Viral Respiratory Infection Provincial Surveillance (VRI) Protocol

Approved by Provincial IPC Surveillance Committee: January 2023
Revised: April 2024

Alberta Health Services
Infection Prevention & Control

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Contents

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Background

Viral respiratory infections (VRI) cause increased morbidity and mortality in both adult and pediatric healthcare settings. Age is a key risk factor with regards to the severity, transmission, and impact of VRI. The consequences of VRI are especially concerning for children and older adults with existing co-morbidities or underlying conditions such as cardiac and pulmonary disease, cognitive disorders, or immunosuppression. The emergence of SARS, avian influenza, novel H1N1 influenza, MERS-CoV and COVID-19 have underlined the need for data to inform infection prevention and control practices for respiratory pathogens in healthcare settings.

Within Alberta, testing for respiratory virus pathogens is done at Alberta Public Health Laboratory (ProvLab) South or North, or regional laboratories, and involves either rapid COVID-19 PCR, rapid influenza/RSV PCR tests or Respiratory virus panel nucleic acid tests (Alberta Precision Laboratories, 2022). The Respiratory virus panel tests for the presence of the following viral pathogens: Adenovirus, Coronavirus (seasonal), Enterovirus/Rhinovirus, Human Metapneumovirus (HMPV), Influenza (A, B), Parainfluenza Viruses (1-4), Respiratory Syncytial Virus (RSV).

Goal

To monitor hospital-acquired VRIs and outcomes of interest in Alberta Health Services (AHS) and Covenant Health facilities.

Objectives

1. To determine the incidence of hospital-acquired VRI in the population under surveillance in AHS/Covenant Health facilities.
2. To establish hospital-acquired VRI rates for trend analysis over time.
3. To describe seasonal trends and disease patterns, including morbidity and mortality.

Methodology

- Cases eligible for surveillance are inpatients with laboratory confirmed VRI (refer to Appendix A for a list of eligible viral respiratory pathogens).
- VRI positive results are identified by Infection Control Professionals (ICPs) in Connect Care.
- Facility-based ICP receiving laboratory reports for VRI pathogens will determine case classification and if cases have symptoms and record at least the minimum case information. Data from completed VRI surveillance will be entered into the provincial surveillance platform in a timely manner.

Patient population

All individuals admitted to AHS/Covenant Health acute and acute tertiary rehabilitation care facilities where inpatient care is provided 24 hours/day, 7 days a week. Acute and acute tertiary rehabilitation facilities will be referred as the "facilities under surveillance" in this protocol for simplicity. Please refer to Appendix B: General Surveillance Definitions for facilities that would be included under this term.

Surveillance period

Surveillance began on January 1, 2023.

Case definition

A primary VRI case meets the following:

Laboratory confirmed positive test with at least one VRI pathogen;

AND

Meets 1. 2. Or 3. Below at the time of admission or during hospitalization.

1. VRI symptomatic, excluding COVID-19

Laboratory confirmation of a positive test with at least one VRI pathogen in addition to at least one of the following new or worsening signs or symptoms within the infection window period (refer to Appendix A for the infection window period definition):

- **Respiratory symptoms:** Cough, shortness of breath, difficulty breathing, decreased O_2 saturation or increased O_2 requirement, sore throat/painful swallowing/hoarse voice, runny nose/nasal congestion/sneezing);
- **Core symptoms:** Fever/chills/rigors: Adults: >37.8°C; Pediatrics ≥38.0°C).

Symptoms other than those listed above would not meet definition (i.e., gastrointestinal, expanded COVID-19, or multiple symptoms);

AND

No other evident cause for the abnormality.

2. COVID-19 symptomatic

Laboratory confirmation of a positive COVID-19 test AND at least one of the following new or worsening signs or symptoms within the infection window period (Appendix A):

- **Respiratory symptoms:** Cough, shortness of breath, difficulty breathing, decreased O_2 saturation or increased O_2 requirement, sore throat/painful swallowing/hoarse voice, runny nose/nasal congestion/sneezing;
- **Gastrointestinal symptoms:** Vomiting, diarrhea;
- **Core symptoms:** Fever/chills/rigors: Adults: >37.8°C; Pediatrics ≥38.0°C, loss of/change to sense of smell (anosmia) /taste (dysgeusia);

- **COVID-19 expanded symptoms:** Headache, myalgia (muscle pain) /arthralgia (joint pain), fatigue/extreme exhaustion, nausea/sudden loss of appetite, conjunctivitis/red eye/chemosis (conjunctival edema), any additional symptoms at clinician's discretion (e.g. skin manifestations such as "COVID toes"))

3. COVID-19 no symptoms or no new/worsening symptoms

- **Laboratory confirmation of a positive COVID-19 test and NONE of the above listed symptoms or symptoms are not new/worsening within the infection window period (Appendix A).** Cases where symptom onset was outside of the infection window period of the collection date would be captured under this definition.

