged 7 years or younger. It allows the vaccination program to be evaluated, as well as providing detailed information on a child's vaccination record for both parents and immunisation providers. Information on the ACIR can be used to ensure eligibility for some Australian Government family assistance payments.[1,5]

CASE 2

COOPER HAD A TERRIBLE REACTION TO HIS INJECTIONS

Cooper is 9 weeks of age. His mother calls you the day after he had his 2 month vaccinations to say that he was taken by ambulance to hospital 3 hours post vaccination.

Cooper was born at 32 weeks gestation when his mother went into spontaneous labour. His birth weight was 1.5 kg and he had an uneventful neonatal course, being discharged home at 5 weeks of age (37 weeks corrected for prematurity). Cooper now weighs 3.3 kg and appears healthy. Yesterday he was given a breastfeed and sucrose and then held snuggly by his mother for his vaccinations. He settled post vaccination with a breastfeed before going home 15 minutes later.

QUESTION 1

What is an adverse event following immunisation (AEFI)?

QUESTION 2

List three common mild AEFIs in a child, and three unlikely but possible AEFIs in a child.

FURTHER INFORMATION

Cooper was seen to stop breathing for 30 seconds. He was picked up by his mother, started breathing and quickly returned to normal.

QUESTION 3

What adverse event did Cooper likely experience and what are the risk factors for this?

QUESTION 4

How would you manage future vaccinations for Cooper?

QUESTION 5

How would you report an AEFI?

QUESTION 6

What AEFI should be reported?

CASE 2 ANSWERS

ANSWER 1

An AEFI is an unexpected or unwanted event occurring after administration of vaccine(s). The most common AEFIs are mild fever and local reactions such as pain and redness.[1]

ANSWER 2

Examples of AEFIs include:[1,6]

- minor common reactions
  - small localised reaction of redness or tenderness
  - tiredness or increased sleepiness
  - low grade fever lasting less than 24 hours
- uncommon severe reactions
  - anaphylaxis
  - apnoea with or without bradycardia
  - hypotonic hyporesponsive episode.

For further examples of adverse reactions refer to the *Australian Immunisation Handbook* – Section 1.5.2 and Appendix 6 of the 9th edn.

ANSWER 3

Given that Cooper was seen to stop breathing for 30 seconds, it is likely that he had an apnoea. Apnoea with or without bradycardia is a known AEFI. This may occur more commonly in babies born prematurely than in infants born at term, and may be noticed after the first 2 month vaccinations. Possible risk factors include low birth weight and children in hospital for complications of prematurity. Apnoeas appear to occur most frequently in the first 24 hours post immunisation.[7]

ANSWER 4

In general, specialist advice should be sought for future vaccinations for a child with a previous apnoea following immunisation. This could be obtained from a specialist immunisation clinic or paediatrician.

Cooper's family need to feel supported and confident in immunising him. It should be arranged for Cooper to receive his 4 month vaccinations under supervision and be observed afterwards. For example, depending on local resources this could be a supervised hospital setting with cardiorespiratory monitoring.

FEEDBACK

The recurrence rate of an apnoea following subsequent vaccination may be as high as 18%, particularly for a premature infant.[7] It is important that future vaccines are administered safely and that this special risk group of children is offered the same protection against vaccine preventable illness as term infants. Additional vaccines are also required in pre-term infants[1] and adult carers should receive a booster of a vaccine containing pertussis.[7]

It is unusual for apnoeas to occur following vaccination in children 6 months of age or over.

ANSWER 5

Each Australian state and territory has similar procedures for reporting an adverse event, which are ultimately reported to the Therapeutic Goods Administration (TGA). Contact details for the relevant state or territory health department can be found in the *Australian Immunisation Handbook,* see *Table 1.5.3.1.*

This includes state based services such as Victoria's SAEFVIC (Surveillance of Adverse Events Following Vaccination in the Community). The Australian Government provides an annual report on surveillance of adverse events following vaccination, which can be found on its health department website.

ANSWER 6

Common and transient minor adverse events such as mild pain, low grade fever or minor local reaction do not necessarily have to be reported. If there is parental concern or concern about a particular vaccine, any AEFI can be submitted to the state vaccine safety group. All serious AEFIs, or those that are unexpected, should be reported to the relevant state or territory health department. For guidance about what constitutes a serious event, Appendix 6 of the *Australian Immunisation Handbook* lists events that should be reported. Examples include anaphylaxis, vasovagal episodes and severe rash. A comprehensive list is also available at the European based Brighton Collaboration (see *Resources*).

Clinicians should use their judgement to also report events deemed serious or unexpected, but which are not included on this list. For example, an apnoea following vaccination is not specifically listed in the *Australian Immunisation Handbook*, but could be deemed a serious event that should be reported. It is not required that the person making a report be sure the vaccine caused the adverse event. Some events following immunisation may be coincidental, but if serious or unexpected they should be reported.[1,8]

CASE 3

SARAH IS CONCERNED THAT THE MMR VACCINE COULD CAUSE AUTISM

Sarah attends your clinic with her daughter Claudia, who is 12 months of age. Claudia has been fully immunised to her 6 month vaccinations, but Sarah wants to skip the 12 month vaccinations as she has read on the internet that the MMR vaccine could cause autism. She has read that three single valent vaccines (ie. measles vaccine, rubella vaccine, and mumps vaccine, each given separately) are safer.

QUESTION 1

Are there single valent vaccines routinely available in Australia for Claudia to receive, and would there be benefits from separating the components of the MMR vaccine?

QUESTION 2

Do you believe that Sarah is a conscientious objector to vaccination? How do you decide whether a person is a conscientious objector?

QUESTION 3

If Sarah did have a conscientious objection to vaccination and requested an exemption for her daughter, what requirements would you need to satisfy to have her recorded on the ACIR as such?

