

Vaccine Protection Options to Consider for Power Outages and Your **Emergency Plan**

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VACCINE PROTECTION IS MORE IMPORTANT THAN EVER.

If your vaccines fall out of their recommended temperature range, they could lose their effectiveness—costing you money and time because of a potential loss of vaccines. The added administration and disruption to an office as a result of a cold-chain break is significant and ranges from documentation of the excursion, to rescheduling of immunization appointments, to replacement of vaccines.

This resource has been developed to provide insights into options to consider when developing an effective emergency plan for protecting refrigerated and frozen vaccines in storage. Whether you're writing your plan for the first time, conducting an annual review, or reevaluating your vaccine management procedures, you'll want to know the full scope of costs and exactly what options will best suit your needs.

If you are in the midst of setting up a new practice, review the vaccine storage and protection options outlined here prior to purchasing your vaccine refrigerator, freezer, or emergency preparedness equipment to ensure that you are aware of effective vaccine storage and protection solutions that will save you money and time.

This guide will walk you through the basics of setting up an emergency plan and lay out the paths medical professionals can take to keep vaccines safe through the many types of emergencies and scenarios that can result in cold-chain breaks.



CHAPTER 1:

What Is Included in a Vaccine Emergency Plan?

To keep vaccines from losing their potency, it's crucial to keep the **cold chain** intact at all times. Essentially, this means keeping vaccines in their safe temperature range through every moment of the vaccine's journey—from creation to administration, whether it's business as usual or an emergency.

**The recommended storage temperature is 2-8°C (36-46°F) for refrigerated vaccines and -50°C to -15°C (-58°F to +5°F) for frozen vaccines.*

IMPORTANCE OF PROTECTING AGAINST COLD-CHAIN BREAKS DURING EMERGENCIES

When it comes to keeping patients safe with effective immunization, it's imperative to take proactive steps to avoid temperature excursions that can reduce the effectiveness of or destroy valuable vaccines. Unfortunately, during emergencies, the likelihood of temperature excursions because of power outages and other challenges increases.

A well-thought-out vaccine emergency plan will reduce the risk of that happening.

Note: Vaccine Emergency Plans are also often referred to by a number of different names. “Emergency vaccine response plan,” “contingency plan,” and “emergency vaccine management plan” are a few examples.

STANDARD COMPONENTS OF A VACCINE EMERGENCY PLAN

Refer to your jurisdiction or vaccine program’s guidance on the elements of an emergency plan if available. Otherwise, other resources to reference include:

- [*AAP Immunization Resources Storage and Handling Series Disaster Planning*](#)
- [*CDC Vaccine Storage and Handling Toolkit*](#)



When you're setting up an emergency plan to keep the cold chain intact, the following components are generally included:

- 1. Designate key staff and responsibilities and outline training requirements.**
- 2. Compose emergency contact and resource lists**—Include a comprehensive list of all possible players and whom to contact in the event of an emergency. Also list resources that would be needed in an emergency.
- 3. Identify emergency supplies to keep in stock**—Your emergency supplies will depend on your needs. Whether your plan is to move vaccines, store them in a secure TempArmour refrigerator, or incorporate backup power, it's important to have appropriate supplies identified before events occur.
- 4. Identify and set up an alternative vaccine storage facility**—To avoid threats to your physical location, you should have a backup vaccine storage facility identified in your plan, even if vaccine protection equipment is in place (e.g., a TempArmour Refrigerator and Freezer that can weather power outages, backup power, and so on).
- 5. Regularly monitor and record vaccine temperatures**—[The Centers for Disease Control \(CDC\)](#) recommends using a digital data logger (DDL) to keep track of vaccine temperatures. Rather than only measuring temperatures in your unit, data loggers also continuously record the temperature of the vaccines over time.
- 6. Include a protocol on what steps to take if vaccine temperatures go out of range.**
- 7. Ensure that the vaccine emergency plan is prominently posted.**
- 8. Emergency equipment**—Map out all of the emergency equipment you have in place (e.g., TempArmour Refrigerator and Freezer, battery backup power, generators, vaccine carriers, or any other emergency equipment that will be used to keep vaccines safe).