4. For information records (these are not primary records)

- For an inpatient positive VRI test (other than COVID-19) – if after review of patient's healthcare record, the symptoms do not meet VRI case definition, a positive VRI test is entered as For Info **(mandatory data entry** if test result is on day 4 or later)
- An inpatient COVID-19 case that occurs ≤ 90 days after a Primary COVID-19 case (optional data entry)
- A positive VRI test from an outpatient, community, or continuing care facility test location (optional data entry)

Inclusion criteria

Positive test	If positive test is performed while the patient is hospitalized, it is eligible to be considered for a primary VRI case:
COVID-19	Every 90 days OR if the variant strain is different
Influenza	If it represents a new infection for the patient OR if the strain is different
VRI (other than COVID-19)	If it represents a new infection event for the patient ○ For patients with different VRI pathogens in the same infection event, all the VRI pathogens will be captured as one Primary VRI case, with multiple pathogens selected

Case classification

Hospital-acquired - mandatory data entry

Meets case definition **on or after the 4th calendar day of admission (≥ 4 calendar days)** to an inpatient location where day of admission is calendar Day 1 based on assessment by the ICP;

OR

If a patient has been admitted for less than four calendar days prior to the identification of the primary VRI and the patient was directly transferred from one provincial facility under surveillance to another the case will be investigated to see if it meets the hospital-acquired definition;

OR

If a patient has been admitted for less than four calendar days prior to the identification of the VRI, there must be compelling evidence that the case is attributable to the facility (i.e. there is an established epidemiological link).

NOTE: For Primary VRI with new/worsening symptoms, the symptom onset date is used to determine case classification. For Primary VRI with no new/worsening symptoms, the collection date is used to determine case classification.

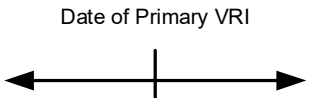
Healthcare-associated – mandatory data entry if test taken on calendar day 4 or later;

Meets case definition on calendar day 1, 2 or 3 of admission to an inpatient location;
AND
was a direct transfer from a long-term care facility where care is provided 24 hours/day, 7 days a week.

Community-acquired – mandatory data entry if test taken on calendar day 4 or later;

Meets definition prior to admission to the facility or during the 3 calendar days after admission to the facility;
AND
No exposure to healthcare and no epidemiological link would have resulted in this infection (i.e. doesn't meet hospital-acquired or healthcare-associated case classification).

NOTE: Surveillance definitions and outbreak definitions may not align (Provincial Population and Public Health Infection Prevention and Control Workplace Health and Safety, 2022).



	Day of Admission			
Calendar Day	1	2	3	4
Time (hours)	0	24	48	72

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Outcomes

Only hospital-acquired VRI will be investigated for the following outcomes 30-days following their first positive test or at the time of discharge from acute care, with assessment of death attribution performed by a designated physician or medical officer of health:

a) still admitted
b) discharged out of acute care;
c) critical care – related, critical care – unrelated – Already in critical care;
d) deceased - related; deceased – contributed; deceased - unrelated; deceased - unable to determine;
e) all-cause ECMO; and
f) all-cause mechanical ventilation.

If an inpatient is a direct transfer between facilities under surveillance and the Primary VRI is attributed to the sending facility, the receiving facility is responsible for following the patient for the above outcomes.

A regularly scheduled administrative data linkage will be performed to identify 30-day outcomes that were missed during regular data entry and will be communicated back to ICPs as needed.

