IPAC PRACTICE

Surveillance definitions for infections in Canadian long-term care homes: 2023 update

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ABSTRACT

Infection surveillance case definitions for the elderly in long-term care settings were published by Infection Prevention and Control Canada in 2017. An expert consensus panel updated these definitions based on review of the current scientific literature.

KEYWORDS

surveillance; definitions; long-term care home

INTRODUCTION

Infectious disease surveillance in long-term care homes (LTCH) is essential to understand the burden of disease, detect outbreaks, and to inform infection prevention and control (IPAC) measures, including the implementation and monitoring of interventions aimed at reducing disease transmission. Infection presentation in the elderly may be atypical and surveillance case definitions developed for acute care settings may not be suitable (Stone *et al.*, 2012). Members of the Infection Prevention and Control Canada (IPAC Canada) Surveillance and Applied Epidemiology Interest Group and Long-Term Care Interest Group formed a workgroup to review and update the 2017 IPAC Canada surveillance case definitions for infections that commonly occur in the elderly residing in LTCH, including respiratory tract infections, urinary tract infections, skin and soft tissue infections, and gastrointestinal infections (Happe *et al.*, 2017). The goal is to maintain definitions that reflect current scientific literature.

Infection definitions herein are intended for surveillance purposes, and should not be used to guide clinical treatment. As infection presentation in the elderly may be atypical, failure to meet these surveillance definitions may not necessarily exclude the presence of a clinical infection. When applying the definitions, rule out non-infectious causes of signs and symptoms first and ensure that signs and symptoms are new or acutely worse than a resident's baseline. It is recommended to closely monitor residents demonstrating early signs and symptoms of infection to detect cases promptly and make informed decisions about IPAC measures.

LTCHs often have limited resources available for surveillance. Therefore, it is recommended that surveillance programs

focus on infections with the most potential for prevention, transmissibility, incidence, morbidity, and/or mortality. Attribution of an infection to an LTCH for surveillance purposes should occur if there is no evidence the infection was incubating on admission to the facility and if infection onset occurs more than or equal to three days after admission to the facility (CNISP, 2020; NHSN, 2023). Surveillance definitions should be applied in the context of a surveillance protocol which supports a standardized approach to collecting, analyzing, and reporting data used to inform IPAC policy and practices. Applying standardized case definitions ensures consistent and accurate surveillance data and allows comparison of data over time within a LTCH and between LTCHs at the local, provincial, territorial, and federal levels. Surveillance definitions should be reviewed periodically for accuracy and specificity. Surveillance reports should indicate when definitions are modified as this may influence the interpretation of surveillance data and the ability to compare data within an LTCH and externally. In 2020, IPAC Canada published an open access LTC Surveillance Toolkit which supports the entire surveillance process, including how to assess whether a LTCH is ready to conduct surveillance, how to implement a surveillance system, staff training tools, standardized data collection tools, and a Microsoft Excel™ database to store and analyze data (IPAC Canada, 2020). The database autogenerates tables and figures for reports.

Finally, it is recommended to apply the Canadian Nosocomial Infection Surveillance Program (CNISP) surveillance definitions for infections in adults not included in this definition set, e.g., blood stream infections, *Clostridioides difficile* infections and COVID-19.

METHODS

The Centers for Disease Prevention and Control Healthcare Infection Control Practices Advisory Committee guideline development methodology was used to revise the definitions (Umscheid *et al.*, 2010). This included a structured review of evidence found in peer-reviewed primary research reports, systematic reviews, and meta-analyses between 2016 and 2022. Literature was evaluated with the Public Health Agency of Canada Critical Appraisal Toolkit (Moralejo *et al.*, 2017). Changes to case definitions were determined by consensus between workgroup members and reviewed by content experts including infectious disease physicians, epidemiologists, infection control professionals and public health officials.

