

Vaccine Storage and Handling Protocol, 2010

Preamble

The Ontario Public Health Standards (OPHS) are published by the Minister of Health and Long-Term Care under the authority of the Health Protection and Promotion Act (HPPA)¹ to specify the mandatory health programs and services provided by boards of health. Protocols are program and topic specific documents which provide direction on how boards of health must operationalize specific requirement(s) identified within the OPHS. They are an important mechanism by which greater standardization is achieved in the province-wide implementation of public health programs.

Protocols identify the minimum expectations for public health programs and services. Boards of health have the authority to develop programs and services in excess of minimum requirements where required to address local needs. Boards of health are accountable for implementing the standards including those protocols that are incorporated into the standards.

Purpose

Vaccine wastage due to spoilage or expiry is a concern for all immunization programs. This protocol has been developed to achieve greater standardization in the management of provincial vaccine inventories to ensure the proper storage and handling of vaccines, strengthen quality assurance activities, and provide education strategies in an effort to minimize and reduce provincially funded vaccine wastage and promote vaccine safety and efficacy.

This protocol replaces the *Vaccine Preventable Diseases (VPD) – Vaccine Distribution, Storage and Handling Protocol, January 1998* and the *Bioinventory System (BIOS) Protocol, 1998*.

Reference to the Standards

The table below identifies the OPHS program standard and requirements to which this protocol relates.

Standard	Requirement
Vaccine Preventable Diseases	<p>Requirement #5: The board of health shall provide a comprehensive information and education strategy to promote optimal vaccine management, including storage and handling practices, among health care providers in accordance with the <i>Vaccine Storage and Handling Protocol, 2008</i> (or as current).</p> <p>This shall include:</p> <ul style="list-style-type: none">• One-on-one training at the time of cold chain inspection;• Distributing information to new health care providers who handle vaccines; and• Providing ongoing support to existing health care providers who handle vaccines.
	<p>Requirement #10: The board of health shall ensure the storage and distribution of provincially funded vaccines including to health care providers practicing within the health unit in accordance with the <i>Vaccine Storage and Handling Protocol, 2008</i> (or as current).</p>
	<p>Requirement #11: The board of health shall promote vaccine inventory management in all premises where provincially funded vaccines are stored in accordance with the <i>Vaccine Storage and Handling Protocol, 2008</i> (or as current).</p>

Operational Roles and Responsibilities

1) Inventory management

The board of health shall:

- a) Record the following vaccine inventory information using the Bioinventory System (BIOS) or any other method specified by the Ministry of Health and Long-Term Care (the “ministry”) on an ongoing basis:
 - i) Catalogue number;
 - ii) Code name;
 - iii) Lot number(s);
 - iv) Expiry date(s);
 - v) Quantity ordered;
 - vi) Quantity received;
 - vii) Quantity distributed;
 - viii) Inventory on hand;
 - ix) Returned product; and
 - x) Reason for return (e.g., cold chain incident, expiry).
- b) Count vaccine inventory and check for expired vaccines before placing a vaccine order.
- c) Compare vaccine inventory against totals listed in BIOS or any other method specified by the ministry.
- d) Remove any expired vaccine immediately and place in a clearly marked box for expired vaccines.
- e) Record expired vaccine as “expired” in BIOS or any other method specified by the ministry and return expired vaccine to the Ontario Government Pharmaceutical and Medical Supply Service (OGPMSS) using the current vaccine return form or any other method specified by the ministry.
- f) Maintain no more than a two-month vaccine supply at the board of health, depending on the product. The board of health may maintain a larger supply of vaccine during health emergencies, a declared outbreak, immunization clinics or an adverse condition that may cause delays in the delivery of vaccine by any mode of transportation.
- g) Rotate inventory to ensure that vaccines with longer expiry dates are stored behind vaccines with shorter expiry dates.
- h) Distribute products with the shortest expiry dates first to ensure that short-dated stock is used first.