Data collection and data entry

Mandatory data entry

- Primary hospital-acquired VRI laboratory episodes of an admitted patient in all AHS/Covenant Health facilities under surveillance.
- Primary Symptomatic VRI episodes that tested positive on day 4 or later and are classified as community-acquired or healthcare-associated because the symptoms started prior to day 4.
- Inpatient positive VRI test (other than COVID-19) collected on day 4 or later and symptoms do not meet VRI case definition: For Info, Symptoms Not Meeting Definition

Mandatory case information

Basic demographic, facility and possible microbiological data will be collected for hospital-acquired cases and must include:

- Name (first, middles and last);
- Date of birth;
- Gender;
- Alberta Personal Healthcare Number (PHN) (or Unique Lifetime Identifier (ULI));
- Connect Care medical record number (where applicable);
- Record type (i.e., New);
- Symptom status (New or Worsening; None or Not Worsening)
- Symptoms present (Respiratory, Gastrointestinal, Core, Expanded) (Appendix A)
- Classification (i.e., hospital-acquired);
- Case status (i.e., active);
- Admission date to reporting facility;
- Reporting zone and facility name;

- Collection date, laboratory name, accession number and specimen (if applicable);
- Virus type (SARS-CoV-2 (COVID-19), Influenza A, Influenza A (H3), Influenza A (H1), Influenza B, Influenza (not-typed), RSV, Human metapneumovirus, Parainfluenza, Adenovirus, Coronavirus (not COVID-19), Rhino-enterovirus, mixed, other)
- Conclusion date; and
- Conclusion outcome (discharge, attributable critical care admission, attributable death, all cause mechanical ventilation, all cause ECMO).

Optional case information

- Community exposure (yes) (Appendix A) – exposure to VRI in the community does not alter the case classification of the record.

Denominator data

Denominators (numbers of inpatient admissions and inpatient days) are provided by AHS Analytics. Denominators are presented by month, which are aggregated for the fiscal quarter of the report. Denominators used for reporting can be accessed on Tableau Workbooks.

Rate calculations

Incidence rates for AHS/Covenant Health hospitalized patients	Calculations
Hospital-acquired VRI	$\frac{\text{Number of hospital-acquired VRI cases}}{\text{Number of patient-days}} \times 10{,}000$

Comparator rates

Internal and external surveillance rates are used as comparators. The internal rates are the historical rates for the province or zone from the previous fiscal year. The external rates are provided by the Canadian Nosocomial Infection Surveillance Program (CNISP) which are created from data submitted by large and tertiary acute care facilities; therefore, may not provide appropriate comparison for smaller acute care facilities.

Reporting

Communication and dissemination of surveillance reports is an integral part of surveillance to inform IPC practice within AHS/Covenant Health and provide support for interventions that improve the quality of patient care delivered. Responsibility for compiling, reporting, and disseminating data and reports is shared between AHS/Covenant Health IPC Surveillance and Standards and the AHS/Covenant Health IPC program. Formal reports are generated routinely (usually quarterly) using reconciled and validated data. The reports contain information on symptomatic, hospital-acquired VRI and asymptomatic HA-COVID-19 at the site, zone and provincial level and are presented to the provincial IPC Surveillance, Evaluation, Quality Improvement and Research Committee for approval (Alberta Health Services, 2023).

Data quality

The purpose of evaluating the quality of the data is to ensure that surveillance-related events are monitored efficiently and effectively. The evaluation should involve the assessment of the program (i.e., the protocol and reporting) and system (i.e., electronic data collection tool) attributes, including relevance, simplicity, flexibility, data quality, acceptability, consistency, representativeness, timeliness and stability. Additionally, with increasing use of technology, informatics concerns for surveillance systems need to be addressed. These include evaluating hardware and software, using a standard user interface, applying standard data formatting and coding, performing quality checks and adhering to confidentiality and security standards.

A standardized approach is used to reconcile and validate the data provincially. The first component of data reconciliation and validation of data in the provincial surveillance platform ensures that demographic data are valid and reliable. The second component entails ensuring that the surveillance-related events are entered in a manner that is consistent with the protocol definitions. At this latter stage, outliers are identified, and requests are sent to the ICPs to verify that the data was correctly entered, and definitions were consistently applied according to the provincial surveillance protocol. Final designation of cases is a collaborative effort between the facility-based ICPs and the epidemiologists/analysts of the IPC Surveillance and Standards team.

Further use of statistical software for validating records is still in development. Algorithms are continuously being updated and added to ensure capture of as many discrepancies as possible. In addition to this current process of data review, there will be data audits using external data sources to determine the validity and reliability of the data in the provincial surveillance platform. This data will also serve to inform decisions made by the IPC Surveillance and Standards team to improve surveillance processes and methodologies.