CHAPTER 2:

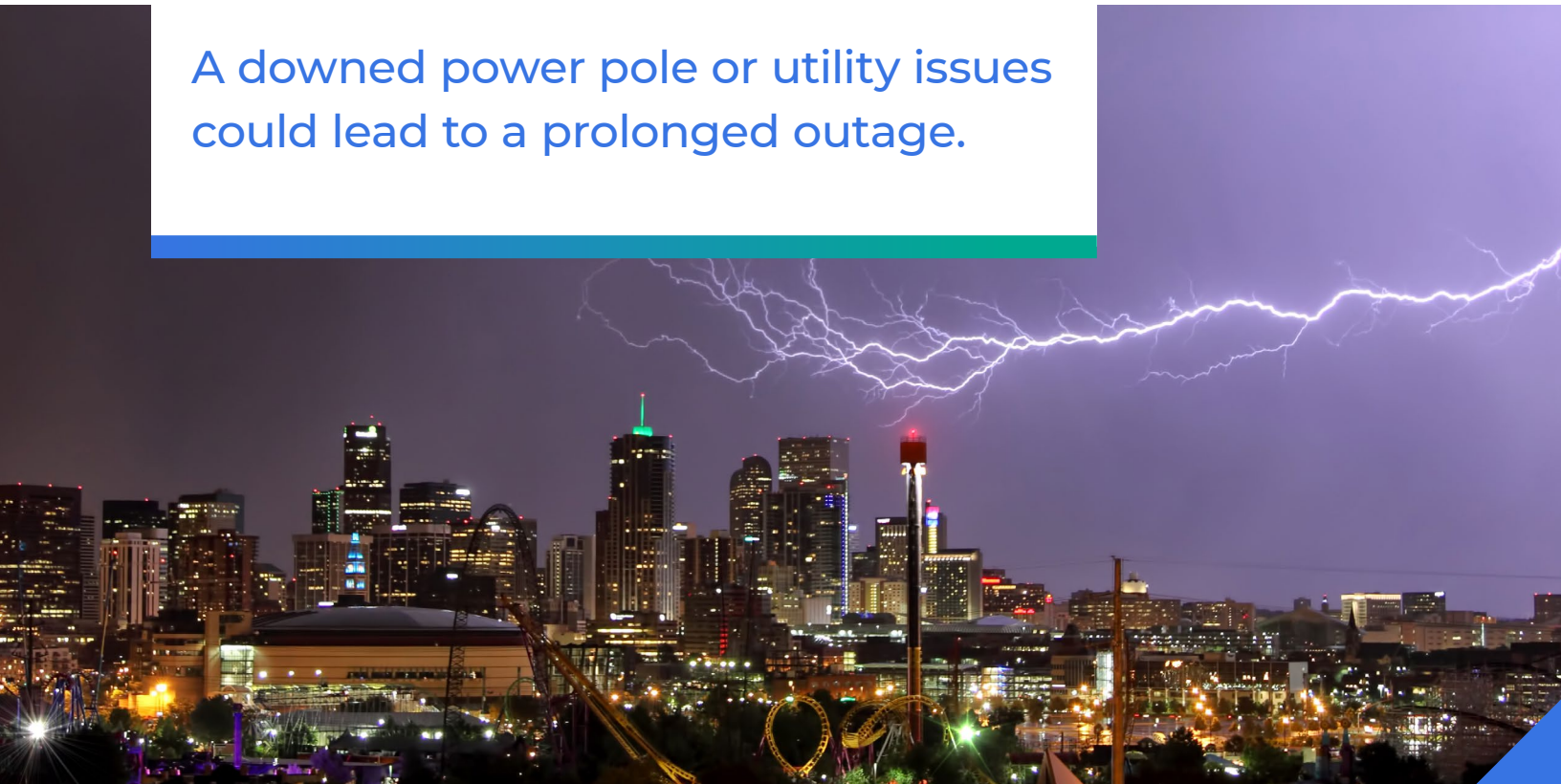
Equipment Options for Protecting Vaccines During Emergencies

When disaster strikes, it's too late to start planning. But by assessing and planning for emergencies in advance, you'll be much better positioned to ensure your vaccines' safety.