QUESTION 4

What evidence is Sarah's concern about MMR vaccine based on, and is it credible?

QUESTION 5

Do you have alternative sources of information you could offer Sarah?

QUESTION 6

How do you communicate the risks and benefits of an immunisation such as MMR vaccine to a parent?

QUESTION 7

If measles is virtually eliminated in Australia, is it worth continuing immunisation?

CASE 3 ANSWERS

ANSWER 1

Currently, the only vaccines routinely available in general practice in Australia against measles, mumps or rubella, are MMR combination vaccines (as M-M-R II® and Priorix®). This means that single valent vaccines are not an option for Sarah's daughter.

There is no evidence that giving each vaccine component of MMR separately over time is of any benefit over combined MMR vaccine. In fact, giving each component separately may be harmful because children and their contacts would be exposed to serious diseases over a longer period of time. In addition, more vaccination visits would be required.[9]

ANSWER 2

Sarah is unlikely to be a conscientious objector as she has already demonstrated a willingness to vaccinate, and is even exploring alternatives such as the single valent vaccines. Most people who have questions or concerns about immunisation are not conscientious objectors, but proceed to have their child vaccinated if they have access to appropriate information or have their questions adequately answered.

The majority of people support immunisation, illustrated by Australia's high rates of vaccination and very low rates of conscientious objection – estimated at only 2.5%.[10,11] However, over the past decade there has been increasing interest in vaccine safety. The success of immunisation has resulted in a remarkable reduction in morbidity and mortality from many infectious diseases. In the absence of these diseases, members of the community have become concerned about the potential side effects associated with immunisation.

The public may read mixed and confusing information about immunisation, especially from the internet, so it is important to clarify what a parent's understanding of immunisation is, what their concerns are and where they have sourced their information. This can make responding to the concerns easier and more time efficient, as you can focus on specific concerns and provide suitable information. Understanding parents' health beliefs, and what medical information they find credible, will often give an insight into whether they have firm conscientious objections, rather than concerns or questions about immunisation.

ANSWER 3

There is an immunisation exemption conscientious objection form available for downloading from the Medicare Australia website (see *Resources*). It is used to record a parent's personal, philosophical, religious or medical belief that immunisation should not occur. This form must be signed by a doctor or immunisation provider and sent to the Immunisation Register. The doctor must declare they have explained the risks and benefits associated with immunisation to the parent or guardian of the child on the form, including informing them of the potential dangers of not immunising the child.

ANSWER 4

Numerous studies and expert panel reviews have concluded there is no link between MMR vaccine and autism or inflammatory bowel disease.

The possibility of a link between the MMR vaccine and autism was suggested primarily by one group of researchers led by Dr Andrew Wakefield in the United Kingdom. Dr Wakefield's studies suggested that measles virus in the gut caused a new syndrome of bowel inflammation (Ileal-lymphoid-nodular hyperplasia), which resulted in decreased absorption of essential vitamins and nutrients through the intestinal tract. It was suggested that this in turn caused developmental disorders such as autism, or worsening of symptoms in children already diagnosed with autism or so-called 'regressive autism'.

Although this theory generated a lot of media attention, the studies on which it was based have many significant weaknesses – including the selection of a small number of specific patients, plus the inconsistent reporting of patient histories and interpretation of results. *The Lancet,* which published the 1998 article by Wakefield et al that suggested a link between MMR vaccine and autism, later retracted the article because some of the authors' claims about methodologies made in the original article were proven to be false.[12]

Over 20 subsequent studies and many expert reviews have shown no association between MMR and these diseases. A fact sheet produced by the National Centre for Immunisation Research and Surveillance (NCIRS)[13] lists some of these studies.

ANSWER 5

The internet is now a common source of information. However, patients often do not see it as their exclusive source of information. Research and a trusted GP are sources of information and advice that parents view as credible.

It is often helpful to provide alternative sources of information to websites that may have been accessed. A useful general website to refer parents to is the Raising Children Network (see *Resources*), which is a resource for parenting newborns to teenagers, and the information on it is reviewed for accuracy and suitability. It has a general section on immunisation, and specific sections on autism, as well as links to the other resources.

The Immunise Australia website has the 9th edn of the *Australian Immunisation Handbook* (particularly *Appendix 5*), and *Immunisation Myths and Realities: Responding to arguments against immunisation* to assist immunisation providers in talking to parents about immunisation concerns (see *Resources*).

Regarding the MMR vaccine – in addition to the NCIRS fact sheet mentioned in *Answer 4* – the NCIRS also host a web based decision aid designed to help parents decide whether to immunise their children with the MMR vaccine. It is suitable for anyone considering MMR vaccination or wanting more information (see *Resources*).

ANSWER 6

Simple information about the benefits of immunisation and the risks and complications of vaccine preventable disease, along with the potential adverse events following vaccination, need to be provided. The 9th edition of the *Australian Immunisation Handbook* has a useful quick guide on the inside flap of the back cover.[1]

The reduction in the number of cases of vaccine preventable diseases following immunisation programs has led many in the community to be unaware of the morbidity and mortality these diseases caused. Measles and rubella are diseases with a long history of causing death or disability within the Australian community prior to introduction of high levels of immunisation. It is estimated that 1 in 70 sufferers of measles is hospitalised, with potential complications such as pneumonia or encephalitis.[1]

Parental concerns should be taken seriously with a non-judgemental approach. If parents feel their concerns have been heard, they are more likely to accept the information being provided. Good communication skills, which GPs employ in all consultations aimed at behavioural change such as in facilitating quitting smoking and other lifestyle changes, apply in the immunisation consultation. These include excellent listening skills and tailoring information to the individual. If the parent continues to have concerns about immunisation, the difference of opinion should be respected, but the option for further discussion of immunisation in a future consultation should be left open.

