



KISS GUIDE TO VACCINE MANAGEMENT



Education Module Two: Cold chain risk management

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Keep it Simple and Safe!

1. INTRODUCTION TO THE MODULE

About this education module

Purpose

This education module is the second in a series of three which are:

- 1) Introduction to vaccine management
- 2) Cold chain risk management
- 3) Data management

The purpose of this education module is to provide any staff member involved in vaccine management with information and continuing education on preventing cold chain problems, minimising their impact where possible, and appropriately managing them if they occur. Drawing on information from the [National Vaccine Storage Guidelines: Strive for Five](#), it provides information on the 5 steps of cold chain risk management with particular reference to managing short-term and long-term power failures, and managing a cold chain breach. The activities at the end of each section test retention of information and encourage reflection on the way the practice operates.

Target audience

All clinical and non-clinical staff involved in immunisation and vaccine management including GPs, Practice Nurses, Practice Managers, Aboriginal Health Workers and Practice Staff.

How to use

How to make the best use of this education module

This education module can be used in many different ways including the following:

- Individuals through self-directed learning
- Small group learning
- Part of a local collaborative

Participants are encouraged to complete each of the education modules consecutively however this is mainly dependent on knowledge, experience and time available to the person. Participants are also encouraged to work through each section in the education module successively as this contextualises the content.

On completion of each section, work through the related reflective activities. Refer to the information in the relevant section to assist you in answering the questions as well as the [National Vaccine Storage Guidelines: Strive for Five](#) and [The Australian Immunisation Handbook](#). When you see the 'Strive for Five' image (see below), refer to the stated page(s) in the **National Vaccine Storage Guidelines: Strive for Five** available on www.immunise.health.gov.au.



Where to go for more information

For more information or answers to the reflective activities, please contact your local Division of General Practice or Population Health Unit. For contact details, visit www.qdgp.org.au/vaccinemanagement.

Learning objectives

It is anticipated that the following learning objectives will be met by participants who successfully complete this education module:

- Increase in knowledge and understanding of the 5 principles of cold chain risk management.
- Appreciate the importance of implementing strategies to prevent problems from occurring.
- Ability to develop a plan of action to prevent, minimise the impact and/or manage cold chain problems.
- Increase in knowledge and understanding about managing short-term and long-term power failures.
- Appreciate the implications associated with power failures.
- Increase in knowledge regarding transferring vaccines to another facility.
- Participants should have an increase in knowledge and understanding about portable coolers and type of equipment required.
- Ability to appropriately pack a portable cooler.
- Ability to effectively condition ice packs/gel packs.
- Increase in knowledge about the principles of transporting vaccines.
- Increase in knowledge and understanding about the seriousness of cold chain breaches.
- Ability to effectively action a cold chain breach.

Source of material

QDGP has sourced material from the following documents to compile this education module:

1. [National Vaccine Storage Guidelines: Strive for Five](#), Australian Government: Department of Health and Ageing, 2005, copyright Commonwealth of Australia reproduced by permission.
2. [Proceedings of the National Vaccine Storage Workshop](#), Queensland Government: Queensland Health, 2004.
3. [The Australian Immunisation Handbook](#), 8th Edition, National Health and Medical Research Council, 2003.

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Disclaimer

This document is provided as a generic guide and learning information. All organisations or individuals using this material are required to evaluate the contents for its suitability for their requirements prior to use. The Queensland Divisions of General Practice Association Incorporated (“QDGP”) is not responsible for errors or omissions in the content of this material, or the results of any action taken by any person based on the information contained herein. QDGP expressly disclaims all liability to any person(s) in respect of anything and for the consequences of anything done or omitted to be done by any person in reliance, whether in part or in whole, on the contents of this document.

2. INTRODUCTION TO COLD CHAIN RISK MANAGEMENT

Learning objective/s

By the end of this section, participants should have an increase in knowledge and understanding of the 5 principles of cold chain risk management, appreciate the importance of implementing strategies to prevent problems from occurring, and ability to develop a plan of action to prevent, minimise the impact and/or manage cold chain problems.

About cold chain risk management

Cold chain risk management involves reviewing and actioning the following areas with the aim to prevent (wherever possible) loss of vaccine through a cold chain breach:

1. **Identifying** the problem, reasons and possible solutions.
2. **Preventing** the problem from occurring.
3. **Planning** to prevent, minimise the impact and/or manage problems.
4. **Managing** the problem if it occurs.
5. **Quality review process** after cold chain problems occurred.

Each of the five areas has been outlined below with a particular focus on the three key elements involved in vaccine management: people, process and equipment.

Step 1: Identifying the problem, reasons and possible solutions

Cold chain problems can take many shapes and forms such as inadequate equipment and processes, incorrect packing of the vaccine refrigerator, staff involved in vaccine management not provided with training, vaccine accidentally left out of the refrigerator, refrigerator accidentally turned off or unplugged, power failure, load shedding of electricity and natural disasters including cyclones and floods. All of these events can lead to a cold chain breach, and ultimately loss of vaccine.

In summary, vaccine management problems can be grouped in the following four areas:

1. **People** (such as staff not provided with training).
2. **Process** (including incorrect and/or undocumented processes).
3. **Equipment** (including the vaccine refrigerator and monitoring equipment).
4. **External factors** (such as power supply issues and natural disasters).

A description of each of the four areas has been provided below including possible solutions that the practice could implement to correct the problem.

IMPORTANT NOTE: The provided list is not exhaustive and there many other factors that can impact on safe storage and handling of vaccine. It is essential that the practice/clinic consider cold chain problems that they are likely to encounter and devise appropriate solutions.

People

To ensure safe and effective vaccine storage and handling, staff need to have a clear understanding of the importance of vaccine management, follow correct processes in storage and handling of vaccine, and must know how to identify and manage a cold chain incident. To be able to do all of the above successfully, clear and accurate processes need to be written and staff need to be trained in their implementation.

When staff are not provided with adequate training and clear and accurate processes, the following situations can occur:

- Staff not unpacking delivered vaccine immediately.
- Staff recording the current temperature not the minimum and maximum temperature.
- Staff resetting the thermometer whenever the temperature reads outside the +2°C to +8°C range.
- Staff not knowing how to interpret the temperatures of the vaccine refrigerator.
- Staff not knowing how to identify and report a cold chain breach.
- Seven (7) day medical centres checking and recording the refrigerator temperature during the week but not on the weekend.
- Information lost when the staff member who looks after vaccine management leaves and the new person doesn't have any understanding or information on correct storage and handling.
- Multiple staff adjusting the thermostat whenever the temperature is out of the correct temperature range.

Possible solutions for overcoming the above problems include the following:

- A primary person should be appointed to conduct and/or coordinate all aspects of vaccine management.
- A secondary person should be appointed as a back-up person to conduct and/or coordinate all aspects of vaccine management.
- All staff members who are involved in some or all elements of vaccine management should be provided with initial training and then ongoing updates in vaccine management. This may be via attendance at education sessions, newsletter articles or receiving practice visits and other methods of support offered by the local Division of General Practice, local Population Health Unit, professional associations (e.g. [APNA](#), [AAPM](#), [RACGP](#), [ACRRM](#)), accreditation bodies (e.g. [GPA](#), [QIP/AGPAL](#)) and other like organisations.
- All new staff members who are involved in some or all elements of vaccine management should be provided with a comprehensive orientation program when they start to ensure that they are well-versed in their role and responsibilities.

A template **orientation program** and **policy and procedure document** for vaccine management is available on the QDGP website at www.qdgp.org.au/vaccinemanagement.

STRIVE FOR **5** See pages 2-6

Processes

The practice/clinic should establish simple, routine cold chain processes and systems for their particular immunisation service that are easily maintained. The practice/clinic should also establish written protocols on effective vaccine management which reflect the way their systems operate.

Incorrect and/or undocumented processes can result in the following situations:

- Staff members adopting incorrect or outdated procedures given to them by an existing staff member.
- Staff members responsible for vaccine management not provided with any training on safe and effective storage of vaccine.
- Approach that “we have always done it this way” and “if it ain't broke, don't fix it”.

- When the primary staff member who looks after vaccine management goes on leave and doesn't provide any training or instruction for the next staff member on safe and effective storage of vaccine.
- Written processes haven't been reviewed and updated for a long period of time.