Data quality working group

The IPC Surveillance Data Quality Working Group reports to the IPC Surveillance, Evaluation, Quality Improvement and Research Committee and is responsible to develop, review and update indicator protocols to include the precise methodology for data collection to ensure consistency. Decisions from the Data Quality Working Group on specific protocol questions are communicated to provincial ICPs through the Data Quality Forum and will be included in the protocol User Guide. These decisions will be supplemental to the protocol and will be incorporated into the protocol, when revised.

Protocol revision history

Date	Details
January 20, 2023	Protocol approved by Surveillance Committee.
February 16, 2023	Revision to Symptom Status labels, addition of passes to CA definition, addition of optional data entry (community VRI exposure), revisions to algorithms; update to long-term care definition in Appendix
February 22, 2023	Addition of optional data entry (Community Exposure) and definitions to appendix; removal of passes from CA definition
March 8, 2023	Simplified algorithm titles
April 2023	Changed reporting process from IPC Surveillance Committee to IPC Surveillance, Evaluation, Quality Improvement and Research Committee. Updated references.
May 2023	Updated Algorithm 3 to clarify that direct admission from acute care could qualify as HA-back
April 2024	Removed *Chlamydophila pneumoniae, Coxiella burnetiid and Mycoplasma pneumoniae* from background as they are not VRI pathogens. Clarified use of Connect care to identify positive labs. Updated Case definition titles from “Symptoms related to VRI – Excluding COVID-19” to “VRI symptomatic, excluding COVID-19” and “Symptoms related to COVID-19” to “COVID-19 symptomatic” and “No Symptoms or no new/worsening symptoms (COVID-19 only)” to “COVID-19 no symptoms or no new/worsening symptoms” Clarified what category the symptoms belong to as opposed to just referencing Appendix A. Added clarification in the “Symptoms related to VRI – excluding COVID-19” that symptoms other than those listed above would not meet definition (i.e. gastrointestinal, expanded COVID-19, or multiple symptoms) Added clarification in the “COVID-19 no symptoms or no new/worsening symptoms" that cases where symptom onset was outside of the infection window period of the collection date would be captured under this definition. In case classification, changed from “Primary VRI” to “Meets case definition” and added a Note to clarify that symptom onset date is used for symptomatic cases and collection date is use for no new/worsening symptoms. For clarity, improved language in outcomes, added direction on follow-up process for adverse outcomes during transfers. Added clarity that community exposures do not impact case classifications. Symptom table in Appendix – clarified which symptoms are only used for COVID-19 General and specific definitions updated. Updated references

References

Alberta Health Services. (2023). *Infection Prevention and Control Alberta Health Services and Covenant Health, Action Plan Province-Wide Surveillance Program.*

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Provincial Population and Public Health Infection Prevention and Control Workplace Health and Safety. (2023). Guide for Outbreak Prevention and Control in Acute Care Sites. Retrieved March 2024, from https://www.albertahealthservices.ca/assets/info/hp/cdc/if-hp-cdc-ob-guide-for-outbreak-prevention-and-control-in-acute-care-sites.pdf.

Appendix A: VRI protocol-specific definitions

Terms	Definitions
Eligible viral respiratory pathogens	Adenovirus
	Coronavirus (not COVID-19)
	COVID-19
	Enterovirus/Rhinovirus
	Enterovirus 68
	Influenza A H1
	Influenza A H3
	Influenza B
	Influenza, non-typable
	Human metapneumovirus (HMPV)
	Parainfluenza 1, 2, 3, 4
	Respiratory Syncytial Virus (RSV)
Community exposure	Patient may have been exposed to a visitor, relative or designated support person who had the same VRI, while admitted to a facility under surveillance. **OR** Patient spent time away from the facility under surveillance, while remaining admitted to their inpatient bed.
Epidemiological Link	A case is thought to be epidemiologically linked to another person(s) or healthcare worker(s) with a VRI in a facility (e.g., shared same room, same ward/unit or same caregiver as a known patient/resident with the same VRI)
Infection window period	The 7-days during which all site-specific infection criteria must be met. It includes the day of the first positive diagnostic test (i.e. lab specimen collection, imaging test, procedure or exam, physician diagnosis and initiation of treatment) that is an element of the site-specific infection criterion, was obtained, the 3 calendar days before and the 3 calendar days after. For site-specific infection criteria that do not include a diagnostic test, the first documented localized sign or symptom that is an element of National Healthcare Safety Network infection criterion, excluding SSIs, should be used to define the window (i.e., diarrhea, site specific pain, purulent exudate).