ANSWER 7

In today's global community immunisation is still required to protect people from disease importation (as well as for those travelling to countries where measles is still endemic). High vaccination rates protect against disease outbreaks or resurgence of disease. With high vaccination rates, herd immunity will protect a minority of people who have not been, or are not able to be, vaccinated.

Figure 1 illustrates the declining levels of measles disease notifications as a response to high immunisation rates. The spike in 2006 commenced with a case of measles imported by a traveller from overseas, and spread locally amongst susceptible individuals.

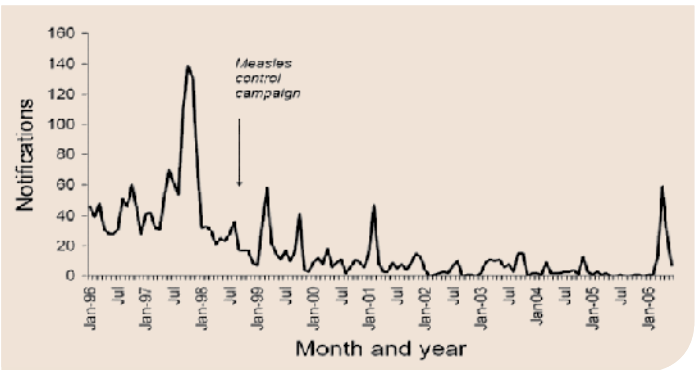

Figure 1. Measles notifications, Australia 1996–2006

Reproduced with permission from The Australian Government Department of Health and Ageing.[9]

CASE 4

GEORGIA IS THINKING ABOUT BECOMING PREGNANT

Georgia is 26 years of age, newly married and presents today for a routine Pap test. She mentions that she is thinking about ceasing the combined oral contraceptive pill and trying to get pregnant.

QUESTION 1

Is an immunisation history important in Georgia now that she is an adult?

QUESTION 2

How do you establish an immunisation history in adults? Is serological testing worthwhile for any vaccines?

QUESTION 3

If an immunisation history cannot be recalled and is not documented, are any vaccines contraindicated (because of possible previous administration)?

FURTHER HISTORY

Georgia is otherwise well with no significant ongoing medical history and no significant allergies. She believes she received all her immunisations as a young child, but has not received any since she left school at year 12.

QUESTION 4

What vaccines would you consider for Georgia and why?

QUESTION 5

When would you administer these vaccines? Are all the vaccines contraindicated if she were already pregnant?

QUESTION 6

What additional vaccine would be recommended if she is a smoker?

QUESTION 7

Adults in which occupations might be at an increased risk of acquiring pertussis, and at an increased risk of transmitting the disease to susceptible contacts with the potential for serious health outcomes?

CASE 4 ANSWERS

ANSWER 1

Obtaining an immunisation history for all patients, regardless of age, is an important part of any medical history. Immunisation is a whole-of-life health intervention. Reasons for adults requiring immunisation include incomplete childhood schedules, waning immunity, medical and lifestyle risk factors, travel and immigration. GPs can face a number of barriers in the delivery of adult immunisations, including lack of opportunity to identify immunisation requirements, public misconceptions about the need for immunisation and the complexity of funding and catch-up programs. The increase in the number of immunisations recommended for adults means that GPs need to develop strategies to vaccinate adults at every opportunity.

ANSWER 2

There is no national register for recording all vaccinations administered to adults. Two vaccines can be recorded on disease specific registers – the National Human Papilloma Virus (HPV) Vaccination Program Register and the Australian Q Fever Register.

Patient recall of previous vaccinations can be inaccurate, unless the vaccine was administered recently. Vaccine doses may be documented in a personal health or vaccination record, and providing adult patients with hand-held records can be a useful tool to aid documentation. Your (or Georgia's previous GP's) medical record may contain documented previous vaccinations. Sometimes you or the patient can access local council immunisation records, but this is often not a simple procedure, especially for vaccines administered some time ago.

Routine serological testing measuring vaccine immunity is not recommended – it can lead to unnecessary costs and is unreliable for some vaccines.

Serological testing of immunity can be considered prior to vaccination in some circumstances.

Varicella, rubella, measles, Q fever, hepatitis A and hepatitis B are examples of diseases where serological testing of immunity is often used. Some results are given as positive or negative (such as with varicella or measles), others have serological protective cut-offs such as hepatitis B surface B antibody (anti-HepBsAb) (>10 IU/mL). Standard serological testing is not sufficiently sensitive to measure immunity after varicella vaccine and is therefore not recommended. Serological testing of immunity is less reliable and generally only used in research for vaccine preventable diseases such as pertussis, meningococcal C and pneumococcal disease.

ANSWER 3

As a general rule (except for Q fever vaccine), if a previous history of vaccination or natural/vaccine induced immunity cannot be established, it is reasonable to offer a standard catch-up vaccination schedule.

For nearly all vaccines (except Q fever vaccine, which is contraindicated if it has been previously administered), there is no significant increase in severe adverse effects with additional doses in immune individuals. Additional tetanus and polysaccharide pneumococcal doses may have increased local reaction, especially if given in the previous 5 years, therefore a decision needs to be made as to whether the benefits of more certain protection outweigh this risk of local reaction.[1]

ANSWER 4

If a woman is planning pregnancy, it is advisable to review her immunisation history, in particular for vaccines with the following antigens: hepatitis B, rubella, varicella and pertussis.

Pertussis

As Georgia is a prospective mother, consider adult diphtheria-tetanus-acellular pertussis vaccine (dTpa) such as Boostrix® or Adacel®, if she has not received a previous booster dose. It has been administered at secondary schools since 2004 – given Georgia's age, she is likely to have received just the adult tetanus and diphtheria vaccine.