So, what emergencies should you prepare for? Here's a list of scenarios to consider that may cause power outages or damage:

- 1. Threats with advance warning**—These are events that are somewhat expected, but there is some time available to react. This could include natural events such as slow-moving storms or hurricanes.
- 2. Threats without advance warning**—These events are not expected and there is no time to react. This type of threat includes earthquakes, tornadoes, quickly moving thunderstorms, and so on.
- 3. Brownouts**—Some remote and other locations are susceptible to unreliable power and brownouts that can affect the operation of electronics including vaccine refrigerators and freezers. In some cases, rolling brownouts can occur due to the electrical supplier mitigating electrical-supply or distribution issues.
- 4. Planned power outages**—At times, building maintenance, electrical system updates, or renovations will call for planned power outages. These occasions often happen after hours, but it's crucial to make sure that vaccines don't spoil during these outages.

A downed power pole or utility issues could lead to a prolonged outage.





5. **Unexpected routine power outages**—The average routine power outage lasts less than three hours (local power outages because of glitches in the system, car or construction mishaps impacting infrastructure, and so on are often resolved relatively quickly). However a downed power pole or utility issues could lead to a prolonged outage.
6. **Post-storm outages**—After a large storm or weather system, power can be knocked offline, with outages that can last for days without access to the area for vaccine retrieval.
7. **Appliance failure/accidental unplugging**—Although not caused by emergencies, these scenarios are common causes of vaccine loss.
8. **High risk of physical damage to location**—There are emergencies with a high risk of physical damage to your premises/vaccines beyond the impacts of power outages. These include floods, fires, or other events that would require moving vaccines from your refrigerator to a safer location.

**Wondering what options will protect you for all the above scenarios?
There are a few solutions to consider.**

WHAT ARE YOUR EMERGENCY PLAN OPTIONS?

There are three main options to consider for protecting vaccines in the event of an emergency:

- **Use a TempArmour® Phase Change Material (PCM) Vaccine Refrigerator and Freezer**—These [advanced-technology vaccine refrigerators and freezers](#) maintain their temperature range for several days without power or the assistance of backup power sources. Essentially, this means that your vaccines are protected even if you lose power at a facility for days.
- **Move vaccines**—When a potential threat to your vaccines is imminent, you may decide to move vaccines to a secondary location with a generator or a [more secure vaccine storage unit](#). Remember: As you're moving vaccines, you must keep the vaccines in temperature range. A reliable option is to use a purpose-built qualified container and pack out for vaccines, such as the TempArmour Vaccine Carrier, which can keep vaccines in their proper temperature range for up to three days without requiring a power source. One advantage of the TempArmour PCM cooler is that there are no electronic parts that can break down or malfunction.

Portable vaccine refrigerators and freezers are another option for transporting vaccines. A standard hard-sided cooler with ice packs can also be used to move vaccines in the event of an emergency but is not recommended by some jurisdictions (as with all vaccine management, follow any vaccine program requirements applicable to you). This [CDC guide](#) provides an outline for how to properly pack a standard cooler using ice packs. Note: a standard cooler does not stay in temperature range as long as other options and may have increased risk to vaccines due to ice packs if not packed properly.

- **Install backup power**—This option includes purchasing a [battery backup power system](#) or a generator for your location. Backup power options feed power to your regular vaccine refrigerator and freezer when the power goes out.

The EMERGENCY PREPAREDNESS: Evaluation Tool for Comparing Vaccine Protection Options is a handy matrix to help you evaluate potential threats to your vaccines and identify emergency preparedness solutions.

EMERGENCY PREPAREDNESS: Evaluation Tool for Comparing Vaccine Protection Options



Use the matrix below to compare your vaccine protection options when updating your Emergency Response Plan for storms, power outages, and other threats to your vaccine supply. You may determine that one or a combination of approaches is most appropriate for your specific location and circumstances.*