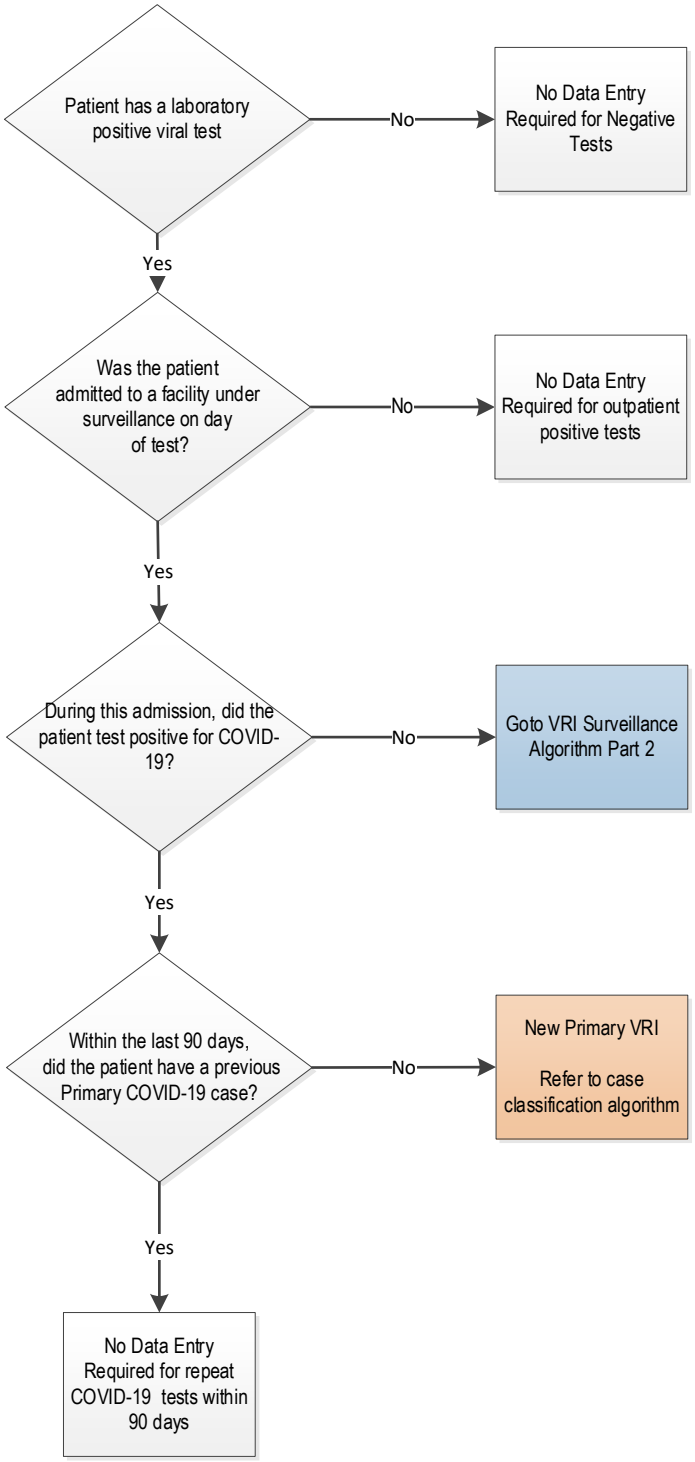
Symptoms	Definitions
Respiratory	Cough, Shortness of breath, difficulty breathing, decreased O2 saturation or increased O2 requirement, Sore throat/painful swallowing/hoarse voice, Runny nose/nasal congestion/sneezing
Gastrointestinal (COVID-19 only)	Vomiting (at least one episode), diarrhea (at least one episode)
Core	Fever/chills/rigors Adults >37.8°C; Pediatrics ≥38.0°C; loss of/change to sense of smell (anosmia)/taste (dysgeusia)
Expanded (COVID-19 only)	Headache, myalgia (muscle pain)/arthralgia (joint pain), Fatigue/extreme exhaustion, Nausea/sudden loss of appetite, conjunctivitis/red eye/chemosis (conjunctival edema), Any additional symptoms at clinician's discretion (e.g., skin manifestations such as "COVID-19 toes")