The *Australian Immunisation Handbook* recommends vaccination of adults planning a pregnancy, or for both parents as soon as possible after delivery of an infant (preferably before hospital discharge), unless contraindicated.[1] This vaccine is not funded under the National Immunisation Program to this age group prior to pregnancy, and would have to be provided on a user-pay basis. The vaccine is recommended because studies have indicated that parents are frequently the source of a pertussis infection contracted by their infant children. Infants are at risk from pertussis infection due to their higher risk of complications (including hospitalisation, apnoea, pneumonia and death), and because a primary course of vaccinations does not commence until 6–8 weeks of age, providing inadequate immunity until the course of 3 doses is completed. Seven infants under 2 months of age died in Australia from pertussis since the start of 2008 to August 2011.[14] Pertussis notifications have increased progressively since 2008, with Australia recording more than 38 000 notifications in 2011. This is the highest number of notifications since records began.[15]

Vaccination with the adult formulation of dTpa can be given to women either when planning pregnancy, or soon after birth of the child. Fathers should receive a dTpa vaccine if their partner is pregnant. Some states/territories provide limited free adult pertussis vaccination, particularly to new parents. Vaccination is encouraged for other household contacts including grandparents.

Rubella

In all adults who were born after 1 January 1966, MMR vaccine (MMRII® or Priorix®) should be considered if they have not received two documented doses prior. Women born overseas are more likely to be seronegative to rubella.

Immunity to rubella should be established via serological screening prior to pregnancy. Women who are seronegative to rubella should be retested for seroconversion 6–8 weeks after vaccination. MMR vaccine is contraindicated in pregnancy, and women should be advised not to become pregnant for 28 days after vaccination.

Varicella

Varicella vaccination is recommended for nonimmune women prior to pregnancy to avoid congenital or neonatal varicella. Lack of immunity can be based on a negative history of previous varicella, and can be supplemented by serological testing. Varicella vaccine is also contraindicated in pregnancy, and women should be advised not to become pregnant for 28 days after vaccination.

Influenza

Seasonal influenza vaccination is now funded and can be administered free of charge under the National Immunisation Program for pregnant women. In addition, it is recommended in the 9th edition *Australian Immunisation Handbook* that influenza vaccine be offered in advance to women planning a pregnancy, and The Royal Australian and New Zealand College of Obstetricians strongly endorses routine vaccination of pregnant women against influenza.[16]

Influenza vaccine is the only vaccine recommended to be given at any stage during pregnancy. It is particularly important for women who will be in their second or third trimester during the influenza season because this is when the risks of complications from an influenza infection are highest. Pregnant women were one of the special risk groups with the highest morbidity and mortality following the H1N1 influenza pandemic.[17]

Influenza vaccines have a good safety profile in pregnant women. Recent evidence suggests that vaccination during late pregnancy may also provide protection against influenza to the newborn.[18,19]

Human papillomavirus (HPV)

Two vaccines, Gardasil® and Cervarix®, are registered in Australia for use in adult women from 9–45 years of age for the prevention of cervical cancer caused by HPV types 16 and 18. The 4-valent vaccine, Gardasil® also provides protection against genital warts caused by HPV types 6 and 11. HPV vaccination is now only funded for adolescent girls 12–13 years of age through the ongoing school based HPV vaccination program. It is still recommended for adult women up to 26 years of age (and may also be of benefit in women older than 26 years of age) and is available through private prescription. The vaccines are most effective when given before the onset of sexual activity. However, while the protection offered by the vaccines decreases with increased exposure to HPV, it is not always possible to quantify this risk, and administering one of the HPV vaccines will protect against some of the HPV types the patient has not yet been exposed to.

ANSWER 5

If Georgia is not pregnant, any of these vaccines could be provided today. MMR and varicella vaccine are live vaccines, so if not administered on the same day, there must be an interval of 4 weeks between doses.

The 9th edition *Australian Immunisation Handbook* recommends that influenza vaccine be offered to pregnant women who will be in the second or third trimester during influenza season.[1] Except for inactivated influenza vaccine, vaccination during pregnancy is not routinely recommended in Australia. MMR and varicella vaccines are contraindicated in pregnancy, and woman must be advised not to become pregnant for 28 days after vaccination.

ANSWER 6

Women with known risk factors for invasive pneumococcal disease (which includes tobacco smokers) should be vaccinated with pneumococcal vaccine prior to pregnancy.[1]

ANSWER 7

Any adults working with young children – especially childcare and healthcare workers – are advised to receive an adult booster dose of dTpa (Boostrix® or Adacel®).

There are ongoing high rates of pertussis notification in infants and children, and several case reports have documented nosocomial infection in young infants (who are at particular high risk of serious pertussis disease requiring hospitalisation or life-threatening illness), acquired from healthcare workers.[1]

CASE 5

THERE HAS BEEN A POWER OUTAGE AT YOUR CLINIC AND THE VACCINES ARE IN THE REFRIGERATOR

You are the first to arrive at your general practice clinic to find the power has been cut, due to a storm overnight, and there is no electricity supply to your refrigerators. The telephones are still in working order. Your computers had been correctly backed-up the night before and your appointment lists for you and your colleague's morning clinic had been printed out. Your colleague's first patient, Hung, is aged 2 years and requires catch-up vaccines for his 12 month vaccinations.

QUESTION 1

What is the recommended storage temperature for all vaccines, and what is the 'cold chain'?

QUESTION 2

What conditions can affect the viability of vaccines?

QUESTION 3

Where are your vaccines stored, and can you list at least five procedures you have in place at your general practice clinic to ensure the 'cold chain'?