2) Vaccine order process

The board of health shall:

- a) Engage in planning and forecasting to maintain an adequate inventory of vaccine to meet the routine needs of health care providers administering publicly funded vaccines and immunization clinics administered by the board of health by:
 - i) Calculating the approximate quantity of each vaccine that should be distributed in the current year by reviewing the total quantities of each vaccine distributed in the previous year. Include in the analysis population demographics, epidemiological analysis (e.g., outbreaks), and estimated vaccine coverage rates to project the number of vaccine doses required;
 - ii) Evaluating vaccine wastage amounts and trends. Spoiled, expired or damaged vaccines are considered “wasted” product. Wastage rates should not exceed 5 per cent for any one product. If wastage exceeds this level, inventory control measures should be taken to reduce it. Wastage levels for each product should be reported to the Public Health Division (PHD) of the ministry once a year at a time specified by the ministry; and
 - iii) Placing vaccine orders with the OGPMSS according to the scheduled OGPMSS delivery dates. The boards of health may order outside of the scheduled OGPMSS delivery dates during health emergencies, a declared outbreak, or an adverse condition that may cause delays in the delivery of vaccine by any mode of transportation.
- b) Place vaccine orders with the OGPMSS by completing the current vaccine order form or through any other method specified by the ministry.

- c) Maintain a record of all vaccine orders placed with the OGPMS using BIOS or any other method specified by the ministry.
- d) Verify that the vaccine received from the OGPMS corresponds with the packing slip received, and with the amounts that were ordered. If there is a discrepancy, OGPMS customer service should be contacted to rectify the situation as soon as possible, but no later than 72 hours after taking receipt of the vaccine order.
- e) For health care providers who order vaccines directly from the board of health, review quantities and adjust orders as required to ensure that no more than a one-month supply of vaccine is stored in premises to which the board of health distributes publicly funded vaccines.
- f) For health care providers who order vaccines directly from the OGPMS:
 - i) Instruct health care providers to order vaccines directly from the OGPMS using the current vaccine order form provided by the ministry; and
 - ii) Instruct health care providers that no more than a one-month supply of vaccine should be stored in their premises.

3) Vaccine return process

The board of health shall:

- a) Return vaccines that cannot be used to the OGPMS in a timely fashion, unless otherwise indicated on the current vaccine return form or any other method specified by the ministry. If vaccines should not be returned to the OGPMS as indicated on the current vaccine return form or any other method specified by the ministry, they should be disposed in approved biomedical waste containers according to local and/or provincial regulations.
- b) Return vaccines that cannot be used by the board of health or health care providers for the following reasons:
 - i) Expiry (if the month and year are only specified, the vaccine expires at the end of the month, e.g., expiry Jan/08 means expiry January 31, 2008. If the day, month and year are specified, the vaccine expires on the specified date);
 - ii) Damaged product;
 - iii) Spoiled product (vaccine that cannot be used due to exposure(s) to temperatures below +2°C or above +8°C for a specific period of time. This will depend on the specific vaccine.);
 - iv) For the redistribution of product with four months of shelf life or more by the OGPMS: only product that has been maintained at the board of health (i.e., never distributed to a health care provider's premises) in the required storage conditions as indicated on the vaccine product monograph; and
 - v) For emergency redistribution of product (i.e., vaccine shortages) by the board of health or OGPMS: the PHD of the ministry shall notify the board of health when redistribution of a product that has not been maintained at the board of health can be redistributed to other health provider's premises. Redistributed product must be accompanied by the current temperature log book or any other method specified by the ministry indicating that the product has been maintained at the required storage conditions as specified in the vaccine product monograph.
- c) Obtain a Return Authorization Number (RAN) from the OGPMS prior to returns of all vaccine inventory to the OGPMS.
- d) List all returned vaccines on the current vaccine return form or any other method specified by the ministry.
- e) Package reusable vaccines and non-reusable vaccines separately. Only reusable vaccines must be stored and transported under the required cold chain temperature conditions. The packages must be clearly identified by attaching the appropriate approved vaccine return label to the outside of the package. Place the corresponding current vaccine return form(s) (reusable or non-reusable) inside the package.
- f) Instruct health care providers who order vaccines directly from their local board of health to return all expired, damaged, and spoiled vaccines to the board of health.
- g) Instruct health care providers who order vaccines directly from the OGPMS to return all expired, damaged, and spoiled vaccines directly to the OGPMS unless otherwise indicated on the current vaccine return form or any other method specified by the ministry; complete the current vaccine return form or any other method specified by the ministry, attach the form with the returned vaccines, and contact the OGPMS for a RAN.