Appendix B: General surveillance definitions

Terms	Definitions
Encounter types	Type of AHS/Covenant Health healthcare location or facility where the patient is located at the time of identification. The following encounter types are referred to in acute care surveillance protocols (Government of Alberta, 2008; Government of Alberta, 2024). • **Inpatient acute care:** Refers to a General Hospital: According to the Hospitals Act, a general hospital is defined as a "hospital providing diagnostic services and facilities for medical or surgical treatment in the acute phase for adults and children and obstetrical care" (Government of Alberta, 2022). General hospitals have several functional centres. Each functional centre is associated with inpatient, outpatient, or diagnostic and therapeutic services. • **Inpatient mental health/rehab**: A designated mental health facility providing diagnosis and treatment for mental illness and addiction in the acute phase for adults and children. Inpatient services refer to a person admitted to and assigned a bed in a facility by order of a physician for provision of diagnostic and/or treatment services. They would have a patient/group room in which inpatient services are provided within the patient's room or within a common group room within the designated mental health facility. AHS facility examples include Glenrose Rehabilitation Hospital, Centennial Centre for Mental Health and Brain Injury.
Infection prevention and control baseline	A comparator rate created for each acute care facility in the IPC Surveillance on-line dashboards and reporting modules, to guide efforts to reduce healthcare-associated infections. The IPC baseline is based on reported monthly rates for the previous fiscal year. The calculation excludes the monthly rates higher than 1 Standard Deviation above the 12-month average but includes all rates where the site had optimal performance. This calculation method biases the IPC baseline rate towards zero, to focus on the best patient safety outcomes.
Long-term care	Long term care facilities include auxiliary hospitals and nursing home that are reserved for those with unpredictable and complex health needs who require 24-hour nursing care. Residents of long-term care facilities usually have multiple chronic and/or unstable medical conditions. Specialized services such as respite, palliative care, case management, rehabilitation therapy, as well as services for advanced Alzheimer's and dementia are available at these facilities. A list of certified long-term care facilities in Alberta Health Services can be found on the COMMON-PROVINCIAL Surveillance drive. In this file, if the site has "LTC" listed in the "Accommodation Subtype II" column, it will qualify as a LTC site. If the site has "LTC" AND another type (i.e. subacute in LTC) listed in the column we would assume they are from a site that offers LTC.
Patient admission (aka inpatient admission)	A person admitted to and assigned a bed in a hospital by the order of a physician, for the provision of diagnostic or treatment services or both. Includes any time in the emergency department where the patient is subsequently transferred to an inpatient unit. This is the denominator used for non-hospital-acquired rates (see Rate Calculation Section) (Government of Alberta, 2024).
Patient days (aka inpatient days)	As defined by AHS, this is used to create the denominator for hospital-acquired or hospital-identified cases. The total is equal to midnight census with patients admitted and discharged on the same day counted as a one day stay. It includes patients out on a pass. Day of admission is counted but the day of separation (discharge, death or transfer out of hospital) is not counted. Patient-days are included for inpatient encounters where discharge date is not recorded in the data source. Inpatient totals exclude the time patients are waiting in the emergency department for an inpatient bed (time from decision to admit to discharge from emergency department).

Terms	Definitions
Emergency department inpatient days (EDIP)	As defined by AHS, denominators for provincial surveillance modules include these figures in the total patient-days. Includes the number of acute care inpatient patient-days utilized in the emergency department during the reporting period. The figures reflect the time from emergency department discharge (i.e. decision to admit) to emergency department departure for patients admitted to an acute care hospital. It is calculated as [(emergency department departure date and time – emergency department discharge date and time) ÷ 60 ÷ 24]. Figures exclude cases where the emergency department discharge date and time or emergency department departure date and time were not provided, or the value has a negative number.

Appendix C: Hospital-acquired VRI provincial surveillance algorithm



Algorithm #1: COVID-19

For patients with different VRI pathogens in the same infection event, all the VRI pathogens will be captured as one Primary VRI case, with multiple pathogens selected