QUESTION 4

List at least two reasons why vaccines should not be removed from their original packaging.

QUESTION 5

How would you manage the vaccines stored in your clinic during this power failure? Would it be advisable to vaccinate Hung who is booked as the first appointment, with vaccines from your practice refrigerator?

FURTHER INFORMATION

The power comes back on soon after 9.00 am, when the refrigerator temperature is at 12ºC. You are informed by the practice nurse that your colleague has just vaccinated Hung.

QUESTION 6

Do you report the 'cold chain' breach, and if so, to whom? Does Hung require follow up?

CASE 5 ANSWERS

ANSWER 1

The *National Vaccine Storage Guidelines: Strive for five* (see *Resources*) define the cold chain as the system of transporting and storing vaccines within the safe temperature range of +2°C and +8°C. The cold chain commences from the time the vaccine is manufactured, moves through to the state or territory vaccine distribution centres, and ends when the vaccine is administered to the patient.

ANSWER 2

Vaccines are delicate biological substances that can become less effective or destroyed if they are frozen, allowed to get too hot or exposed to direct sunlight or fluorescent light. The outcome following exposure to any or all of these conditions is dependent on the vaccine itself. Efficacy studies are a requirement for vaccine license within Australia, and they are based on vaccines being stored at 2–8ºC. There is limited information on how effective vaccines are when stored outside these temperatures.

ANSWER 3

Some procedures to have in place in a general practice clinic to ensure the cold chain are listed below.

- **Vaccines stored in a dedicated vaccine refrigerator**

  Food or drink or other supplies should be placed in a separate refrigerator, otherwise there may be too frequent opening of the refrigerator door and overcrowding of the refrigerator minimising air-circulation.

- **The recommended vaccine storage in the *National Vaccine Storage Guidelines*[20] is a purpose built vaccine refrigerator**

  If you are using a domestic refrigerator, it must at least be frost-free and have the freezer section separate. It should not be a bar refrigerator. Additional modifications are necessary if the refrigerator is not purpose built. These include:

  – not using the refrigerator door or crisper at the base for vaccine storage, instead filling them with bottles of salt water to help buffer the temperature within the refrigerator

  – enclosed and labelled storage draws to increase insulation and improve organisation

  – use of a 24 hour data logger to demonstrate that the refrigerator is acceptable for vaccine storage.

  See *National Vaccine Storage Guidelines: Strive for Five* (*Resources*) for more information on modifying a domestic refrigerator.

- **The vaccine refrigerator must be monitored at all times with a maximum–minimum thermometer**

  This should be appropriately positioned in the refrigerator to give an accurate representation of the temperature the vaccines are exposed to.

- **Temperature recording chart must be used to record the maximum and minimum temperature daily**

  Temperature recording should preferably be recorded twice daily, but always in the morning prior to any vaccines being administered.

- **Vaccines should be organised in designated areas**

  This will assist quick and easy access to the vaccines – limiting the time the door is open and will make stock checking and ordering easier. Vaccines should be stored on the middle shelves, and not be too crowded so as to allow air circulation.

- **Warning on the powerpoint**

  The warning should make everyone aware (including nonpractice staff) that this powerpoint must not be disconnected or turned off.

- **Procedure manual for the cold chain including protocol for managing a cold chain breach**

  The 4th edition RACGP *Standards for general practices*[21] state that key indicators for *Criterion 5.3.2.* Vaccine potency are that:

  A. Our practice team can identify the person with primary responsibility for cold chain management within the practice. The person with primary responsibility for cold chain management has this responsibility defined in their position description and can describe how the process used for cold chain management complies with the current edition of the *National Vaccine Storage Guidelines.*

  B. Our practice can demonstrate how we review the following processes to ensure potency of our vaccine stock:

  – ordering and stock rotation protocols

  – maintenance of equipment

  – annual audit of our vaccine storage procedures

  – continuum of cold chain management, including the handover process between designated members of the practice team

  – accuracy of our digital vaccine refrigerator thermometer.

- **Storing vaccines in their original packaging.[20]**

ANSWER 4

Vaccines should not be removed from their original packaging because:

- packaging provides a degree of protection from temperature fluctuations
- some vaccines are light-sensitive and the packaging protects them from light exposure
- some vaccines require specific diluents or additional components, which could be accidentally separated or forgotten if removed from the original packaging.

ANSWER 5

If an electrical generator is not available, vaccines should ideally be transferred to another temperature monitored refrigerator such as the refrigerator at your local hospital, under cold chain conditions. Transfer the vaccine in an esky with ice bricks wrapped in bubble wrap or newspaper so that the ice bricks are not in direct contact with the vaccine packaging. Alternatively:

- leave the vaccines in the refrigerator that has lost power with the door closed, or
- transfer the vaccines to an esky with ice bricks wrapped in bubble wrap, if the temperature can be measured with a maximum-minimum thermometer or data logger.

If you leave the vaccines in the refrigerator:

- note the current temperature, and continue to monitor the temperature, noting especially the time when the temperature is first noted to be outside +8ºC
- place ice bricks in the spare space in the refrigerator away from direct contact with vaccine packaging
- a refrigerator with a glass door should be covered with either bubble wrap, or thick cardboard or a blanket and taped down
- place a note on the door of the refrigerator: 'Do not use vaccine or open fridge until further notice'
- lock the fridge if possible.[22]

The patient should not be vaccinated until you have reported the cold chain breach and received advice that the vaccines to be used are still likely to be potent.

ANSWER 6

If any vaccines have been exposed to temperatures below +2ºC or above +8ºC, you should report a cold chain breach by contacting your state/territory immunisation program. You should not use, nor discard any vaccine until after you have received advice from them. If you are storing private (non-National Immunisation Program) vaccines you may need to contact the vaccine manufacturer directly for advice.