4) Vaccine handling and use

Storage by the board of health

The board of health shall:

- a) Ensure that vaccines remain in the refrigerator, except for removing dose(s) for
 - i) Shipping to health care providers;
 - ii) Transporting to immunization clinics; or
 - iii) Transferring vaccines to an alternative refrigerator, insulated container, or facility due to power outages, refrigerator failure, or maintenance.
- b) Ensure that space is left between the vaccine and the refrigerator wall, and that there is space between each box or tray of vaccine in the refrigerator to allow for adequate air circulation around the vaccine.
- c) Group vaccines by product type in the refrigerator.
- d) Refer to the vaccine product monograph to determine the required storage conditions for the vaccine diluent (e.g., refrigeration or room temperature).

5) Vaccine storage and handling equipment

Physical requirements at the board of health

The board of health shall:

- a) Ensure purpose-built refrigerators (also referred to as pharmacy, laboratory, or industrial-quality refrigerators) are used for storing inventory of vaccines. The purpose-built refrigerator shall meet the following requirements:
 - i) A feedback system ensures narrow tolerances with internal temperatures, thus providing appropriate temperature regulation;
 - ii) Ongoing air circulation ensures that the temperature distribution is even;
 - iii) A set-point temperature within a +2°C to +8°C range is maintained;
 - iv) An evaporator operates at +2°C, preventing the vaccine from freezing;
 - v) Air circulation is fan-forced;
 - vi) The temperature recovery system is appropriate; and
 - vii) The refrigerator is built to handle ambient temperature changes.
- b) Not use domestic refrigerators (also referred to as kitchen-style refrigerators) or bar refrigerator units (also referred to as bar-style refrigerators) to store vaccines. These refrigerators are ineffective at maintaining the required storage temperatures.
- c) Replace domestic refrigerators or bar refrigerator units with purpose-built vaccine refrigerators as soon as possible, but no later than January 1, 2011.
- d) Ensure that all vaccine refrigerators are equipped with an alarmed temperature monitoring system. The alarm must be either a voice or electronic message that will be telephoned or e-mailed to on-call staff or security service or a recognizable audio tone that is monitored during office hours by staff and after office hours by a security service. Security service or on-call staff must be trained in appropriate procedures for responding to an alarm. The alarmed temperature monitoring system should have a battery back-up system in case of an electricity disruption.
- e) Ensure that all vaccine refrigerators are equipped with a lockable door and are kept locked, especially after office hours. A latch or padlock must be installed on refrigerators without built-in locks.

Routine maintenance at the board of health

The board of health shall:

- f) Ensure that vaccine refrigerator maintenance agreements are in place. Maintenance agreements should include:
 - i) Regular maintenance of vaccine refrigerators is completed at least once annually;
 - ii) Testing of vaccine refrigerator alarm system;
 - iii) Calibration of vaccine refrigerator temperature monitoring and recording device(s) once annually; and
 - iv) Results of maintenance activities, records, and tests are recorded and acted on accordingly.
- g) Maintain vaccine refrigerator maintenance records and create a summary of maintenance information that includes the following:
 - i) Name and contact information for refrigerator service provider;
 - ii) Itemized list of vaccine refrigerators within the board of health, including location, age, size, and serial numbers; and
 - iii) Maintenance status and history of the vaccine refrigerators.
- h) Ensure that vaccine refrigerator alarm system batteries are replaced at least every six months, or as required.

Temperature control at the board of health

The board of health shall:

- i) Ensure that all vaccine refrigerators have a continuous temperature monitoring and recording device.
- j) Ensure that temperature monitoring and recording devices are calibrated once annually and batteries are changed twice annually, or as required.
- k) Ensure that maximum-minimum thermometers and temperature monitoring and recording devices are accurate within $\pm 1^{\circ}\text{C}$.
- l) Check the temperature monitoring and recording devices twice daily, when the board of health opens and before the board of health closes, to ensure that vaccine refrigerator temperatures remain between $+2^{\circ}\text{C}$ and $+8^{\circ}\text{C}$.
- m) Record the current, minimum and maximum temperatures in the current temperature log book or any other method specified by the ministry twice daily during business days, following thermometer inspection.
- n) Review the print-outs from the temperature monitoring and recording device when the vaccine refrigerator temperatures are below $+2^{\circ}\text{C}$ or above $+8^{\circ}\text{C}$.
- o) Not open vaccine refrigerator doors more often than is necessary to stock, count, or remove vaccines.
- p) Ensure that nothing other than vaccine is stored in vaccine refrigerators at the board of health.
- q) Ensure that all vaccine-handling staff are knowledgeable about all temperature control devices, including maximum-minimum thermometers and temperature monitoring and recording devices.