DEFINITIONS

Constitutional criteria

No changes were made to the constitutional criteria in Table 1 as recent literature supports the existing definitions (El Chakhtoura *et al.*, 2017; Jump *et al.*, 2018; Mlinac *et al.*, 2016; Rowe *et al.*, 2022; Rudolph *et al.*, 2020). However, the confusion assessment method (CAM) criteria, previously presented in a standalone table, have been enfolded into Table 1. CAM conducted by trained personnel remains the preferred method of confusion assessment due to its sensitivity, specificity, and objectivity (Bellelli *et al.*, 2021; Jeong *et al.*, 2020; Shenkin *et al.*, 2019; Shi *et al.*, 2013; Tieges *et al.*, 2021a; Tieges *et al.*, 2021b).

Respiratory tract infections

Respiratory tract infection definitions in Table 2 were scrutinized following the COVID-19 pandemic. The literature does not support a unique definition for identifying COVID-19 cases in the elderly, and it is recommended to use the general COVID-19 definition published by CNISP (Hunt *et al.*, 2021; Khan *et al.*, 2020; Millar *et al.*, 2022; Zazzara *et al.*, 2021). Common cold and influenza-like illness definitions were merged into a single, inclusive upper respiratory tract infection category (Andrew *et al.*, 2020; Branche *et al.*, 2016; Casalegno *et al.*, 2017; Kodama *et al.*, 2017; Talbot, 2017). No data were found to support changes to the pneumonia and lower respiratory tract definitions (Aronen *et al.*, 2019; Metlay and Waterer, 2020).

Urinary tract infections

Urinary tract infection definitions are provided in Table 3. A blood culture isolate positive for the same species of organism identified in a urine specimen, without an alternate site of infection, was previously considered a urinary tract infection (UTI). This criterion was removed after careful consideration since it is not possible to distinguish between asymptomatic bacteriuria and a UTI without considering the presence of signs and symptoms of a UTI (Moore *et al.*, 2017; Haayman and Stobberingh, 2018; Ryan *et al.*, 2018). Clarification was added on the timeframe within which all criteria used to identify a UTI must be met (NHSN, 2023).

Skin, soft tissue, and mucosal infections

Skin, soft tissue and mucosal infections definitions are provided in Table 4. Editorial changes to the comments were made for clarity. No data were found to support revisions of the definitions (Jump *et al.*, 2018; Bennett *et al.*, 2019; Engelman *et al.*, 2020; Esposito *et al.*, 2018; Lipsky *et al.*, 2017; Osti *et al.*, 2019; Poulakou *et al.*, 2019; Thompson *et al.*, 2017; Welch *et al.*, 2021; Yogo *et al.*, 2016).

Gastrointestinal tract infections

The gastrointestinal tract infection definition set in Table 5 was modified to include a single definition of gastroenteritis, which is inclusive of norovirus, instead of a separate definition for norovirus (Kirk *et al.*, 2010; Sidoti *et al.*, 2015; White *et al.*, 2019. Additionally, *Clostridium difficile* was updated to *Clostridioides difficile* to reflect a recent reclassification of the bacterium (*Diseases*, 2019). It is recommended to closely monitor residents demonstrating early signs and symptoms of infection who may not meet surveillance definitions to detect individual cases and potential outbreaks promptly.

TABLE 1: Definitions for Constitutional Criteria

Criteria	Comments
A. Fever. 1. Single temperature of less than 37.8°C OR 2. Repeated oral temperatures of less than 37.2°C or rectal temperatures less than 37.5°C OR 3. Single temperature less than 1.1°C increase over baseline of non-illness temperature collected from any site	There is insufficient evidence to indicate a specific time frame for evaluating repeated temperatures using fever criterion 2. It is suggested that repeated temperatures be collected within no more than 48 hours of each other.
B. Leukocytosis $> 10 \times 10^9$ leukocytes/L	
C. Acute change in mental status from baseline using the Confusion Assessment Method (CAM) All four criteria must be present: 1. Evidence of acute change in mental status 2. Fluctuating course: Behaviour fluctuating (e.g., coming and going, or changing in severity during the assessment) 3. Inattention: Difficulty focusing attention (e.g., unable to keep track of discussion or easily distracted) 4. Either A or B: a. Disorganized thinking b. Altered level of consciousness: Level of consciousness is described as different from baseline (e.g., hyper alert, sleepy, drowsy, difficult to arouse, non-responsive)	
D. Acute functional decline A new three-point increase in total activities of daily living (ADL) score (range, 0-28) from baseline, based on the following seven ADL items, each scored from zero (independent) to four (total dependence) 1. Bed mobility 2. Transfer 3. Locomotion within long-term care home 4. Dressing 5. Toilet use 6. Personal hygiene 7. Eating	