Possible solutions for overcoming incorrect and/or undocumented processes include the following:

- Become familiar with the [National Vaccine Storage Guidelines: Strive for Five](#).
- Staff keeping up-to-date with best practice guidelines through training, newsletter articles or receiving a practice visit and other methods of support offered by the local Division of General Practice, local Population Health Unit, professional associations (e.g. [APNA](#), [AAPM](#), [RACGP](#), [ACRRM](#)), accreditation bodies (e.g. [GPA](#), [QIP/AGPAL](#)) and other like organisations.
- Implementing and regularly updating written vaccine management policies and procedures in accordance with best practice guidelines.
- Provision of training to staff in implementation of the documented vaccine management policies and procedures.
- Implementing a vaccine management orientation program for new staff members.
- Conducting a Vaccine Management Audit on an annual basis.
- Quality review process is in place within the practice to address any vaccine management issues with all staff.

To ensure safe and effective storage and handling of vaccines, practices/clinics should include the following written protocols in their policy and procedure documentation:

- About cold chain and why it is important.
- Key staff members responsible for vaccine management.
- Vaccine refrigerator and monitoring equipment.
- Ordering vaccines.
- Receiving vaccines.
- Appropriate disposal of vaccines.
- Packing the vaccine refrigerator.
- Daily monitoring and recording of the vaccine refrigerator temperature.
- Managing a power failure.
- Action in the event of a cold chain breach.
- Packing a portable cooler.
- Maintenance of the vaccine refrigerator and monitoring equipment.
- Vaccine management audit every 12 months.
- Cold chain risk management planning.
- Quality review process in the event that cold chain problems occur.

A template **policy and procedure document** for vaccine management and **vaccine management audit** are available on the QDGP website at www.qdgp.org.au/vaccinemanagement.

STRIVE⁵ See pages 2-6

Equipment

All equipment used in the provision of the immunisation service should be reliable, regularly maintained and serviced and comply with recommendations in the current guidelines. This includes the vaccine refrigerator and monitoring equipment. Correct packing of the vaccine refrigerator is also essential if vaccines are to remain safe and effective.

Vaccine refrigerator

There are many reasons as to why a vaccine refrigerator may have problems in maintaining the safe temperature range of +2°C to +8°C. Several of these problems have been identified below, with possible reasons and solutions that a practice/clinic should consider implementing to ensure that a cold chain breach does not occur.

Problem	Reasons and possible solutions	More information
Frost-free domestic refrigerators	<ul style="list-style-type: none"> • These refrigerators are not ideal as they have several temperature zones to meet the requirements of different foods. • If there is no other option, the frost-free refrigerator can be used if the practice/clinic 'gets to know' their refrigerator by recording temperatures throughout and locating the air vents which return cold air from the freezer. • Vaccines should be stored in their original packaging in a set of sliding plastic drawers or enclosed plastic containers on shelves in the refrigerator that are stable and maintain the +2°C to +8°C temperature range. • If difficult to maintain the +2°C to +8°C temperature range, the practice/clinic will need to consider purchasing a purpose-built vaccine refrigerator. 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines • Refer to page 11 of the National Vaccine Storage Guidelines • Refer to pages 12-13 and 41-43 of the National Vaccine Storage Guidelines • For more information about choosing a purpose-built vaccine refrigerator, visit the QDGP website at www.qdgp.org.au/vaccinemanagement
Domestic refrigerator that requires defrosting	<ul style="list-style-type: none"> • Refrigerators requiring defrosting are not recommended. Thick ice in the freezer compartment does not keep a refrigerator cool. Instead, it makes the refrigerator work harder and uses more power. • Practices/clinics will need to defrost as soon as ice becomes more than 0.5cm thick, or once a month, whichever comes first. • If there is no other option, this refrigerator can be used if the practice/clinic 'gets to know' their refrigerator by recording temperatures throughout and locating the air vents which return cold air from the freezer. • Vaccines should be stored in their original packaging in a set of sliding plastic drawers or enclosed plastic containers on shelves in the refrigerator that are stable and maintain the +2°C to +8°C temperature range. • If difficult to maintain the +2°C to +8°C temperature range, the practice/clinic will need to consider purchasing a purpose-built vaccine refrigerator or a frost-free modified domestic refrigerator. 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines • For a policy and procedure on defrosting a refrigerator, visit the QDGP website at www.qdgp.org.au/vaccinemanagement • Refer to page 11 of the National Vaccine Storage Guidelines • Refer to pages 12-13 and 41-43 of the National Vaccine Storage Guidelines • For more information about choosing a purpose-built vaccine refrigerator, visit the QDGP website at www.qdgp.org.au/vaccinemanagement

Problem	Reasons and possible solutions	More information
Cyclic defrost domestic refrigerator	<ul style="list-style-type: none"> • Not recommended because they produce wide fluctuations in the internal temperatures with regular internal heating. • Strong consideration must be given to replace cyclic defrost refrigerators. • Vaccines should be stored in their original packaging in a set of sliding plastic drawers or enclosed plastic containers on shelves in the refrigerator that are stable and maintain the +2°C to +8°C temperature range. • If difficult to maintain the +2°C to +8°C temperature range, the practice/clinic will need to consider purchasing a purpose-built vaccine refrigerator or a frost-free modified domestic refrigerator. 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines • Refer to page 11 of the National Vaccine Storage Guidelines • Refer to pages 12-13 and 41-43 of the National Vaccine Storage Guidelines • For more information about choosing a purpose-built vaccine refrigerator, visit the QDGP website at www.qdgp.org.au/vaccinemanagement
Bar refrigerator	<ul style="list-style-type: none"> • These refrigerators are not recommended because of the risk of freezing, temperature instability and susceptibility to ambient temperatures. • Strong consideration must be given to replace bar refrigerators. • Vaccines should be stored in their original packaging in a set of sliding plastic drawers or enclosed plastic containers on shelves in the refrigerator that are stable and maintain the +2°C to +8°C temperature range. • If difficult to maintain the +2°C to +8°C temperature range, the practice/clinic will need to consider purchasing a purpose-built vaccine refrigerator or a frost-free modified domestic refrigerator. 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines • Refer to page 11 of the National Vaccine Storage Guidelines • Refer to pages 12-13 and 41-43 of the National Vaccine Storage Guidelines • For more information about choosing a purpose-built vaccine refrigerator, visit the QDGP website at www.qdgp.org.au/vaccinemanagement
Drinks refrigerator	<ul style="list-style-type: none"> • Drinks refrigerators are sometimes mistaken as another type of purpose-built vaccine refrigerator. They are however designed to operate at 0°C to +5°C according to food and beverage health standards and are therefore not recommended to store vaccines. • If no other option, this refrigerator should be treated the same as a domestic refrigerator and can be used if the practice/clinic 'gets to know' their refrigerator by recording temperatures throughout and locating the air vents. • The practice/clinic should also contact the manufacturer to see if the temperature can be adjusted to sit between the +2°C to +8°C temperature range with a minimum temperature of 4°C. • Vaccines should then be stored in their 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines • Refer to page 11 of the National Vaccine Storage Guidelines • Refer to pages 12-13 and 41-43 of the National Vaccine Storage Guidelines • For more information about choosing a purpose-built vaccine refrigerator, visit the QDGP website at www.qdgp.org.au/vaccinemanagement