6) Vaccine transport**General**

The board of health shall:

- a) Transport all vaccines in insulated containers supplied by the OGPMS with the appropriate packing configuration (i.e., summer or winter).
- b) At its discretion, use alternative insulated containers for vaccine transport and storage, provided the following requirements are met:
 - i) Internally validate and document insulated containers to ensure that they are capable of maintaining the vaccine at the required temperatures for the required duration for transportation and/or storage;

- ii) Produce documentation that is either consistent with the manufacturer’s recommendations based on testing, or the board of health’s test results; and
 - iii) Submit documented evidence to the PHD of the ministry prior to use of the insulated container.
- c) Ensure that all insulated containers storing vaccines have a maximum-minimum thermometer or a temperature monitoring and recording device.
 - d) Clearly mark all insulated containers storing vaccines with the following label: “VACCINES – REFRIGERATE IMMEDIATELY.” Before placing vaccines into the refrigerator, they must be removed from the insulated container(s).
 - e) Not transport vaccines in insulated containers in the trunk of a car due to the risk of exposure to temperature extremes.

Immunization clinics

The board of health shall:

- f) Use insulated containers with packing material and a maximum-minimum thermometer or a temperature monitoring and recording device to store vaccine if a refrigerator is not available during immunization clinics.
- g) Minimize the number of times that the insulated container is opened during the immunization clinic.
- h) Visually inspect the thermometer each time the insulated container is opened.
- i) Monitor and record temperature readings in the insulated container:
 - i) Before leaving the board of health with the insulated container;
 - ii) Upon arrival at the clinic location, but prior to the immunization clinic;
 - iii) Every three hours during the immunization clinic;
 - iv) Upon completion of the clinic but before transport back to the board of health; and
 - v) After return to the board of health but before the vaccines are placed back into the refrigerator.

Health care providers

The board of health shall:

- j) Ensure that health care providers use insulated containers that are able to maintain the +2°C to +8°C temperature range for the maximum length of time required for transport when transporting vaccine from the board of health to the health care provider’s premises. The insulated container also should contain packing material (i.e., ice packs) and a maximum-minimum thermometer or a temperature monitoring and recording device.

Air and courier

The board of health shall:

- k) Advise air/courier transport services contracted to transport vaccine that vaccines are perishable, must be refrigerated immediately upon receipt, and must be transported under required cold chain conditions.
- l) Inquire about estimated travel times and choose insulated containers accordingly.

7) Information and education strategies

The board of health shall:

- a) Ensure that settings to which it distributes publicly funded vaccines meet the following requirements:
 - i) Maximum-minimum thermometers or temperature monitoring and recording devices are in place on all refrigerators used to store publicly funded vaccines;
 - ii) Maximum-minimum thermometers or temperature monitoring and recording devices are checked twice daily and documented, upon arrival and before office closing, to ensure refrigerator temperatures remain between +2°C and +8°C;

- iii) *Vaccine Storage and Handling Guidelines, 2006*² (or as current) and materials are available at the health care provider's premises and are easily accessible (these materials are available from the OGPMS and can be distributed to health care providers by the board of health).
- b) Conduct an on-site inspection for newly enrolled immunization service providers prior to distributing publicly funded vaccine to them.
- c) Provide an orientation for all health care providers who have been newly enrolled to receive publicly funded vaccines from the board of health.
- d) Educate health care providers that vaccines are perishable, must be refrigerated immediately upon receipt, must be transported under required cold chain conditions, and must be transported in properly labelled insulated containers.
- e) Inform health care providers that vaccine that has been exposed to a cold chain incident must be reported immediately to the board of health.
- f) Provide ongoing education with respect to appropriate vaccine ordering, storage, and cold chain management throughout the year for all health care providers who distribute publicly funded vaccines.

8) Cold chain inspections

The board of health shall:

- a) Conduct cold chain incident inspections if required and routine inspections on vaccine storage and handling practices in health care provider premises that store publicly funded vaccine.