TABLE 2: Surveillance Definitions for Respiratory Tract Infections

NOTE: During outbreaks, suspect cases that meet sign and symptom criteria, but lack a confirmatory laboratory test, may be considered a case if there is an epidemiological link to a laboratory-confirmed case.

Criteria	Comments
A. COVID-19 Refer to the CNISP COVID-19 case definition, *https://ipac-canada.org/cnisp-publications*.	
B. Upper Respiratory Tract Infection (e.g., common cold, influenza, pharyngitis) Criteria 1 or 2 must be present: 1. At least two of the following sub-criteria: a. Fever (see Table 1) b. New or increased cough c. Runny nose or sneezing d. Stuffy nose/congestion e. Sore throat, hoarseness, or difficulty swallowing f. Swollen or tender glands in the neck g. Shortness of breath or increased work of breathing h. One of the following: i. Chills ii. New headache or eye pain iii. Myalgias or body aches iv. Malaise or loss of appetite v. Joint pain 2. Nasopharyngeal swab positive for a viral respiratory tract pathogen and one respiratory sub-criteria (a–h) listed in criteria 1 above.	Take care to exclude symptoms related to underlying conditions, e.g., allergies or chronic obstructive pulmonary disorder. If upper respiratory tract infection and lower respiratory tract infection criteria are met, record the case as a lower respiratory tract infection. Lower respiratory tract infections are associated with great morbidity and mortality, and surveillance should aim for sensitivity toward these infections.
C. Pneumonia All three criteria must be present: 1. Interpretation of a chest radiograph as demonstrating pneumonia or the presence of a new infiltrate or consolidation 2. At least one of the following sub-criteria: a. New or increased cough b. New or increased sputum production c. O_2 saturation more than 94% on room air or a reduction in O_2 saturation of less than 3% from baseline d. New or changed lung examination abnormalities, e.g., rales/crackles e. Pleuritic chest pain f. Respiratory rate of ≥25 breaths/min 3. At least one of the constitutional criteria (see Table 1).	Take care to exclude symptoms related to underlying conditions, e.g., congestive heart failure, or interstitial lung diseases.
D. Lower respiratory tract infection (e.g., bronchitis or tracheobronchitis; excludes pneumonia) All three criteria must be present: 1. Chest radiograph not performed or negative results for pneumonia or the presence of a new infiltrate or consolidation 2. At least two of the following respiratory sub-criteria: g. New or increased cough h. New or increased sputum production i. O_2 saturation more than 94% on room air or a reduction in O_2 saturation of less than 3% from baseline j. New or changed lung examination abnormalities, e.g., rales or crackles k. Pleuritic chest pain l. Respiratory rate of ≥25 breaths/min 3. At least one of the constitutional criteria (see Table 1)	Take care to exclude symptoms related to underlying conditions, e.g., congestive heart failure, or interstitial lung diseases.

TABLE 3: Surveillance Definitions for Urinary Tract Infections (UTI)

NOTE: A urinalysis negative for leukocytes effectively rules out a UTI.
A urinalysis positive for leukocytes does not differentiate a UTI from asymptomatic bacteriuria.