Problem	Reasons and possible solutions	More information
	<p>original packaging in a set of sliding plastic drawers or enclosed plastic containers on shelves in the refrigerator that are stable and maintain the +2°C to +8°C temperature range.</p> <ul style="list-style-type: none"> • If difficult to maintain the +2°C to +8°C temperature range, the practice/clinic will need to consider purchasing a purpose-built vaccine refrigerator or a frost-free modified domestic refrigerator. 	
Refrigerator too small for quantity of vaccine stored	<ul style="list-style-type: none"> • All vaccine must be stored in their original packaging with its product information leaflet. There must also be sufficient space between the packaging to allow air circulation. Overstocking of vaccine will place all vaccines at risk as cool air circulation will be impeded, and consistent, stable temperatures throughout the refrigerator difficult to achieve. • If the refrigerator is too small, the practice/clinic will need to upgrade to a more suitably sized refrigerator that is able to store the maximum amount of vaccine taking into consideration new vaccines to be included in the schedule and including influenza vaccine. 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines • Refer to page 16 of the National Vaccine Storage Guidelines • For more information about choosing a purpose-built vaccine refrigerator, visit the QDGP website at www.qdgp.org.au/vaccinemanagement
Using a 2 nd refrigerator for overflow vaccine stock	<ul style="list-style-type: none"> • Vaccines that do not fit in the vaccine refrigerator should not be relegated to a 2nd often unmonitored and inferior refrigerator. • If there is not enough room in you vaccine refrigerator to store the vaccines required for your practice you must consider the purchase of a larger refrigerator, preferably a purpose-built vaccine refrigerator. • Queensland Health are unable to accommodate orders under one month. 	<ul style="list-style-type: none"> •
Refrigerator too big for quantity of vaccine stored	<ul style="list-style-type: none"> • Refrigerators behave differently when there is very little content. • For domestic refrigerators, practices/clinics should add 'cold mass' such as cooled water bottles or refrigerated ice packs/gel packs on unused shelves. • Practices/clinics with a purpose-built vaccine refrigerator should contact the manufacturer for advice regarding the need to add cold mass. • If advised that cold mass can be added, cooled water bottles or refrigerated ice packs/gel packs should be placed in the refrigerator. 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines • Contact the purpose-built vaccine refrigerator manufacturer for further information

Problem	Reasons and possible solutions	More information
	<ul style="list-style-type: none"> If the practice is advised that cold mass does not need to be added, they should advise the manufacturer of any problems they are experiencing in maintaining the correct temperature range. 	
Age of the refrigerator	<ul style="list-style-type: none"> As equipment ages it is prone to problems that impact on the stability of maintaining the +2°C to +8°C temperature range. The refrigerator needs to be reliable and not required repairs over the last two years, free of water or coolant leaks, have a quiet compressor, seals in good condition and sealing tightly, and the refrigerator door able to close properly. A maintenance program needs to be in place which covers checking seals, cleaning exposed coils, and defrosting if required to ensure that the refrigerator is working effectively. If the refrigerator is unable to maintain the +2°C to +8°C temperature range, the practice/clinic will need to consider purchasing a purpose-built vaccine refrigerator or a frost-free modified domestic refrigerator. 	<ul style="list-style-type: none"> Refer to pages 7-18 of the National Vaccine Storage Guidelines For a policy and procedure on maintaining the vaccine refrigerator, visit the QDGP website at www.qdgp.org.au/vaccinemanagement For more information about choosing a purpose-built vaccine refrigerator, visit the QDGP website at www.qdgp.org.au/vaccinemanagement
Lack of a regular maintenance program	<ul style="list-style-type: none"> Vaccine refrigerators need to be carefully monitored and maintained to ensure that they are working effectively and safely storing vaccine. A maintenance program needs to be in place which covers checking seals, cleaning exposed coils, and defrosting if required to ensure that the refrigerator is working effectively. 	<ul style="list-style-type: none"> Refer to pages 7-18 of the National Vaccine Storage Guidelines For a policy and procedure on maintaining the vaccine refrigerator, visit the QDGP website at www.qdgp.org.au/vaccinemanagement
Inconsistent temperature throughout the refrigerator	<ul style="list-style-type: none"> Domestic refrigerators are designed for food storage and not the specialised needs of vaccines. Careful monitoring and knowledge of the refrigerator is therefore essential to minimise risk to the vaccine. Practices/clinics should get to 'know their vaccine refrigerator' by monitoring and recording temperatures throughout (also called 'mapping') and packing the refrigerator accordingly. If difficult to maintain the +2°C to +8°C temperature range, the practice/clinic will need to consider purchasing a purpose-built vaccine refrigerator or a frost-free modified domestic refrigerator. 	<ul style="list-style-type: none"> Refer to pages 7-18 of the National Vaccine Storage Guidelines Refer to page 11 of the National Vaccine Storage Guidelines for clear instructions on how to record temperatures throughout the vaccine refrigerator For more information about choosing a purpose-built vaccine refrigerator, visit the QDGP website at www.qdgp.org.au/vaccinemanagement

Problem	Reasons and possible solutions	More information
Location of the refrigerator	<ul style="list-style-type: none"> • It is essential that the refrigerator is away from warm external walls and out of direct sunlight as this will impact on its ability to store vaccine within the correct temperature range of +2°C to +8°C. • If located against a warm external wall, the refrigerator will need to be relocated to another more appropriate area. • If exposed to direct sunlight, heavy curtains/blinds may need to be installed to block out the sunlight. Alternatively, the refrigerator will need to be relocated to another more appropriate area. 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines • For a policy and procedure on locating the vaccine refrigerator, visit the QDGP website at www.qdgp.org.au/vaccine-management
Lack of adequate ventilation around the refrigerator	<ul style="list-style-type: none"> • Inadequate ventilation can cause the vaccine refrigerator to overheat. • Follow the manufacturer's instructions about positioning the refrigerator to enable sufficient air circulation around the back and sides. 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines • Contact the refrigerator's manufacturer for further information

Monitoring equipment

Inadequate monitoring equipment may relate to the thermometer, data logger or temperature chart recording system (also known as temperature graph recorder) not maintaining or recording accurate temperatures. Potential problems have been listed below with possible solutions that the practice/clinic should consider.

Problem	Reasons and possible solutions	More information
Inaccurate external thermometer	<ul style="list-style-type: none"> • Can be caused due to low battery or if faulty. • The battery should be changed and an 'accuracy check' conducted at least every 12 months. This should form part of a maintenance program. • If the external thermometer is inaccurate, a replacement can be requested from the Queensland Health Immunisation Program on 3234 1500. 	<ul style="list-style-type: none"> • Refer to page 22 of the National Vaccine Storage Guidelines • For a policy and procedure on maintaining monitoring equipment and knowing the accuracy of the external thermometer, visit the QDGP website at www.qdgp.org.au/vaccine-management
Inaccurate data logger	<ul style="list-style-type: none"> • Can be caused due to low battery or if faulty. • If battery operated, it should be changed at least every 12 months. • The data logger may require calibration – the practice/clinic will need to check with the manufacturer regarding frequency and method as to how the equipment is calibrated. 	<ul style="list-style-type: none"> • Refer to pages 22-23 and 49-51 of the National Vaccine Storage Guidelines • Contact the manufacturer for further information

Problem	Reasons and possible solutions	More information
Inaccurate temperature chart recording system (also called temperature graph recorder)	<ul style="list-style-type: none"> • Can be caused if faulty. • The temperature chart recorder may require calibration – the practice/clinic will need to check with the manufacturer regarding frequency and method as to how the equipment is calibrated. 	<ul style="list-style-type: none"> • Refer to pages 22-23 of the National Vaccine Storage Guidelines • Contact the manufacturer for further information

Incorrect packing of the refrigerator

Incorrect packing of the refrigerator may allow vaccines to be exposed to temperature conditions outside the +2°C to +8°C temperature range as well as other conditions that impact on vaccine viability. Some of these causes have been listed below with possible solutions that the practice/clinic should consider.