	IN-PLACE OPTIONS				OPTIONS TO MOVE VACCINES		
	TempArmour® PCM Vaccine Refrigerator	Battery Backup Power	Automatic Generator	Standard Generator	Pre-qualified Container & Packout	Standard Cooler & Ice Packs	Portable Fridge/ Freezer
Typical Cost (USD)	No backup power required; Lowest Cost	\$1600 – \$5000+	\$10,000+	\$500 – \$3,000+	\$750+ PCM Vaccine Carrier	Up to \$200 Lowest Transport Cost	\$750+
POTENTIAL THREATS TO VACCINE STORAGE	Threat with advance warning (e.g., hurricane / slow-moving storm)	✓	▲	✓	▲	✓	✓
	No advance warning (e.g., thunderstorm, tornado, earthquake)	✓	▲	✓	▲	▲	▲
	Brownouts	✓	✓	✓	✗	✗	✗
	Planned power outages	✓	▲	✓	✓	✓	✓
	Unexpected routine power outage	✓	▲	✓	▲	▲	▲
	Post-storm (e.g., extended power outage potential / no access)	Option: Add battery backup for longer protection	▲	✓	✗	✓	✓
	High risk of physical damage to location (e.g., wildfire, flood)	✗ MOVE VACCINES				✓	✓

✓ Best Solution ✓ Viable Solution ▲ Limited option ✗ Least effective

Considerations:

The TempArmour® Vaccine Refrigerator typically maintains its temperature in range for 6 days during a power outage or when its operation has been disrupted. However, many factors can affect temperature holdover time and the number of days maintained in temperature range.

Battery backup power and generators can malfunction and stop working during a power outage. This is not the case for the TempArmour® Refrigerator that maintains its temperature for typically 6 days without actually having to operate.

Vaccine Transport: Our choice for best transport solutions is a PCM Vaccine carrier due to its ease of use and multiple days of vaccine protection without power. Consider weight and manageability of transport options. Multiple smaller carriers that can be easily moved by one person may be preferable.

* TempArmour® Refrigeration does not warrant that this tool include an exhaustive list of potential threats to vaccines in storage and/or emergency preparedness options. The user of this tool agrees that TempArmour® is not responsible for any emergency preparedness choices or path ultimately pursued by the user. With the exception of products sold by TempArmour® Refrigeration, costs provided are estimates, and reader is responsible for undertaking their own price comparisons/research.

TempArmour® Refrigeration specializes in PCM vaccine storage, transport, and backup power options.

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CHAPTER 3:

Understand the Pros and Cons of Each Emergency Option

Setting up a vaccine emergency plan that fits your unique needs is easier when you know what you're up against. As you weigh your emergency plan options, you'll want to walk through each possible emergency scenario. Here are some pros and cons to consider as you decide from among these emergency options:



OPTION 1 – USE A TEMPARMOUR® PCM VACCINE REFRIGERATOR

(They stay in temperature range for several days when the power is out.)

Pros:

- **Peace of mind during emergencies**—Because TempArmour purpose-built vaccine refrigerators keep vaccines safely within their critical temperature range for up to six days during a power outage (typically more than four days for a TempArmour PCM Freezer), medical professionals can focus on other priorities in an emergency.
- **No hidden costs**—TempArmour Vaccine Refrigerators and Freezers provide exceptional temperature stability during everyday use while providing a reliable layer of protection during power outages. They deliver several days of power-failure protection without requiring additional power sources or other added costs.
- **Overall cost savings**—When you [compare the full costs](#) of vaccine storage and emergency vaccine management, advanced TempArmour Vaccine Refrigerators and Freezers emerge as the best investment.
- **Everyday protection**—In addition to being a reliable emergency option, TempArmour PCM vaccine refrigerators virtually eliminate the common causes of everyday vaccine losses. They protect against temperature spikes, freezing, open doors, and other daily mishaps that can negatively impact vaccines.
- **A proven solution**—The [TempArmour Vaccine Refrigerator](#) has been in use in North America since 2012 and is currently being used to protect vaccines in virtually every state in the U.S., as well as every province in Canada. You can find TempArmour units everywhere; from doctor's offices, to large hospital networks, to all levels of government facilities.

Cons:

- **Less familiarity**—Because it's a comparatively new option, there is less awareness of the advantages of this type of technology.



OPTION 2 – MOVE VACCINES



Pros:

- **Familiarity**—Moving vaccines has protected vaccines during emergencies for years. Chances are that your vaccine program is familiar with this emergency approach.