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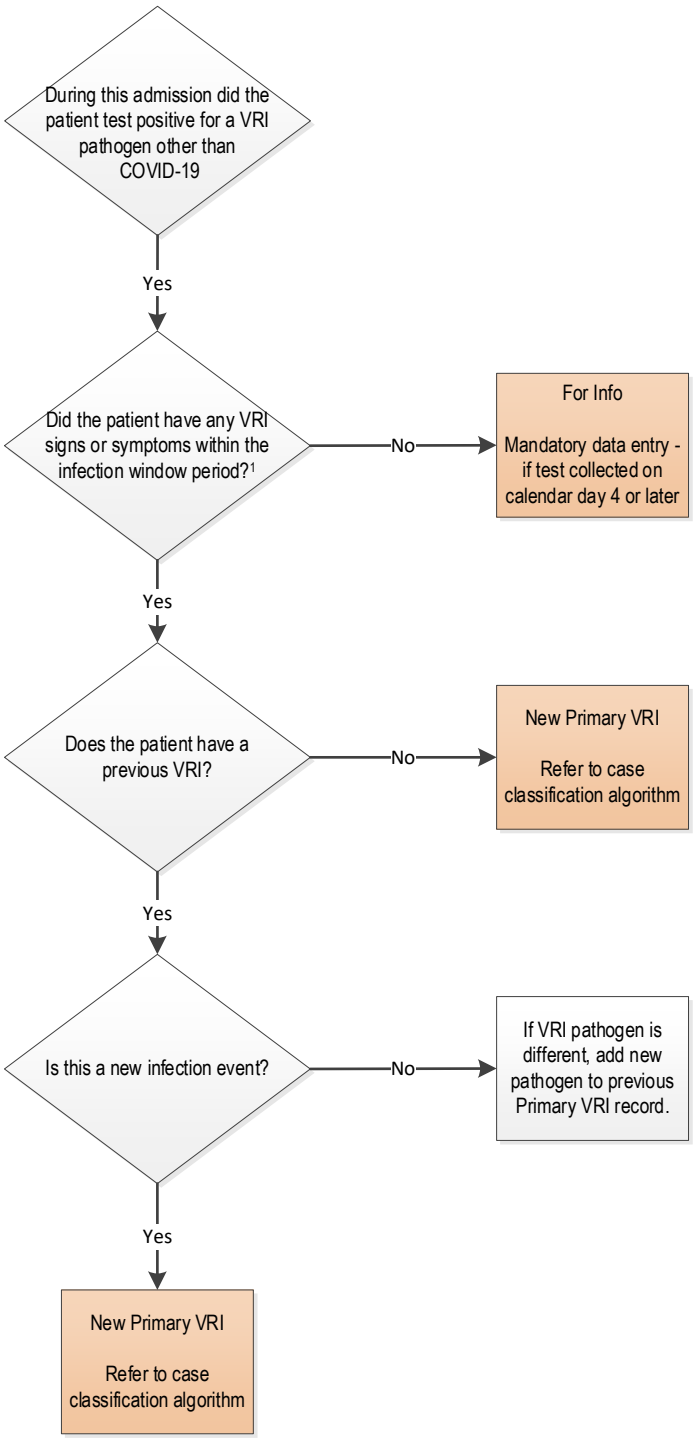
Algorithm #2
VRI, not COVID-19



For patients with different VRI pathogens in the same infection event, all the VRI pathogens will be captured as one Primary VRI case, with multiple pathogens selected

NOTE:

[1]**At least one of the following signs or symptoms within the infection window period:** Cough, shortness of breath, difficulty breathing, decreased O_2 saturation or increased O_2 requirement, sore throat/ painful swallowing/hoarse voice, runny nose/nasal congestion/sneezing; fever/chills/rigors: Adults: >37.8°C; Pediatrics ≥38.0°C