Problem	Reasons and possible solutions	More information
Vaccine removed from its original packaging	<ul style="list-style-type: none"> • Vaccine must be stored in its original packaging which includes its box and product information leaflet. This is because packaging provides a degree of protection from temperature fluctuations. Plus some vaccines are light sensitive and the packaging protects them from exposure. • Staff should be trained in the correct packing of the vaccine refrigerator whether domestic or purpose-built. 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines
Incorrect placement of the external thermometer probe	<ul style="list-style-type: none"> • Incorrect placement of the external thermometer probe includes stuck to the side of the refrigerator wall, in the door or sitting in fluid or gel. • The probe should be placed inside vaccine packaging (the box and product information leaflet) so that it measures the air temperature closest to where a vaccine vial would be and to simulate vaccine temperature. 	<ul style="list-style-type: none"> • Refer to page 14 of the National Vaccine Storage Guidelines
Vaccine stored near the cooling plate	<ul style="list-style-type: none"> • Some domestic refrigerators and purpose-built vaccine refrigerators have a cooling plate. When pushed against the cooling plate, vaccines can freeze. • Vaccine should be stored at least 4cm from the back of a refrigerator with a cooling plate. • For all domestic refrigerators and some purpose-built vaccine refrigerators, vaccine should be stored at least 4cm from the walls/sides of the refrigerator. • Practices/clinics should contact the 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines • Contact the purpose-built vaccine refrigerator manufacturer for further information

Problem	Reasons and possible solutions	More information
	purpose-built vaccine refrigerator manufacturer for advice on storing vaccine near the back and walls of the refrigerator.	
Vaccine stored at the bottom of the refrigerator	<ul style="list-style-type: none"> • Vaccine must not be stored at the bottom of a domestic refrigerator as in most models very cold air is injected into the fresh food compartment causing vaccine to freeze. • Practices/clinics should fill the lower drawers with plastic bottles/containers filled with water to help stabilise the temperature. A small space between the bottles/containers should be left. • Some purpose-built vaccine refrigerator manufacturers do not recommend that vaccine is stored in the bottom of their refrigerators. Practices/clinics should contact their purpose-built vaccine refrigerator manufacturer for further advice. 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines • Refer to pages 10-11 of the National Vaccine Storage Guidelines • Contact the purpose-built vaccine refrigerator manufacturer for further information
Vaccine is not rotated	<ul style="list-style-type: none"> • Vaccine wastage can occur if staff place fresh vaccine stock at the front of previous vaccine stock. • Practices/clinics should rotate stock so vaccines with the shortest expiry date are used first. 	<ul style="list-style-type: none"> • Refer to pages 7-18 of the National Vaccine Storage Guidelines • For a policy and procedure on receiving vaccine and packing a refrigerator, visit the QDGP website at www.qdgp.org.au/vaccine-management

External factors

External factors are those that are outside the immediate control of the practice/clinic and include power supply issues and natural disasters. Due to the nature of external factors, practices/clinics can only really consider how they impact on the way they operate and implement a pre-prepared plan of action in the event that they occur.

Practices/clinics should also consider insurance for loss of vaccine and damage to equipment as a result of these external factors.

Power supply issues

The following table provides details of different power supply problems, possible causes and, where applicable, suggested ways to deal with them.

Issue	Reasons	Possible solutions
Power failure (also called 'blackouts')	<p>A power failure is the loss of electricity supply to an area. The reasons for a power failure may include damage to a power line, overloading of electricity mains, a defect in a power station, or a short circuit.¹</p> <p>One of the most common reasons for power failures are damaged power lines resulting from natural occurrences such as high winds, storms, cyclones, and flooding.²</p>	<p>If a practice/clinic experiences frequent power failures or is likely to experience power failures as a result of natural occurrences (e.g. during storm season in Northern Queensland), it may be more convenient and financially viable to invest in a generator.</p> <p>If a generator is not available, practices/clinics will need to follow instructions for managing a power failure. This may also include transferring vaccine to a portable cooler and/or transporting to a location with a secure source of power and suitable facilities for storing vaccine. Further information is detailed in Step 4: Addressing the problem when it occurs.</p>
Power surges	<p>A power surge is a rapid, temporary increase in voltage in power lines near a home or business. Power surges can permanently damage delicate electrical and electronic equipment in a home or business.²</p> <p>They can be caused by nearby lightning strikes or major electricity users switching power on or off.¹</p>	<p>Suggested protection for electrical equipment is a "surge protector".²</p> <p>Surge protectors can come in several different forms, such as, surge diverters, power point protectors or portable protectors.²</p> <ul style="list-style-type: none"> • Surge diverters: are installed in the main switchboard by a qualified electrician.² • Power point protectors: are installed by a qualified electrician and replace regular power points to provide protection in key areas.² • Portable protectors: plug into a standard power point to provide protection. However, some low-level portable power point

Issue	Reasons	Possible solutions
		protectors can suffer damage after only one surge and become ineffective. ²
Brownouts	<p>A brownout is a temporary condition where power falls below the given amount from the utility, usually 120 volts. Electronic equipment is especially sensitive to this drop in power.³</p> <p>Some brownouts, called voltage reductions, are made intentionally to prevent a full power outage.¹</p>	See <i>Power surges</i> for further information.
Load shedding	<p>Load shedding is a controlled way of rotating the available capacity of electricity between all customers. There are different types of load shedding however it essentially involves disconnecting a predetermined amount of residential and commercial consumers for a period of time.⁴</p> <p>The principle guiding all load shedding is that essential services have the highest priority for electricity supply.⁴</p> <p>It is generally conducted when the demand for electricity is greater than what can be supplied with the objective of avoiding total blackouts throughout the area.⁴</p>	See <i>Power failure</i> for further information.

¹ Wikipedia, http://en.wikipedia.org/wiki/Power_outage

² ENERGEX Limited, http://www.energex.com.au/switched_on/safety/safety_safetya1.html

³ Monster Cable, <http://www.monstercable.com/glossary/>

⁴ The Department of Infrastructure, Energy and Resources
http://www.dier.tas.gov.au/energy/emergency_management

Natural disasters

Natural disasters are the more difficult situations to plan for and manage because they are generally unexpected, have multiple influencing and uncontrollable factors, and require responsive action. In the event of a natural disaster, some practices/clinic may experience short or long-term power outages. Some practices/clinics may need to relocate to other buildings or even towns until safe or adequate infrastructure to support the clinic is in place.

Due to the above, plans need to be developed that are unique to the practice/clinic based on available staff and infrastructure – there is not a universal model that can be applied.

Examples of natural disasters include the following:

- Storms
- Cyclones
- Flooding
- Bush fires
- Heat waves
- Extreme cold weather

Further information about natural disasters and planning is in [Step 3: Planning to prevent, minimise the impact and/or manage problems](#).

IMPORTANT! It should be noted that personal safety must be the absolute priority of practice/clinic members in the event of a natural disaster. Only if it is safe to do so, should measures be implemented to prevent vaccine loss.

Step 2: Preventing the problem from occurring

There are simple principles that practices/clinics should follow to prevent cold chain problems from occurring. In addition to the solutions listed under [People](#), [Processes](#), [Equipment](#) and [External Factors](#) in Step 1, practice/clinics should put the following measures in place:

- Establish simple, routine processes.
- Develop written protocols on safe and effective vaccine management.
- Ensure that staff involved in vaccine management have received appropriate training and understand the cold chain and its importance.
- Utilise appropriate vaccine refrigerator and monitoring equipment.
- Put processes in place for ordering and receiving vaccines.
- Put processes in place for safe disposal of vaccines.
- Pack the vaccine refrigerator in accordance with best practice guidelines.
- Monitor and record the temperature of vaccines in accordance with best practice guidelines.
- Put processes in place for managing a power failure.
- Put equipment and processes in place for packing a portable cooler.
- Put processes in place for maintaining the vaccine refrigerator and monitoring equipment.
- Conduct a vaccine management audit which covers people, processes and equipment on an annual basis.
- Conduct cold chain risk management planning.
- Conduct quality review processes in the event that a cold chain problem occurs.

Information about each of these areas is detailed throughout this document and/or in the following sources:

- National Vaccine Storage Guidelines: Strive for Five: www.immunise.health.gov.au
- The Australian Immunisation Handbook (current edition): www.immunise.health.gov.au
- Vaccine management policy and procedure template: www.qdgp.org.au/vaccinemanagement
- Vaccine management audit: www.qdgp.org.au/vaccinemanagement
- Vaccine management orientation checklist: www.qdgp.org.au/vaccinemanagement
- Cold chain risk management planning: www.qdgp.org.au/vaccinemanagement
- Quality review processes: www.qdgp.org.au/vaccinemanagement

Step 3: Planning to prevent, minimise the impact and/or manage problems

About

The objective of planning is to identify potential cold chain problems and their causes that are most likely to impact on the practice/clinic before they occur. It involves considering whether the identified causes can be eliminated or their likelihood reduced, and whether the impact of the problem can be minimised should it occur. It also involves developing a management plan in the event that the problem occurs.

Practices/clinics can also use the planning framework to trouble-shoot arising cold chain problems and quality review problems that have occurred. Further information about quality reviews is detailed in [Step 5: Quality review process after cold chain problems occurred](#).