Cold chain incident inspection

The board of health shall:

- b) Conduct cold chain inspections following a cold chain incident. The purpose of these inspections is to determine whether vaccine can be used by the health care provider or returned to the board of health, to investigate the cause of the cold chain incident, provide follow-up education in order to prevent the occurrence of future incidents, and ensure that adequate cold chain conditions can be maintained prior to continuing the vaccine supply to the health care provider.
- c) Investigate all reports of cold chain incidents in health care settings to which it has distributed publicly funded vaccines within 24 hours (or next business day) of receiving a report of such an incident.
- d) Determine whether an on-site cold chain incident inspection is required at the premises or whether the investigation can adequately be handled over the telephone. (Note: it is recommended that on-site inspections be conducted following cold chain incidents that are related to non-compliance with vaccine storage and handling requirements.)
- e) Provide consultation and technical assistance to health care providers who have experienced cold chain incidents.
- f) Ensure that the steps as outlined in Section 9, part b, of this protocol are followed.
- g) Communicate in writing the board of health's assessment of the cold chain incident, and/or issues related to non-compliance, the value of the vaccine loss, and the required remediation strategy(ies) to health care providers who are non-compliant with the minimum vaccine storage and handling requirements or have experienced a cold chain incident. A specified remediation time frame shall be established with the health care providers.
- h) Ensure that compliance with the required remediation strategy(ies) has occurred.
- i) Withhold vaccines until compliance issues have been resolved or until completion of other follow-up deemed necessary to ensure appropriate vaccine storage and handling when minimum cold chain requirements are not met by a health care provider. For health care providers who order vaccines directly from the OGPMS, the board of health shall instruct the OGPMS to discontinue further vaccine deliveries to the health care provider premises until the requirements have been met.

- j) Consider issuing an advisory from the medical officer of health (or designate) to the health care provider's premises advising that access to publicly funded vaccines has been suspended due to non-compliance with the required remediation strategy(ies) or repeated cold chain incidences have occurred. Once remediation activities have been undertaken as recommended by the board of health, vaccine supply can be restored. For health care providers who order vaccines directly from the OGPMS, the board of health shall instruct the OGPMS to resume filling orders for health care providers.

Routine inspections

The board of health shall:

- k) Conduct routine inspections on an annual basis, regardless of whether or not a cold chain incident inspection has been conducted. The purpose of these inspections is to assess the health care providers' level of compliance with vaccine storage and handling requirements, including cold chain requirements, and to provide an opportunity for board of health staff to provide information and resources regarding the proper storage and handling of vaccines and the proper temperature monitoring systems that should be in place to optimize vaccine potency.
- l) Provide one-on-one consultation to health care providers with respect to vaccine storage, handling, and cold chain management at the time of routine inspection.
- m) Review and inspect the following practices:
- i) Vaccine storage;
 - ii) Vaccine storage and handling equipment (i.e., temperature monitoring and recording device, refrigerator);
 - iii) Vaccine refrigerator temperatures;
 - iv) Vaccine temperature log book;
 - v) Vaccine handling;
 - vi) Vaccine inventory; and
 - vii) Availability of vaccine storage and handling resource material.
- n) Complete the current vaccine cold chain maintenance inspection report form or any other method specified by the ministry during the inspection and indicate the premises' compliance with each of the vaccine storage and handling requirements and recommendations. A copy of the report shall be provided to the health care provider.
- o) Report on the results of these inspections, using the current vaccine cold chain maintenance inspection report form or any other method specified by the ministry, to the PHD of the ministry once annually.

9) Cold chain incidents

Within the board of health

- a) The board of health shall contact the PHD of the ministry following a cold chain incident during vaccine delivery from the OGPMS. The PHD of the ministry is responsible for assessing conditions and making recommendations.

Within the board of health or at a health care provider's premises

- b) The board of health shall ensure that the following steps are taken following a cold chain incident within the board of health or at a health care provider's premises:
- i) Store exposed vaccines in a separate container marked "DO NOT USE" in a refrigerator or insulated container with the appropriate packing material and with a maximum-minimum thermometer or a temperature monitoring and recording device until the board of health determines which products are usable and which products must be replaced.
 - ii) Calculate the maximum length of time the temperature was outside +2°C to +8°C. If specific time/temperature details are not available, assume the refrigerator malfunctioned immediately after the last thermometer check.
 - iii) Assess products involved in the cold chain incident and provide advice for use/return based on the recommendations on the current Canadian Provincial/Territorial Vaccine Stability Chart. If cold chain incident conditions are not provided in the current Canadian Provincial/Territorial Vaccine Stability Chart, or the products have been exposed in a previous incident, board of health staff shall contact the product manufacturer as indicated in the current Canadian Provincial/Territorial Vaccine Stability Chart.