Cons:

- **Employee safety**—Anytime personnel have to travel during storms or emergencies to retrieve vaccines, it adds a layer of risk. That risk extends to both personnel and vaccines and can be compounded if vaccines must be retrieved in the dark because of a power outage.
- **Loss of precious time**—Driving to pick up, pack, and move vaccines all take time. And time tends to be in short supply during emergencies. There may also be unforeseen barriers to access, such as unlocking buildings or making calls to gain access to vaccines during off-hours; or if a short or long-term (e.g., pandemic-related) lockdown is in effect.

Additionally, if the plan is to use traditional coolers with ice packs instead of multi-day [vaccine carriers](#), there will be less time available to implement a plan B if the designated receiving location can no longer receive your vaccines.

- **Designated storage site rejections**—It is not uncommon that when you arrive at an alternative storage site, vaccines in hand, they can't store your vaccines after all. The designated sites may not have the space, or a decision to avoid liability issues has been made in the heat of an emergency.
- **Backup sites can fail**—Generators aren't perfect. In some cases, vaccines are moved to a designated backup site with a generator only for the backup power at the facility to fail and the vaccines to be lost.



OPTION 3 – INSTALL BACKUP POWER



Pros:

- **Familiarity**—Vaccine programs are well acquainted with backup power as an emergency strategy for vaccine protection.
- **Avoid transportation risks**—If you have a reliable generator in place, it will kick on when your power goes out. This means that as long as it's up and running, and vaccines are in a reliable vaccine refrigerator, you can safely leave vaccines in their storage unit. The same goes for backup battery power as long as the power isn't out for longer than the finite number of hours that the backup system provides.

Cons:

- **Battery backup is limited**—Many medical refrigerators and freezers consume a great deal of energy. Although battery backup power can maintain power during shorter outages and brownouts, most backup batteries won't provide power for many hours during a long outage (note: a battery system can be sized for longer periods; however, the increased cost and physical size often limits how large a battery system is desirable).
- **Backup power can be expensive**—[When you consider overall costs](#), including maintenance and fuel (for generators), or replacement batteries (for battery-based systems), backup power options are generally a more expensive emergency option than having power failure protection already inherent in your vaccine refrigerator and freezer.
- **Routine maintenance and testing**—Backup power options tend to require extra care and maintenance. Generators require regular maintenance. At the same time, batteries usually need to be replaced every few years. Without regular attention and testing, a backup power system may not engage when needed.



CHAPTER 4:

Understand the True Costs of Each Emergency Plan Option

Let's face it: Costs matter, and it's important for medical professionals to be aware of the initial and long-term investments, as well as any hidden costs. We endeavor to provide a breakdown of the full costs of the options below:

COSTS: USING TEMPARMOUR® PCM REFRIGERATORS AND FREEZERS (WITH POWER FAILURE PROTECTION)

Costs here can be deceiving. Although the price of the TempArmour [PCM Vaccine Refrigerators](#) and Freezers are mid-range with respect to medical appliances prices, TempArmour Refrigerators and Freezers also serve a dual purpose. In addition to being able to maintain their temperature for several days during a power outage, they also maintain exceptional temperature stability to keep vaccines safe during business-as-usual operations. This arguably makes TempArmour purpose-built vaccine storage the most cost-effective solution. [View our Cost Comparison Tool here.](#)

In addition to being able to maintain their temperature for several days during a power outage, TempArmour Refrigerators also maintain exceptional temperature stability to keep vaccines safe during business-as-usual operations.



COSTS: MOVING VACCINES

- **Qualified containers and pack outs**—[Qualified Containers](#) generally have a low-to-medium upfront cost. PCM vaccine carriers don't require additional packing materials such as bubble wrap and cardboard, avoiding added administration to maintain an inventory of those types of supplies.
- **Mobile fridges and freezers** require a power source and have a medium-to-high upfront cost.
- **Standard coolers**—Standard hard-sided (food and beverage) coolers with ice packs are the cheapest option out there for moving vaccines. Care must be taken to ensure that proper procedures are followed.