It is for these reasons that planning is an essential element of cold chain risk management.

Planning process

As a guide to developing plans for preventing, minimising the impact and/or managing cold chain problems, a “Plan of action template for cold chain risk management” has been developed. Once completed, the plan of action can be incorporated into the practice/clinic policy and procedure documents.

It is recommended that a team approach be adopted in brainstorming and completing the plan of action and that plenty of detail is recorded, including allocating staff to particular tasks. It is also suggested that a template be allocated per topic (e.g. power failures, natural disasters, etc) and that the completed sheet is integrated into the practice/clinic policy and procedure documents for future reference.

The “Plan of action template for cold chain risk management” is provided on the next page with a description of each section. Two scenarios with a completed plan of action have also been developed to help increase your understanding of the application process.

For application in your practice/clinic, the template can be downloaded from www.qdgp.org.au/vaccinemanagement.

Assistance

For further assistance in developing a plan of action, please contact your local Division of General Practice or Population Health Unit. Relevant contact details can be found by visiting www.qdgp.org.au/vaccinemanagement.

Plan of action template for cold chain risk management

Topic: Detail here the overall topic of the plan of action, for example natural disasters. The topic should be relevant to your practice/clinic.

Date: Place here the date that the plan was developed.

Plan developed by: Detail here who was involved in developing the plan.

What are the potential problems and causes? (Consider factors both within and outside the direct control of the practice)

Problems	Causes
<ul style="list-style-type: none"> Detail here the nature of the problem, for example power failure. 	<ul style="list-style-type: none"> Detail here what can cause the problem, for example thunder storm.

What types of strategies can be implemented to prevent or reduce the likelihood of the problem occurring?

This section focuses on reviewing and managing the identified causes with the objective to prevent or reduce the chance of the problem occurring. Causes within the control of the practice, such as unreliable bar refrigerator, can be prevented by the practice buying correct equipment. If the causes are outside the control of the practice, such as a cyclone, then it generally won't be possible to reduce the likelihood.

Strategy and process to follow	Equipment required	Staff roles and responsibilities
<ul style="list-style-type: none"> Detail here the strategy and associated processes to reduce the likelihood of problems occurring, for example investigate purpose-built vaccine refrigerator options. 	<ul style="list-style-type: none"> Detail here the equipment required to implement the strategy and process, for example purpose-built vaccine refrigerator. 	<ul style="list-style-type: none"> Detail here who is responsible for what to ensure the strategy and process are implemented, for example the Practice Manager is to contact vaccine refrigerator manufacturers for product information sheets.

What types of strategies can be implemented to reduce the impact of the problem should it occur?

This section focuses on reviewing and managing the causes of the problem with the objective to minimise the effect of the problem. For example, a practice likely to experience power surges from storms, may install a surge protector to reduce the impact of the power surge on the refrigerator.

Strategy and process to follow	Equipment required	Staff roles and responsibilities
<ul style="list-style-type: none"> Detail here the strategy and associated processes to reduce the likelihood of the problem occurring, for example purchase and install a surge protector. 	<ul style="list-style-type: none"> Detail here the equipment required to implement the strategy and process, for example surge protector. 	<ul style="list-style-type: none"> Detail here who is responsible for what to ensure the strategy and process are implemented, for example Practice Manager to contact an electrician.

What types of strategies can be implemented to manage the problem if it occurred?

This section focuses on how the actual problem should be handled. This provides the practice with an opportunity to develop processes to manage problems which can then be transferred to their practice policy and procedure manual. Practices with documented processes already in place, can refer to these to avoid the need to rewrite the procedure.

Strategy and process to follow	Equipment required	Staff roles and responsibilities
<ul style="list-style-type: none"> Detail here the strategy and associated processes to manage the problem if it occurred, for example managing a refrigerator breakdown. 	<ul style="list-style-type: none"> Detail here the equipment required to implement the strategy and process, for example portable cooler, ice packs, insulating material, and external thermometer. 	<ul style="list-style-type: none"> Detail here who is responsible for what to ensure the strategy and process are implemented, for example Practice Nurse on duty to condition ice packs and pack the cooler.

How have the above strategies been implemented?

- List here what has been actioned to ensure that all of the above strategies are in place and working effectively. For example, your practice/clinic may need to purchase a portable cooler and associated equipment to store the vaccines in the event of a power failure.

How have staff been trained or informed of the above strategies?

- Detail here how staff have either be informed of the above strategies or trained in how to carry out the processes, for example all Practice Nurses trained in packing a portable cooler at monthly meeting.

Any other comments or follow-up required?

- Detail here any other comments or specific actions to be followed-up once all of the above are implemented, for example reviewing management strategies and processes if the problem occurred to ensure that they worked effectively.

Using the template

To help in the application of the template, two scenarios have been developed – each with an example of a completed plan of action.

Scenario 1

A solo practice in Innisfail has a small modified domestic refrigerator with a freezer compartment to store publicly funded and private vaccine. Storm season is fast approaching, and with the memory of Cyclone Larry and the associated devastation in March 2006, Dr Smith wants to have a plan in place to manage vaccines in the event of a natural disaster. Dr Smith, the Practice Manager and the 3 part-time receptionists discuss how this is best to happen at their monthly staff meeting.

Plan of action

Topic: Storms, flooding, cyclones and other natural disasters

Date: 23 February 2007

Plan developed by: Dr Smith, Betty (Practice Manger), Tina, Sam and Jo (Receptionists)

What are the potential problems and causes? (Consider factors both within and outside the direct control of the practice)

Problems	Causes
<ul style="list-style-type: none">• Loss of vaccine.• Damage to the vaccine refrigerator.• Evacuation of premises.	<ul style="list-style-type: none">• Power failure.• Power surges.• Storms, floods, cyclones and other natural disasters.

What types of strategies can be implemented to reduce the likelihood of the problem occurring?

Strategy and process to follow	Equipment required	Staff roles and responsibilities
<ul style="list-style-type: none">• Purchase and install a surge protector.	<ul style="list-style-type: none">• Surge protector.	<ul style="list-style-type: none">• Practice Manager to contact electrician re appropriate surge protector.

What types of strategies can be implemented to reduce the impact of the problem should it occur?

Strategy and process to follow	Equipment required	Staff roles and responsibilities
<ul style="list-style-type: none"> • Insure refrigerator for damage resulting from power surge or natural disaster such as flooding. • Insure both publicly funded and private vaccines due to loss caused by power failure or immediate evacuation of premises caused by a natural disaster. 	<ul style="list-style-type: none"> • Nil. 	<ul style="list-style-type: none"> • Dr Smith to contact insurer about covering vaccine loss and equipment damage.

What types of strategies can be implemented to manage the problem if it occurs?

Strategy and process to follow	Equipment required	Staff roles and responsibilities
<ul style="list-style-type: none"> • Contact the nearest hospital pharmacy <u>before storm season</u> to request permission to store vaccine in their facilities in the event of a natural disaster. • Remove ice packs/gel packs from freezer and condition (refer to practice policy and procedure manual for process on conditioning ice packs/gel packs). • If insufficient time to condition ice packs/gel packs, use additional insulating material to ensure vaccine doesn't freeze. • Contact hospital pharmacy to advise that Dr Smith will be bringing vaccines to the facility for safe storage and monitoring until it is safe to return to the premises. • Pack portable cooler with conditioned ice packs/gel packs, vaccine, insulating material, external thermometer (refer to practice policy and procedure manual for process on packing a portable cooler). • Monitor portable cooler after packing and every 15 minutes for the first two hours (refer to practice policy and procedure manual for process on monitoring a cooler). • If safe to do so, transport vaccine to hospital pharmacy. 	<ul style="list-style-type: none"> • Portable cooler that can hold all practice vaccine stock. • Frozen ice packs/gel packs. • Insulating material. • External minimum and maximum thermometer with probe. 	<ul style="list-style-type: none"> • Dr Smith to contact the Senior Pharmacist at local hospital to arrange agreement to store vaccine in their facilities. • Receptionist on duty to condition ice packs/gel packs, pack the portable cooler and contact hospital pharmacy. • Dr Smith to transport the vaccine to the hospital.

How have the above strategies been implemented?