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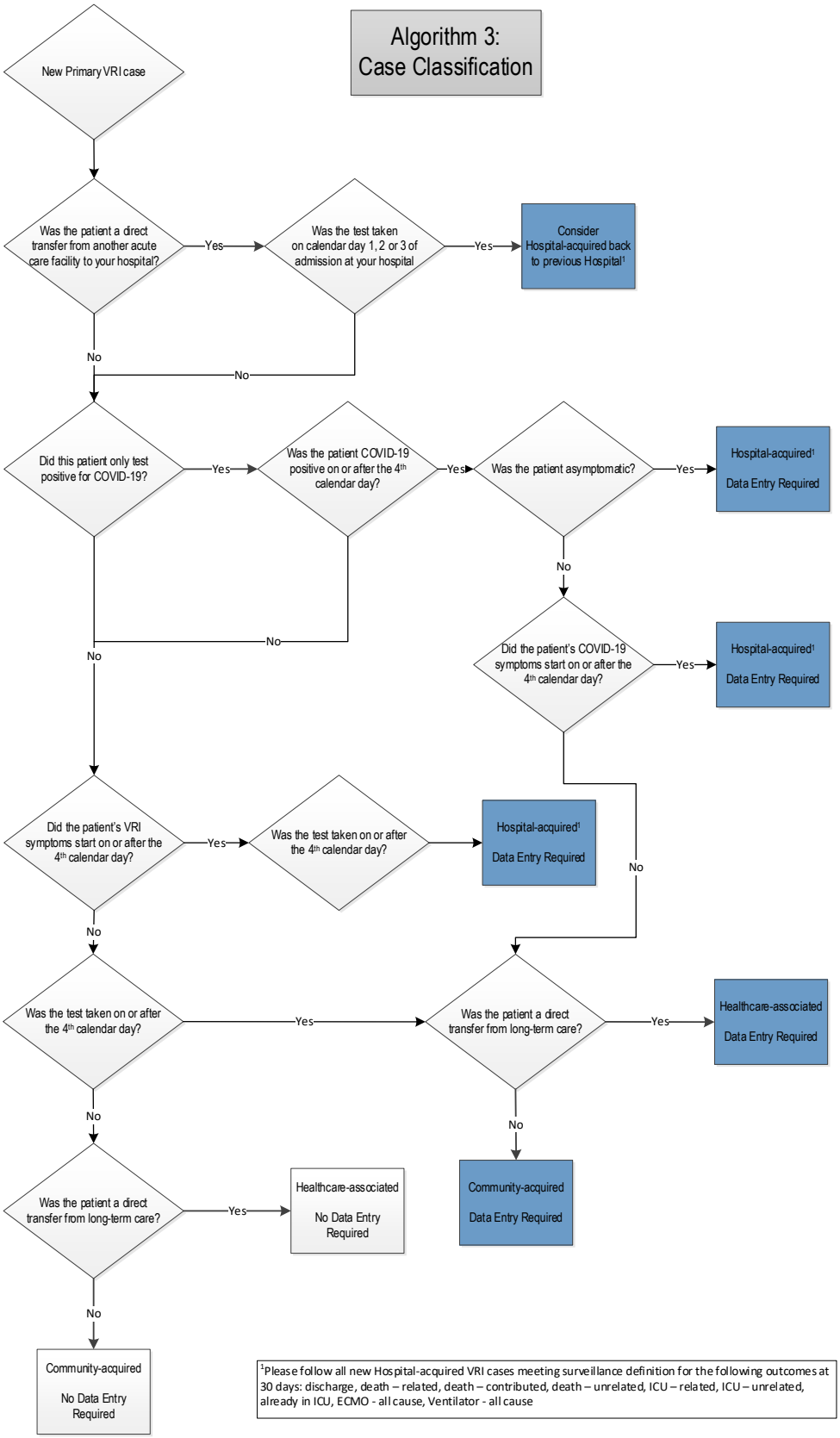

[1]Please follow all new Hospital-acquired VRI cases meeting surveillance definition for the following outcomes at 30 days: discharge, death – related, death – contributed, death – unrelated, ICU – related, ICU – unrelated, already in ICU, ECMO - all cause, Ventilator - all cause

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Appendix D: Case examples

For more examples see the Data Entry User Guide in the Help section of our provincial surveillance platform.

Case #1: Multiple viral tests, same admission
On January 10, 2022, a patient develops a new cough and tests positive for both hospital-acquired COVID-19 and hospital-acquired RSV on the same test result during the same hospital admission after a week-long admission.
Rationale
As this is the same hospitalization and the same respiratory event, patient would get one new primary, hospital-acquired VRI, with both COVID-19 and RSV captured in the single record.
Case #2: Multiple viral tests, same admission
Patient is admitted on January 15th and is positive for hospital-acquired Influenza on Feb 1st. The patient also tests positive for hospital-acquired RSV March 15th, with new onset of cough, during the same hospital admission. The patient's respiratory infection had resolved prior to testing positive for RSV on March 15th.
Rationale
Since the patient's respiratory symptoms had resolved after the influenza event and then reoccurred at the time of testing positive for RSV, the patient would require two primary hospital-acquired VRI event entries - one for the hospital-acquired Influenza and one for the hospital-acquired RSV.
Case #3: Multiple viral tests, multiple admissions
On Aug 1, 2021, a patient tests positive for hospital-acquired Influenza A viral respiratory infection and is hospitalized from July 1 to Aug 8, 2021. The patient is hospitalized again on Dec 6, 2021, and starts to have a runny nose and cough on December 11. A rapid COVID/RSV/Flu test is ordered and results as positive for RSV on December 11, 2021.
Rationale
As these are two separate hospitalizations and represent two separate respiratory events, the patient would get two NEW hospital-acquired VRI (one for the hospital-acquired Influenza A infection and one for the hospital-acquired RSV infection).