You should record the maximum and minimum temperatures in the vaccine storage receptacle, and if possible, estimate the time the temperature has been outside of the safe +2°C to +8°C range.

An investigation after any cold chain breach will require documentation of who has received any vaccines, which may have been incorrectly stored.

It is important to follow a policy of open disclosure, as for any error, and discuss with local immunisation authorities the recommended follow up strategies. In some instances it may be recommended to repeat some immunisations if the potency of the vaccines was likely to be affected. In this case, a personalised plan may be developed with the parents following discussion with your state/territory immunisation program or local vaccine expert networks.

CASE 6

TERESA PRESENTS WITH HER TWO SONS FOR THEIR VACCINATIONS

Teresa presents to your clinic with her eldest son Frankie for his 4 year vaccinations. Teresa also brings her newborn son Vincent. After completing Frankie's vaccinations, Teresa asks about vaccinations for Vincent as she is not sure when to get his first immunisations as he was born prematurely. After discussion you discover that Vincent has Down syndrome and a ventricular septal defect. He was born at 31 weeks gestation via emergency caesarean due to breech presentation in the setting of premature labour. His birth weight was 1504 g. He was on continuous positive airways pressure (CPAP) for 3 days, spent 6 days in a neonatal intensive care unit (NICU) and 42 days in a special care nursery. Vincent is now 7 weeks chronological age (38 weeks corrected for prematurity). On examination he is alert and settled with no unremarkable findings aside from obvious Down syndrome features. Teresa reports he continues to steadily gain weight via oral formula feeds. He currently weighs 3220 g.

QUESTION 1

At what age can Vincent have his first scheduled immunisations?

QUESTION 2

If Vincent's first immunisations were delayed, when would you administer his next set of vaccines?

QUESTION 3

Do premature infants develop a good immune response to vaccination when given according to their chronological age?

QUESTION 4

Will Vincent require any extra immunisations due to his prematurity/ low birth-weight? If so, at what age(s) will he require these?

QUESTION 5

If Vincent were born <28 weeks gestation or <1500 g birth weight, in addition to the vaccines in *Answer 4*, what other vaccines might he require and at what age(s)?

QUESTION 6

What other vaccine(s) would you recommend for Vincent because of his Down syndrome or cardiac condition?

QUESTION 7

Are there any potential adverse events you need to consider when vaccinating a premature infant?

QUESTION 8

Now that you have Vincent's immunisation schedule arranged, what else could be done to protect him from vaccine preventable diseases?

CASE 6 ANSWERS

ANSWER 1

Vincent can have his vaccinations at this visit. The Australian Technical Advisory Group on Immunisation (ATAGI) recommended in February 2011 a change to the age for commencing the immunisation schedule from 2 months to 6 weeks of age.[23] This was introduced in light of the current pertussis epidemic and the high morbidity and mortality associated with pertussis in infants 6 months of age and younger. As the first dose of the pertussis vaccine is immunogenic from 6 weeks of age, it is recommended to begin the primary schedule at this age to ensure infants begin developing protection against pertussis as early as possible. This new recommendation includes premature infants. Provided they are not acutely unstable and there are no contraindications to vaccination, premature infants can be vaccinated according to the recommended schedule at the usual chronological age. You do not need to adjust for prematurity.

ANSWER 2

If Vincent's first scheduled vaccinations were delayed, the next set can be given after an interval of 1 month, rather than 2 months. For example, if Vincent didn't receive his first dose until 4 months of age, then the second dose (scheduled 4 month vaccinations) should be administered at 5 months. To provide optimal boosting of vaccine immune responses, an interval of 2 months should be retained between the second and third doses. So in this case, the third dose would be given at 7 months of age.

ANSWER 3

In spite of their relative immunological immaturity, premature infants usually respond quite effectively to vaccines. Though the antibody response to a number of vaccines may be lower than in full term infants, protective concentrations and immune memory are usually achieved. Premature infants do not respond as well to hepatitis B vaccine. The antibody concentrations induced by these vaccines have a relatively short life in pre-term infants. However, a booster vaccination of these antigens produce protective levels very quickly.

ANSWER 4

Yes – hepatitis B at 12 months of age. For infants <32 weeks gestation or <2000 g birth weight it is recommended to give hepatits B vaccine at 0–6 weeks, 4 and 6 months of age (usual primary schedule) and then a booster dose of hepatitis B at 12 months of age. This can usually be done without measuring the anti-HepBsAb titre. If it is checked, the titre should be >10 IU/mL.[1]

ANSWER 5

Pneumococcal vaccine. Pre-term infants born <28 weeks gestation or with medical conditions such as chronic lung disease should receive the 13 valent pneumococcal conjugate vaccine (Prevenar13®) at 6 weeks, 4 and 6 months of age (usual primary schedule) with a booster at 12

months of age. They should also receive a 23 valent pneumococcal polysaccharide vaccine (Pneumovax23®) booster at 4–5 years of age.[1]

ANSWER 6

Vincent should receive additional pneumococcal vaccines – the 13 valent pneumococcal conjugate vaccine at 6 weeks, 4 and 6 months (usual primary schedule) then a booster at 12 months of age followed by a 23 valent pneumococcal polysaccharide booster at 4–5 years of age.