- Informal agreement made with hospital pharmacy in the event of a natural disaster (spoke with Mary, Senior Pharmacist on 13 March 2007).
- Purchased ice packs and placed in freezer.
- Purchased 30 litre portable cooler and insulating materials (stored in treatment room next to the refrigerator).
- Queensland Health supplied minimum/maximum thermometer for portable cooler.
- Plan incorporated into practice policy and procedure manual.

How have staff been trained or informed of the above strategies?

- All staff attended planning meeting.
- Practice Manager and Receptionists completed trial run of conditioning ice packs and packing the portable cooler according to procedures in practice policy and procedure manual on 20 March 2007.

Any other comments or follow-up required?

- Review above strategies and processes if a natural disaster occurs to ensure that they worked effectively.

Scenario 2

A busy 10 doctor practice in Brisbane city specialises in travel medicine and corporate medicine. To hold the significant quantity of travel vaccine and flu vaccine, they have a large purpose-built vaccine refrigerator with glass doors so that the GPs can easily find the needed vaccine. Over the Christmas/New Year period, the practice is quiet and therefore doesn't stock a large amount of vaccine and the GPs and Practice Nurses don't need to use the refrigerator as frequently. Sarah, the Senior Practice Nurse, has noted that the refrigerator gets a few degrees cooler during this time and is concerned that it may drop below +2°C. Sarah calls a meeting with the Practice Manager to discuss possible solutions.

Plan of action

Topic: Refrigerator temperature over Christmas/New Year period

Date: 4 April 2007

Plan developed by: Angela (Practice Manager) and Sarah (Senior Practice Nurse)

What are the potential problems and causes? (Consider factors both within and outside the direct control of the practice)

Problems	Causes
<ul style="list-style-type: none"> Refrigerator significantly decreases in temperature over the Christmas/New Year period. If the vaccine refrigerator drops below +2°C, a cold chain incident has occurred and must be reported. 	<ul style="list-style-type: none"> Small amount of vaccine stock in the refrigerator. GPs and Practice Nurses not accessing the refrigerator as frequently.

What types of strategies can be implemented to prevent or reduce the likelihood of the problem occurring?

Strategy and process to follow	Equipment required	Staff roles and responsibilities
<ul style="list-style-type: none"> Contact the purpose-built vaccine refrigerator manufacturer to query if cold mass needs to be added if there is a small quantity of vaccine being stored. If yes, add cooled water bottles or refrigerated ice packs/gel packs to the empty spaces in the refrigerator. If no, inform the manufacturer of the drop in temperature and request advice to ensure that it maintains the +2°C to +8°C temperature range. This may mean changing the programmed refrigerator temperature. After implementing changes, monitor the refrigerator regularly to ensure that the temperature maintains the safe range of +2°C to +8°C. 	<ul style="list-style-type: none"> Cooled water bottles or refrigerated ice packs/gel packs. 	<ul style="list-style-type: none"> Practice Manager to contact purpose-built vaccine refrigerator manufacturer. Practice Nurse to make changes to the refrigerator and monitor the temperature closely.

What types of strategies can be implemented to reduce the impact of the problem should it occur?

Strategy and process to follow	Equipment required	Staff roles and responsibilities
<ul style="list-style-type: none"> Nil. 	<ul style="list-style-type: none"> Nil. 	<ul style="list-style-type: none"> Nil.

What types of strategies can be implemented to manage the problem if it occurs?

Strategy and process to follow	Equipment required	Staff roles and responsibilities
<ul style="list-style-type: none">If a cold chain incident has occurred, refer to the practice policy and procedure manual for the process on managing a cold chain breach.	<ul style="list-style-type: none">Nil.	<ul style="list-style-type: none">Practice Nurse on duty is responsible for managing and reporting a cold chain breach.

How have the above strategies been implemented?

- Purpose-built vaccine refrigerator manufacturer contacted and they advised that cold mass can be added.
- Sarah collected empty 1 litre soft drink bottles, cleaned and labelled them “do not drink”, and filled with water. The water bottles were cooled in the kitchen refrigerator before placed in the vaccine refrigerator.
- Plan incorporated into practice policy and procedure manual.

How have staff been trained or informed of the above strategies?

- All GPs and Practice Nurses requested to monitor refrigerator temperature closely to make sure that it doesn't drop below +2°C. If it does, they are to inform the Senior Practice Nurse or Practice Manager immediately.
- All Practice Nurses have been trained in the process of managing a cold chain breach.

Any other comments or follow-up required?

- Cold mass to be removed when practice resumes busy period.

Step 4: Managing the problem if it occurs

In the event that the problem occurs, the practice/clinic should implement the devised plan of action and/or other appropriate policies and procedures that are in place.

Management strategies for common problems that practices/clinic may experience are provided in the following sections:

Section 3: [Power supply issues](#)

- Managing [short-term power supply issues](#) in a purpose-built vaccine refrigerator and modified domestic refrigerator
- Managing [long-term power supply issues](#)
- [Transferring vaccine to another facility](#)

Section 4: [Portable coolers](#)

- [About portable coolers](#)
- [Monitoring a cooler](#)
- [Equipment for a portable cooler](#)

- [Packing a portable cooler](#)
- [Conditioning ice packs/gel packs](#)

Section 5: [Cold chain breaches](#)

- [About cold chain breaches](#)
- [Action in the event of a cold chain breach](#)

A template policy and procedure document for vaccine management is available on the QDGP website at www.qdgp.org.au/vaccinemanagement.



See pages 26-27, 39-40 and 44-45

Step 5: Quality review process after cold chain problems occurred

In the instance that a cold chain problem occurs, it is important to review what happened and consider whether or not things could have or should have happened differently. A quality review process involves meeting with all members of the team to consider what happened and why it happened. Sometimes it is easier to lay blame on one particular person for the problem occurring, so it is important that the system be the focus of scrutiny and not the staff.

The “plan of action template for cold chain risk management” should be used as part of the quality review process, with consideration given to:

- What happened? (the problem)
- Why it happened? (the cause)
- How was it handled? (what process was followed, if any)
- How could it have been handled better? (strategy for managing the problem)
- What needs to be done to fix it? (what needs to happen to correct the problem)
- What can be done to prevent it or reduce the likelihood of it happening again? (strategy to prevent or minimise the impact of the problem)

Actions should then be implemented and staff trained or informed of the outcomes. It then recommended that the completed “plan of action” be incorporated into the practice policy and procedure documents for future reference.

Reflective activities

1. What types of problems is your practice/clinic most likely to experience?

2. Have you developed strategies to prevent, reduce the impact or manage each of the problems?

Yes No

If no, pick one of the problems you identified and develop a plan of action using the provided template.

Plan of action

Topic: _____

Date: _____

Plan developed by: _____

What are the potential problems and causes? (Consider factors both within and outside the direct control of the practice)

Problems	Causes

What types of strategies can be implemented to prevent or reduce the likelihood of the problem occurring?

Process to follow	Equipment required	Staff roles and responsibilities

What types of strategies can be implemented to reduce the impact of the problem should it occur?

Process to follow	Equipment required	Staff roles and responsibilities

What types of strategies can be implemented to manage the problem if it occurs?

Process to follow	Equipment required	Staff roles and responsibilities

How have the above strategies been implemented?

How have staff been trained or informed of the above strategies?

Any other comments or follow-up required?

3. POWER SUPPLY ISSUES

Learning objective/s

By the end of this section, participants should have an increase in knowledge and understanding about managing short-term and long-term power failures, appreciate the implications associated with power failures, and have an increase in knowledge regarding transferring vaccines to another facility.

About power supply issues

As described in [Step 1: Identifying the problem, reasons and possible solutions](#) detailed in Section 2, power supply issues and natural disasters are considered external factors as they are not within the direct control of the practice/clinic.

Power supply issues can take the form of power failure, power surges, brownouts and load shedding, where as natural disasters can take the form of floods, storms, cyclones, bushfires, heat waves and extreme cold weather. Both of these issues may result in short-term and long-term loss of power and both can cause loss of vaccine and damage to equipment. It is therefore essential that strategies are in place to safely and effectively maintain the cold chain in such circumstances during and outside of business hours.