COSTS: INSTALLING BACKUP POWER

- **Batteries**—These have a medium-to-high immediate cost for a system to power an appliance, and the runtime varies widely depending on what is plugged into it (i.e., how much power is being drawn). A mid-range battery backup system costing a few thousand dollars that may provide as little as an hour with a very large medical refrigerator plugged into it, could last a couple of days with a very small or power-efficient appliance plugged into it. Additional batteries can be added to keep vaccines safe through longer outages. Over time, battery systems can be expensive when factoring in initial and replacement battery costs.
- **Generators**—The initial cost of generators can vary widely with automatic generators costing more than smaller [manual](#) generators. [Automatic](#) generators that are installed and automatically engage in the event of a power outage typically cost \$10,000+ dollars. It's important to remember that they come with additional costs including fuel, maintenance, and repairs.

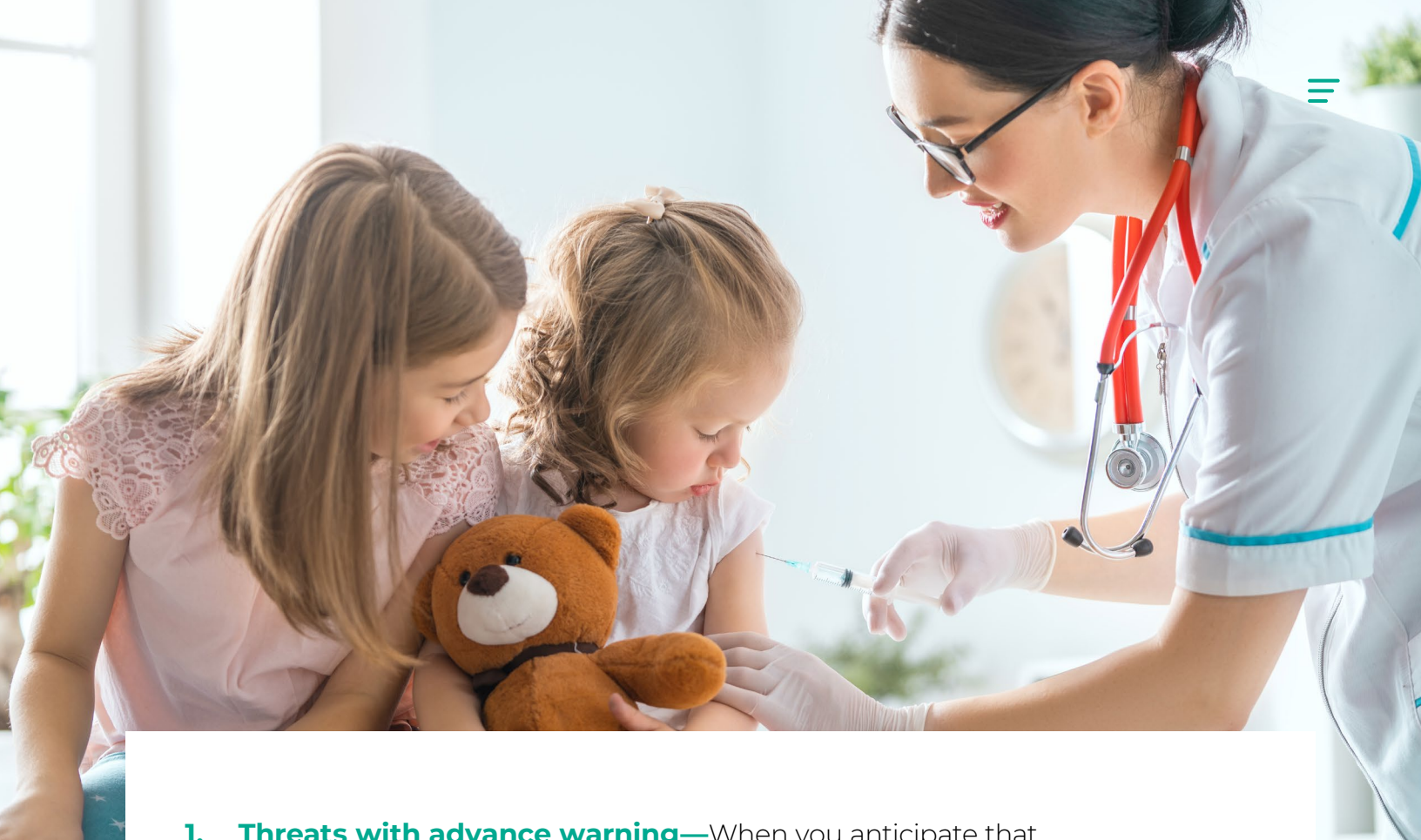
Coolers with ice packs are the cheapest option out there for moving vaccines.