- iv) Mark vaccines involved in a cold chain incident that have been determined to be usable in order to identify them in case of a second exposure. These products must be distributed and/or administered before unexposed products, regardless of expiry date.
- v) Return vaccines involved in a cold chain incident that have been determined to be unusable to the OGPMS using the current vaccine return form or any other method specified by the ministry. These vaccines do not require refrigeration.
- vi) After any cold chain incident that has occurred either at the board of health or at a health care provider's premises, the board of health shall complete the current cold chain incident exposure/wastage report form or any other method specified by the ministry.
- vii) The completed current cold chain incident exposure/wastage report form or any other method specified by the ministry must be submitted to the PHD of the ministry after the investigation of each incident.
- viii) A record of cold chain incident(s) should be maintained by the board of health.

10) Contingency planning within the board of health

The board of health shall:

- a) Establish urgent vaccine storage and handling practices in the event of a vaccine refrigerator malfunction, power failure, natural disaster, or other emergency that may compromise vaccine storage conditions. The urgent vaccine storage and handling practices shall cover the following:
 - i) Maintaining the vaccines within the board of health if the vaccine refrigerator is connected to a generator;
 - ii) Establishing in advance at least one alternative storage facility where vaccine can be appropriately stored and monitored if the board of health does not have a generator. The facility should also have adequate vaccine storage capacity. In situations where an alternative vaccine storage facility cannot be identified within a reasonable distance, maintain the appropriate packing materials to temporarily and safely store vaccine at the board of health; and
 - iii) Ensuring that appropriate board of health staff have training so that they understand the urgent vaccine storage and handling practices and their responsibilities for maintaining the cold chain.
- b) Post the urgent vaccine storage and handling practices on or near all board of health vaccine refrigerators.

Glossary

Cold chain: Includes all of the materials, equipment, and procedures used to maintain vaccines in the required temperature range of +2°C to +8°C from the time of manufacture until the vaccines are administered to individuals. In addition, protection from light is a necessary condition for some vaccines.²

Cold chain incident: Occurs when vaccine is exposed to a temperature outside the required temperature range of +2°C to +8°C for any period of time and the potency of the vaccine is potentially compromised. The vaccine temperature excursion tolerance and permissible time excursion is determined by each product manufacturer.

Damaged product: Vaccine vials/ampoules that have been broken or are defective (e.g., missing a label, missing a vial cap).

Diluent: Liquid substances used to reconstitute vaccines prior to administration.

Exposed vaccine: Vaccine that is stored or handled at temperatures below +2°C or above +8°C for any period of time, or that is not stored according to the manufacturer's recommendations.²

Insulated container: An insulated container that has been tested and internally qualified to meet the requirements of storing and transporting vaccines at the required temperatures for the necessary duration of time.

Potency: The ability of a vaccine to produce a predictable and expected level of immune response in the vaccine recipient.

Spoiled product/vaccine: Vaccine that cannot be used due to exposure(s) to temperatures below +2°C or above +8°C for a specific period of time. This will depend on the specific vaccine.²

Temperature monitoring and recording device: An electronic device that measures temperatures and keeps a record of the results. This can include devices such as a data logger and a chart recorder.

Temperature recovery system: A mechanism that allows the refrigerator to return to its set temperature after being exposed to out of range temperatures (e.g., after opening the door to remove vaccine).

Wasted vaccine: Any vaccine that cannot be used is considered to be “wasted.” This includes vaccines that are exposed and those that have expired.²

References

1. Health Protection and Promotion Act, R.S.O. 1990, c. H.7.
Available from http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90h07_e.htm.
2. Ministry of Health and Long-Term Care. Vaccine storage and handling guidelines. Toronto, ON: Queen’s Printer for Ontario; 2006. Available from http://www.health.gov.on.ca/english/providers/program/pubhealth/oph_standards/ophs/progstds/pdfs/guide_vaccine_handling_storage_en.pdf.