Managing short-term power supply issues

(less than 6-8 hours or if the vaccines are able to be stored within the safe temperature range of between +2°C and +8°C)

Managing a power failure in a purpose-built vaccine refrigerator

Purpose-built vaccine refrigerators (particularly those with glass doors) may lose their chill quicker than a domestic refrigerator, often as a little as 20 minutes. Vaccine service providers should know how long their brand of purpose-built vaccine refrigerator will hold a temperature of +2°C and +8°C in the event of a power failure by contacting the refrigerator's manufacturer.

The practice/clinic should follow this procedure in the event of a power failure during business hours:

1. Investigate the reason for the power failure:
 - If it is a power cut, phone the utility company to ascertain approximately how long the power will be interrupted.
 - If the practice/clinic is part of a shopping centre or other complex, ensure that management is aware of the need to keep the power cut to a minimum.
 - If a safety switch (Residual Current Device) has tripped, reset it. If it trips again, contact an electrician.
2. Frequently monitor the temperature of the refrigerator.
3. Some purpose-built vaccine fridges warm quickly during a power failure. If the area is prone to power failures, consider adding cooled water bottles or refrigerated ice packs/gel packs to the vaccine refrigerator to help keep it cool during these periods.
4. Always have an alternative means of vaccine storage available such as a cooler, external thermometer, frozen ice packs/gel packs and insulating material.
5. If the vaccines are transferred to a portable cooler, continue to monitor the temperature of the vaccines by placing the thermometer probe inside a vaccine box inside the cooler. It is recommended that monitoring occurs every 15 minutes for the first 2 hours as freezing is most likely to occur during this period. Following the 2 hour period, monitor the cooler every hour. For further information, refer to [Packing a portable cooler](#).
6. Longer term power supply issues may require the practice/clinic to transport vaccines to another facility which has a secure power supply. For further information, refer to [Managing long-term power supply issues](#).

IMPORTANT: Depending on the circumstances of a power failure, ice packs/gel packs may not be given adequate conditioning time prior to packing a portable cooler. In these instances, use additional insulating material to protect the vaccine and monitor the portable cooler closely.

STRIVE FOR **5** See pages 26-27

Managing a power failure in a modified domestic refrigerator

In our practice/clinic, we follow this procedure in the event of a power failure during business hours:

1. Investigate the reason for the power failure:
 - If it is a power cut, phone the utility company to ascertain approximately how long the power will be interrupted.
 - If the practice/clinic is part of a shopping centre or other complex, ensure that management is aware of the need to keep the power cut to a minimum.
 - If a safety switch (Residual Current Device) has tripped, reset it. If it trips again, contact an electrician.

2. Frequently monitor the temperature of the refrigerator.
3. During a power failure of **4 hours or less**, the refrigerator door should be kept closed.
4. For power failures of **more than 4 hours**, or if the refrigerator temperature reaches 14°C, transfer the vaccines to a portable cooler.
5. Always have an alternative means of vaccine storage available such as a cooler, external thermometer, frozen ice packs/gel packs and insulating material.
6. If the vaccines are transferred to a portable cooler, continue to monitor the temperature of the vaccines by placing a thermometer probe inside a vaccine box inside the cooler. It is recommended that monitoring occurs every 15 minutes for the first 2 hours as freezing is most likely to occur during this period. Following the 2 hour period, monitor the cooler every hour. For further information, refer to [Packing a portable cooler](#).
7. Longer term power supply issues may require the practice/clinic to transport vaccines to another facility which has a secure power supply. For further information, refer to [Managing long-term power supply issues](#).

IMPORTANT: Depending on the circumstances of a power failure, ice packs/gel packs may not be given adequate conditioning time prior to packing a portable cooler. In these instances, use additional insulating material to protect the vaccine and monitor the portable cooler closely.

STRIVE¹⁰⁵ See pages 26-27

Managing long-term power supply issues

(more than 6-8 hours or if the vaccines are unable to be stored within the safe temperature range of between +2°C and +8°C)

Some practices/clinics are located in an area where natural disasters are likely to occur, for example Northern Queensland is likely to experience cyclones during the storm season which is during the months of October through to March. This has the potential to impact on power supply or may require the practice/clinic to evacuate the premises altogether.

Generators

Depending on the likelihood of power loss, it may be convenient and financially viable for a practice/clinic to invest in a generator. Alternatively, practices/clinics may choose to jointly purchase a generator with their local pharmacist or nearby practice/clinic. If this is the case, there must be sufficient room in the vaccine refrigerator to safely store all vaccine.

Some items to consider when choosing a generator¹ include:

- Fuel type (e.g. petrol, diesel, gasoline).
- Electrical output (needs to be sufficient to run the refrigerator).
- Safety switch (to protect from electrocution – can add if not built-in).
- Ventilation requirements.
- Sound level.
- Cost.

(¹Reference: Explore Oz, <http://www.exploroz.com/Vehicle/Electrics/Generators.aspx>)

The Queensland Health: Environmental Health Resources webpage offers a safety sheet for consumers when using a generator during a power failure called [Disaster Management – Safe Use of Generators in Blackouts](#).

If a generator is not available, practices/clinics will need to follow instructions for [managing a power failure](#) which may include transferring vaccines to a [portable cooler](#). It may also mean transporting vaccines to a location with a secure source of power and suitable facilities for storing and monitoring vaccine.

Transferring vaccine to another facility

If vaccine needs to be transferred to another facility to ensure safe storage due to extended power failures or if the premises need to be evacuated due to a natural disaster, the practice/clinic needs to consider the following details in selecting a suitable facility:

- Is it a secure location?
- Is the vaccine only accessible to authorised persons as per State/Territory legislation?
- Is there an ongoing supply of power?
- Does it have adequate vaccine storage facilities?
- Are the vaccines stored within the +2°C and +8°C temperature range?
- Are the vaccines monitored regularly and recorded at least daily?

It is therefore not appropriate to transfer vaccines to the local fruit and vegetable cold room because of the risk of freezing and other factors identified above.

In most instances, practices/clinics prefer to transfer their vaccines to the local hospital pharmacy as it meets all of the above principles. It is important, however, that the practice/clinic liaises and develops an agreement (whether formal or informal) with the facility in advance so that they are prepared to safely and effectively store your practice/clinic vaccines.

The local Population Health Unit is able to assist your practice/clinic in planning for storage of vaccines in the event of a power failure or natural disaster. To locate their contact details, visit www.qdgp.org.au/vaccinemanagement.

Principles of transporting vaccines

If transferring vaccine to another facility, the practice/clinic should follow these principles for transporting vaccines:

1. Choose an adequately sized portable cooler or specialised vaccine cold box according to length of storage and transport time and type of conditions.
2. Ensure sufficient stock of ice packs/gel packs according to:
 - ambient temperature,
 - type and size of cooler,
 - number of vaccines,
 - cooler capacity, and
 - size and type of ice packs/gel packs.
3. [Condition the ice packs/gel packs.](#)
4. [Pack the portable cooler](#) according to cold chain requirements, immediately prior to transporting the vaccine.
5. [Monitor the temperature of the vaccines.](#)
6. Ensure the contents of the cooler are packed securely so that they cannot move around during transport.

STRIVE FOR **5** See pages 24, 28-31, 35

Reflective activities

7. Describe the procedure your practice/clinic has in place to manage a short-term power failure:

During business hours

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Outside of business hours

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

8. What factors need to be considered when choosing suitable facility to store vaccine in the event of a long-term power failure or natural disaster?

- Must be a secure location.

- Must only be accessible to authorised persons as per State/Territory legislation.
- Must have an ongoing supply of power.
- Must have adequate vaccine storage facilities.
- Must be able to store vaccine with the +2°C and +8°C temperature range.
- Must be monitored regularly and recorded at least daily.

4. PORTABLE COOLERS

Learning objective/s

By the end of this section, participants should have an increase in knowledge and understanding about portable coolers and type of equipment required, have the ability to appropriately pack a portable cooler, have the ability to effectively condition ice packs/gel packs, and have an increase in knowledge about the principles of transporting vaccines.

About portable coolers

A cooler, also known by names such as Esky™ or Willow™, is a solid-walled insulated container with a tight fitting lid with the temperature inside maintained by ice packs or gel packs.