CHAPTER 5:

Assessing Vaccine Protection Solutions for Every Type of Emergency



1. **Threats with advance warning**—When you anticipate that an outage is coming, moving vaccines, setting up backup power, or using a TempArmour Vaccine Refrigerator and Freezer to store vaccines are all viable solutions to consider.

However, there are a few things to keep in mind:

- TempArmour Refrigerators will typically stay in temperature range for up to six days during a power failure (TempArmour freezers for approximately four to five days).
- Calculating backup battery power runtime is tricky and impacted by many factors, so be aware that an estimated runtime can have a fairly wide margin of error (and factor in that the runtime will diminish over time as the batteries age).
- If you're moving vaccines, it's important to make sure that they are safe when they are in transit. This means monitoring with a DDL and using a carrier that will maintain vaccine temperatures in range for a period of time that takes into account any potential glitches in the plan, such as traffic or having to implement a plan B if the designated site is no longer available.

2. **Threats without advance warning**—If you are located in an area prone to earthquakes, tornadoes, violent storms, or other threats that appear without advance warning, transporting vaccines to another location may not always be an option. Chances are that moving vaccines will be too dangerous in those circumstances; however, it may be possible after the threat has passed.

Consider equipment that will protect the vaccines from power outages for extended periods of time in case vaccines cannot be moved. Options include the TempArmour PCM Refrigerator and Freezer, which will keep vaccines in temperature range for several days during outages, or an automatic generator or battery backup system that starts automatically when needed.

3. **Brownouts**—It's helpful to have vaccine fridges and freezers that keep their temperature in range if your location experiences frequent outages or brownouts. TempArmour vaccine storage units that maintain their temperature range for days without power are an alternative to purchasing and maintaining a backup power system.
4. **Planned power outages**—Even if these outages occur after work hours, it's crucial to ensure that measures are in place to prevent spoiled vaccines. All three solutions are viable for a planned outage as long as the length of the outage has been factored in.



5. Unexpected routine outages—If the lights go out unexpectedly, it usually means that you won't know for how long power will be lost. TempArmour [Vaccine Refrigerators and Freezers](#) battery backup power, and generators are all viable options in this situation.

Vaccines can also be moved to a designated emergency storage site; however, that can be a more disruptive and time-consuming solution.

6. Post-storm outages—Long power outages that often accompany large storms are best handled by a solution that will provide days of protection. Moving the vaccines in advance, using TempArmour Refrigerators and Freezers or having an automatic generator installed on-site are all options. If there is access after the storm, a standard generator may also work.

7. High risk of physical damage—If fires or floods threaten your vaccine storage facility, your likely best option is to transport vaccines to a safer location. A qualified container and pack out, a standard cooler with ice packs, or a portable refrigerator or freezer can be used for emergency transport.

In a perfect world, it may be best to land on a comprehensive solution that combines vaccine protection options. However, costs can add up fast, and resources aren't unlimited. This means that the best strategy emergency planners can adopt is to weigh their options and choose solutions that align with their resources, potential hazards, and needs.






A Final Look at Setting up an Emergency Vaccine Plan

Ultimately, there are five steps you'll want to take as you set up an emergency plan:

1. Consider the potential threats that may affect your vaccines (weather-related and other).
2. Weigh the equipment options that will best maintain your vaccines' temperature range during regular operations as well as during emergencies.
3. Evaluate each solution's pros and cons.
4. Factor in the costs and benefits.
5. Execute your plan.

By understanding the potential risks to the cold chain and knowing what solutions are available, you'll have the best chance of protecting your vaccines from temperature excursions or losses no matter what the circumstances.



Ready to prepare or review your vaccine emergency plan? Have some questions about the options outlined here?

Feel free to contact us for assistance.

[This document is to be used for informational purposes only.]

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