Even though Vincent was not born <28 weeks gestation or <1500 g birth weight, his Down syndrome and cardiac condition both predispose him to invasive pneumococcal disease and, therefore, he requires this extra protection.[1]

Due to his congenital heart condition, Vincent is at increased risk of complications from influenza infection. He should receive the influenza vaccination annually from 6 months of age. In general, children aged 9 years or younger require two doses of influenza vaccine 1 month apart when receiving it for the first time. Each year thereafter they require just one dose. This is because this age group are relatively naïve to influenza antigens and require the two doses initially to prime and boost their immune response. Children aged 6 months to 3 years should receive 0.25 mL of influenza vaccine for each dose.[1]

FEEDBACK

In general, the TGA do not currently advise revaccination of immunocompetent individuals with the 23 valent pneumococcal vaccine as there has been an increase in severe injection site reactions related to second or subsequent doses. However, they have advised that revaccination with the 23 valent vaccine should be considered in individuals who are at high risk of serious pneumococcal disease as long as 5 years have passed since the last dose. For these patients it is recommended they have a second dose of the 23 valent vaccine, 5 years after the first dose and then 5 years later or at age 65 years (whichever is later). See *Table 2.*

ANSWER 7

Pre-term infants who are vaccinated in hospital (especially those requiring special care) should be monitored for apnoea and bradycardia for up to 48 hours post vaccination. However, there is no evidence of increased risk of apnoea or sudden infant death syndrome once these infants are well enough to be discharged home. Other potential AEFIs are the same as for full term infants. Common AEFIs include mild fever, injection site pain, tiredness or increased sleep. Rarer AEFIs in infants include hypotonic hyporesponsive episodes.

ANSWER 8

'Cocooning' is one of the best strategies protecting premature infants, full term infants and those with underlying medical conditions who are at increased risk from vaccine preventable diseases. These individuals are at an extremely high risk of vaccine preventable diseases as they are too young to be fully vaccinated, or have not received timely vaccination due to their underlying medical condition. The main source of infection is their household contacts – parents, grandparents, siblings and carers. Ensuring these individuals are adequately immunised, minimises the transmission of vaccine preventable diseases to them. The main areas for cocooning include ensuring siblings have received all scheduled immunisations for their age; adults who have not received a pertussis booster at age 15 years should receive an adult pertussis booster, and if born after 1966, two doses of MMR vaccine, and all contacts should be encouraged to receive an annual influenza vaccine. Varicella immunisation status or clinical history of disease should also be determined. Due to the ongoing pertussis epidemic and the morbidity of this disease to infants under 6 months of age, the following strategies have been introduced: the first scheduled vaccination can now be commenced at 6 weeks of age and adult pertussis boosters to new parents (for which there is funding in some states/territories).

Table 2. Revaccination with 23VPPV for people ≥15 years of age

Primary dose 23vPPV (first dose) given to	First 23vPPV revaccination (second dose)	Second 23vPPV revaccination (third dose)
non-Indigenous adults ≥65 years without any underlying chronic medical conditions who are not tobacco smokers	No	No
non-Indigenous adults ≥65 years with underlying chronic medical conditions or smoker	5 years after first dose	No
non-Indigenous adults <65 years with underlying chronic medical conditions or smoker	5 years after first dose	Either 5 years after first revaccination (second dose) or at 65 years of age, whichever is later
Indigenous adults aged ≥50 years	5 years after first dose	No
Indigenous adults aged <50 years with underlying chronic medical conditions or smoker	5 years after first dose	Either 5 years after revaccination (second dose) or at 50 years of age, whichever is later
asplenic individuals	5 years after first dose	Either 5 years after revaccination (second dose) or at 50 years of age (for Indigenous adults), or at 65 years of age (for non-Indigenous adults), whichever is later

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Based on information from http://immunise.health.gov.au/internet/immunise/publishing.nsf/Content/pneumo23-atagi-statement-cnt.htm.

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RESOURCES FOR DOCTORS

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- Brighton Collaboration is a network of vaccine safety experts that provides information on research relating to vaccines. Available at https://brightoncollaboration.org/public
- Immunisation exemption conscientious objection form is available at www.medicareaustralia.gov.au/public/files/ma_conscientious_objection_form.pdf.

CONTACTS

The government health department of each state or territory have contact telephone numbers for their immunisation/public health departments:

- Australian Capital Territory Government, Health Directorate, Immunisation Information Line: 02 6205 2300
- Department of Health and Human Services Tasmania: 1300 135 513
- Department of Health, Victoria, Immunisation Program: 1300 882 008
- Government of South Australia, Department of Health, South Australia Immunisation Coordination Unit: 08 8226 7177
- Government of Western Australia, Department of Health, Communicable Disease Control Directorate: 08 9388 4878
- New South Wales Government Public health units: www.health.nsw.gov.au/public-health/phus/phus.html
- Northern Territory Government, Department of Health, Immunisation Database: 08 8922 8315
- Queensland Government, Queensland Health Immunisation Program: 07 3328 9888.

RESOURCES FOR PATIENTS

- Immunise Australia Program, Department of Health and Ageing provides information for patients on various aspects of the Australian Immunisation schedule. Available at http://immunise.health.gov.au/
- Raising Children Network is a website for parents of newborns to teenagers that has a section on immunisation. Available at www.raisingchildren.net.au
- National Centre for Immunisation Research and Surveillance (NCIRS) has a 'MMR decision aid' to help parents in their decision on immunising children with the MMR vaccine. Available at www.ncirs.edu.au/immunisation/education/mmr-decision/index.php
- The Centers for Disease Control and Prevention has a section on misconceptions relating to immunisation. Available at www.cdc.gov/vaccines/vac-gen/6mishome.htm#Themajorityofpeople.

Immunisation

In order to qualify for 6 Category 2 points for the QI&CPD activity associated with this unit:

- read and complete the unit of *check* in hard copy or online at the *gplearning* website at www.gplearning.com.au, and
- log onto the *gplearning* website at www.gplearning.com.au and answer the following 10 multiple choice questions (MCQs) online, and
- complete the online evaluation.