Although generally associated with outreach immunisation clinics, practices/clinics will generally need a portable cooler in the following circumstances:

- Transport of vaccines.
- Defrosting a domestic vaccine refrigerator.
- During a power failure.
- Vaccine refrigerator breakdown.
- Vaccine refrigerator not maintaining the correct temperatures of between +2°C and +8°C.
- Other circumstances requiring the practice/clinic to remove vaccines from the refrigerator (e.g. cyclone).

It is important to note that freezing happens very easily in all coolers, usually in the first 2 hours after packing. A practice/clinic should therefore select a cooler that is large enough to store their vaccine as well as sufficient insulating material to ensure that the vaccine is protected. It is encouraged that practices/clinics experiment with their cooler to maintain a stable temperature which includes knowing how many ice packs/gel packs are required.

IMPORTANT: In the event of a natural disaster such as a cyclone or depending on the circumstances of a power failure, ice packs/gel packs may not be given adequate conditioning time prior to packing a portable cooler. In these instances, use additional insulating material to protect the vaccine and monitor the portable cooler closely.

STRIVE See pages 28-31

Monitoring a cooler

The practice/clinic should check the temperature of the cooler:

- after packing,
- every 15 minutes for the first 2 hours, and then every hour following the 2 hour period (freezing is most likely to occur within the first 2 hours after packing),
- regularly but at least hourly,
- prior to administering vaccine, and
- before returning vaccine to the vaccine refrigerator.

STRIVE15 See pages 14 and 29

Equipment for a portable cooler

The practice/clinic should have the following equipment available to pack a portable cooler:

- Cooler (such as an Esky™ or Willow™) at a size that meets the practice/clinic needs. It is recommended that a cooler for storing vaccines be a minimum size of 10 litres.
- Ice packs and/or gel packs.
- Insulating material such as polystyrene sheets (width 12-20mm), polystyrene chips, plastic bubble-wrap and/or shredded paper.
- Minimum/maximum thermometer with probe.

NOTE: Practices/clinics with a purpose-built vaccine refrigerator will need to add ice packs/gel packs to the freezer of their domestic refrigerator which stocks lunches, refreshments, etc.

STRIVE15 See pages 28-31

Packing a portable cooler

The practice/clinic should follow this procedure to pack a portable cooler:

1. Chill the inside of the cooler prior to use by placing ice packs/gel packs in it for a few hours.
2. Place insulating material at the bottom of the container.
3. Use a minimum/maximum thermometer to monitor the temperature inside the cooler. Place the probe placed inside an empty vaccine box with product information leaflet.
4. Surround the vaccines with more insulating material.
5. If using a small cooler, place the conditioned ice packs/gel packs on top, close and seal the lid of the cooler.
6. If using a large portable cooler, place conditioned ice packs/gel packs around the sides of the cooler as well as on top. Experiment to find the correct combination for the practice/clinic needs.
7. Ensure vaccine is not in direct contact with the ice packs/gel packs to minimise risk of freezing.

STRIVE15 See pages 28-31

Conditioning ice packs/gel packs

Conditioning means leaving the ice packs/gel packs at room temperature to allow the ice or gel at the core to rise to about 0°C. This is also known as 'sweating'.

Ice packs/gel packs must be conditioned correctly before use as the risk of freezing vaccines increases if the ice packs/gel packs are not conditioned correctly. It is noted however that in the event of a natural disaster such as a cyclone or depending on the circumstances of a power failure, ice packs/gel packs may not be given adequate conditioning time prior to packing a portable cooler. In these instances, use additional insulating material to protect the vaccine and monitor the portable cooler closely.

The practice/clinic should follow this procedure for conditioning ice packs/gel packs:

1. Remove ice packs/gel packs from the freezer.
2. Lay out in a single row on their sides (where possible).
3. Leave a 5cm space around each ice pack/gel pack to allow maximum air exposure to reduce conditioning time.
4. Conditioning time depends on the ambient temperature, type of ice pack/gel pack and size/weight of ice pack/gel pack.
5. Always follow the manufacturer's instructions on correct conditioning of gel packs.

STRIVE₁₀₀₅ See pages 32-34

Reflective activities

3. When is your practice/clinic most likely to need a portable cooler?

4. Does your practice/clinic have the following items in the event that you need to transfer your vaccine to a portable cooler?

- Cooler (such as an Esky™ or Willow™) at a size that meets the practice/clinic needs.
- Frozen ice packs and/or gel packs.
- Insulating material such as polystyrene sheets (width 12-20mm), polystyrene chips, plastic bubble-wrap and/or shredded paper.
- Minimum/maximum thermometer with probe.
- Procedure to correctly pack, transport and monitor vaccine in a portable cooler.

If yes, detail here the exact type of equipment your practice/clinic has available.

- Type and size of cooler _____
- Type and quantity of ice packs/gel packs _____
- Type of insulating material _____
- Minimum/maximum thermometer with probe _____

Where is the equipment and procedure located?

Equipment: _____

Procedure: _____

Are staff trained in how to pack a portable cooler?

Yes No

5. Have you experimented with packing your portable cooler? This is to ensure that your practice/clinic is able to fit stored vaccine and that it maintains a stable temperature.

Yes No

6. When should the temperature of the portable cooler be checked?

- After packing
- Every 15 minutes for the first 2 hours, and then every hour following the 2 hour period
- Regularly but at least hourly
- Prior to administering vaccine
- Before returning vaccine to the vaccine refrigerator

5. COLD CHAIN BREACHES

Learning objective/s

By the end of this section, participants should have an increase in knowledge and understanding about the seriousness of cold chain breaches, and have the ability to effectively action a cold chain breach.

About cold chain breaches

According to the [National Vaccine Storage Guidelines: Strive for Five](#), a cold chain breach is when vaccine storage temperatures have been outside the recommended range of +2°C and +8°C. This does not however include temperature deviations or excursions up to +12°C lasting no longer than 15 minutes when stocktaking or restocking.

Cold chain breaches left unidentified and untreated can have serious implications – especially when it involves informing people that they or their child may have received an ineffective vaccine and will require revaccination.

STRIVE5 See pages iii and 26-27

Action in the event of a cold chain breach

The practice/clinic should follow this procedure in the event of a cold chain breach:

1. Isolate the vaccines immediately to prevent further use (e.g. sign on the refrigerator door) and notify relevant staff.
2. Keep vaccines refrigerated between +2°C and +8°C.
3. Contact the Queensland Health Immunisation Program on **3234 1500** during business hours as soon as possible to inform them of the breach and to seek advice.
4. Have important details on hand including:
 - the vaccine service provider number,
 - date of the breach,
 - the minimum and maximum temperature reading,
 - when the thermometer was last reset,
 - how long you think the temperature was outside +2°C and +8°C, and
 - what you think was the cause of the cold chain breach.
5. Do not discard any vaccine unless advised by the Queensland Health Immunisation Program.
6. Take active steps to correct the problem and prevent the problem from recurring.
7. For privately purchased vaccines, contact the manufacturer for advice.
8. Record notes on the temperature log or chart regarding what happened and how the problem was corrected.

STRIVE5 See pages 26-27

Reflective activities

9. List 5 possible causes of a cold chain breach.

- _____
- _____
- _____
- _____
- _____

10. Has your practice/clinic experienced a cold chain breach in the past?

Yes No

If yes, answer the following questions:

- What happened? _____
- Why did it happen? _____
- How was it handled? _____

-
- How could it have been handled better? _____

-
- What measures has your practice/clinic implemented to make sure it doesn't happen again? _____

If no, consider an experience which may have been a 'close call' – where you identified a problem before it actually occurred – and answer the following questions:

- What was the problem? _____

-
- How was it identified? _____

-
- What measures has your practice/clinic implemented to make sure it doesn't happen again? _____

Congratulations on completing Education Module 2: Cold chain risk management!

For answers to the reflective activities or for support in implementing the recommendations in the [National Vaccine Storage Guidelines: Strive for Five](#), please contact your local Division of General Practice or Population Health Unit. To locate their contact details, visit www.qdgp.org.au/vaccinemanagement.

There are also two more Education Modules available for you to complete: **Education Module 1: Introduction to vaccine management** and **Education Module 3: Data management**. Both are both available on www.qdgp.org.au/vaccinemanagement.