If you are not an RACGP member, please contact the *gplearning* helpdesk on 1800 284 789 to register in the first instance. You will be provided with a username and password that will enable you access to the test.

The expected time to complete this activity is 3 hours.

Do not send answers to the MCQs into the *check* office. This activity can only be completed online at www.gplearning.com.au.

If you have any queries or technical issues accessing the test online, please contact the *gplearning* helpdesk on 1800 284 789.

QUESTION 1

Sylvana, aged 4 years, presents to you for her 4 year old vaccinations. Which of the following would be a contraindication to vaccination with measles-mumps-rubella vaccine in Sylvana?

A. Sylvana has an upper respiratory tract infection with fever of 37.8˚C
B. Sylvana's mother is currently in the first trimester of pregnancy
C. Sylvana has just completed a course of chemotherapy for leukaemia
D. Sylvana previously had a prominent local reaction to measles-mumps-rubella vaccine
E. Sylvana requires catch-up varicella vaccine on the same day.

QUESTION 2

Chin, aged 4 years, presents for his routine 4 year vaccinations. In general, which of the following is advised when administering intramuscular vaccines to a 4 year old child?

A. The needle should be 23 or 25 gauge
B. The needle should be 16 mm in length
C. The needle should be inserted at 45 degrees to the skin
D. The preferred site for vaccination is the anterolateral thigh
E. An alternative site for vaccination is the dorsogluteal area

QUESTION 3

Which of the following is true regarding adverse events following immunisation (AEFI) in general?

A. An AEFI is defined as a reaction to immunisation of sufficient severity to warrant hospital admission
B. Serious or unexpected AEFIs should be reported to the relevant state or territory health department
C. The person making a report of a serious AEFI should be sure that the vaccine caused the AEFI
D. Individuals who have had an AEFI to a particular vaccine in the past should not be given that vaccine in the future
E. Events that are not listed in the *Australian Immunisation Handbook* as likely AEFIs do not need to be reported.

QUESTION 4

Mahir is 2 months of age and had an apnoea following his 2 month vaccinations. In general, which of the following is true regarding an apnoea following immunisation?

A. It occurs with equal rates in term and preterm infants
B. It occurs most frequently in the first 24 hours following immunisation
C. The recurrence rate is miniscule
D. Future vaccinations can be given without any extra precautions
E. It is usually fatal.

QUESTION 5

You are about to see Cody, aged 4 years. Cody has seen another doctor at your clinic but has not consulted you previously. You open his medical record on the computer and read that his parents have a conscientious objection to immunisation. In general, which of the following is true of conscientious objection to immunisation?

A. Most people who have concerns about immunisation are conscientious objectors
B. The rate of conscientious objection in Australia is estimated at 0.25%
C. The rate of conscientious objection tends to parallel the morbidity and mortality from vaccine preventable diseases during the same period of time
D. Completion of a conscientious objection form requires a doctor's or immunisation provider's signature
E. Registration of conscientious objection to immunisation precludes eligibility for some Australian Government family assistance payments.

QUESTION 6

Which of the following is true of administering vaccines to adults in general?

A. Routine testing of serology measuring vaccine immunity is recommended for nearly all vaccines

B. If a previous history of vaccination or natural/vaccine induced immunity cannot be established, offer a standard catch-up vaccination schedule

C. For most vaccines, there is a significant increase in severe adverse effects in giving additional doses in immune individuals

D. Vaccines only need to be administered to adults for the purposes of travel

E. Details of most vaccines given to adults should be forwarded to the national register.

QUESTION 7

Kylie, aged 32 years, is unexpectedly pregnant but very happy with the pregnancy. She asks you about vaccination during pregnancy. In general, which of the following vaccines is recommended for administration to most pregnant women at any stage during pregnancy?

A. Adult diphtheria-tetanus-acellular pertussis (dTpa) vaccine

B. Influenza vaccine

C. Human papilloma virus vaccine

D. Measles-mumps-rubella vaccine

E. Varicella vaccine.

QUESTION 8

You are establishing your own general practice clinic and revise the recommendations and requirements for storage of vaccines. Which of the following is recommended or required in relation to storage of vaccines?

A. Vaccines should be stored in a dedicated vaccine refrigerator

B. Vaccines should be stored between 0°C and +4˚C

C. Vaccines should be stored removed from their original packaging

D. Refrigerators in which vaccines are stored should have their temperature recorded on a minimum of a weekly basis

E. Refrigerators in which vaccines are stored are required to have a power supply independent from the mains supply in case of a power outage.

QUESTION 9

Your general practice clinic has a power outage overnight and you discover the following morning that the temperature in the vaccine refrigerator has been outside the safe range. You are unable to determine how long the temperature was outside the safe range or the minimum and maximum temperatures during the outage. What is your next step?

A. Discard all the vaccines in the vaccine refrigerator

B. Discard only the private (non-National Immunisation Program) vaccines

C. Use the vaccines as normal

D. Examine a sample of the vaccines to check if they appear any different

E. Contact your state or territory Immunisation program advisor.

QUESTION 10

Ezekial was born 2 weeks ago at 27 weeks gestation and is in a neonatal intensive care unit. You ring his mother to discuss how she is coping and in the course of your conversation with her, she asks about Ezekial's vaccination requirements. Which of the following is true in relation to vaccinations for Ezekial?

A. The recommended age for starting Ezekial's vaccinations on the immunisation schedule is 6 weeks chronological age (as for term infants)

B. Adjustment for Ezekial's corrected age for prematurity should be performed

C. The same number of doses of hepatitis B vaccine are required for Ezekial as for term infants

D. The same number of doses of pneumococcal vaccine are required for Ezekial as for term infants

E. Influenza vaccination is not recommended at the minimum allowable age even if Ezekial has ongoing respiratory problems at that age.