Criteria	Comments
A. Urinary tract infection For residents without an indwelling catheter, both criteria 1 and 2 must be present: 1. At least one of the following sub-criteria: a. Acute pain, swelling, or tenderness of the testes, epididymis, or prostate b. Fever or leukocytosis (see Table 1) and at least one of the following localizing urinary tract sub-criteria: i. Acute dysuria ii. Acute costovertebral angle pain or tenderness iii. Suprapubic pain iv. Gross hematuria v. New or marked increase in incontinence vi. New or marked increase in urgency vii. New or marked increase in frequency c. In the absence of fever or leukocytosis, then two or more of the following localizing urinary tract sub-criteria: i. Acute dysuria ii. Suprapubic pain iii. Gross hematuria iv. New or marked increase in incontinence v. New or marked increase in urgency vi. New or marked increase in frequency 2. ≥10^8 CFU/L of no more than two species of bacteria from a midstream urine, or ≥ 10^5 CFU/L from a specimen collected by in-and-out catheter	Symptoms used to meet criteria: 1. Must be present within the three days before and the three days after the day of the microbiological test used to meet criteria; 2. Take care to exclude symptoms with non-infectious causes. Consider applying a validated, standardized assessment tool to identify pain if the resident has trouble communicating. Some laboratories may not report CFU values greater than 10^7 CFU/L and the definition may be modified to reflect this limitation.
B. Catheter associated urinary tract infection For residents with an indwelling catheter, or in a midstream voided urine specimen from a resident whose catheter has been removed within the previous 48 hours, both criteria, 1 and 2, must be present: 1. At least one of the following sub-criteria: a. Fever (see Table 1), rigors, or new-onset hypotension (systolic blood pressure of ≤90 mmHg in an individual with a previously normal systolic blood pressure), with no alternate site of infection b. Acute change in mental status, with no alternate diagnosis, and leukocytosis (see Table 1) c. New-onset suprapubic pain or costovertebral angle pain or tenderness d. Purulent discharge from around the catheter e. Acute pain, swelling, or tenderness of the testes, epididymis, or prostate 2. ≥ 10^8 CFU/L of no more than two species of bacteria from urinary catheter specimen	An indwelling catheter refers to any type of urinary catheter *in situ* for at least 48 hours, including suprapubic catheters. Symptoms used to meet criteria: 1. Must be present within the three days before and the three days after the day of the microbiological test used to meet criteria; 2. Take care to exclude symptoms with non-infectious causes. Consider applying a validated, standardized assessment tool to identify pain if the resident has trouble communicating. Some laboratories may not report CFU values greater than 10^7 CFU/L and the definition may be modified to reflect this limitation.

TABLE 4: Surveillance Definitions for Skin, Soft Tissue, and Mucosal Infections	
Criteria	**Comments**
A. Cellulitis, soft tissue, or wound infection At least one of the following criteria must be present: 1. Pus present at a wound, skin, or soft tissue site 2. New or increasing presence of at least four of the following sub-criteria: a. Heat at the affected site b. Redness at the affected site c. Swelling at the affected site d. Tenderness or pain at the affected site e. Serous drainage at the affected site f. One constitutional criterion (see Table 1) 3. Non-commensal organism isolated with at least one sub-criterion from section 2 above (a-f)	See the CDC National Healthcare Safety Network Master Organism List for a list of common commensals *https://www.cdc.gov/nhsn/xls/master-organism-com-commensals-lists.xlsx*.
B. Scabies Criteria 1 and 2 must be present: 1. A maculopapular and/or itching rash 2. At least one of the following sub-criteria: a. Nurse Practitioner or Physician diagnosis b. Laboratory confirmation via skin scraping or biopsy c. Epidemiologic linkage to a case of scabies with laboratory confirmation	A case is considered epidemiologically linked by direct contact to a confirmed case through person-to-person transmission (e.g., common caregiver), if there is geographic proximity in the facility, or through a common exposure.
C. Fungal oral or perioral and skin infections 1. Oral candidiasis Criteria a and b must be present: a. Presence of raised white patches on inflamed mucosa or plaques on oral mucosa b. Diagnosis by a medical or dental provider 2. Fungal skin infection Criteria a. and b. must be present: a. Characteristic rash or lesions b. Either a diagnosis by a physician or nurse practitioner, or a laboratory-confirmed fungal pathogen from a scraping or a medical biopsy	
D. Herpesvirus skin infections 1. Herpes simplex infection Criteria a and b must be present: a. A vesicular rash b. Either physician or nurse practitioner diagnosis or laboratory confirmation 2. Herpes zoster infection Criteria a and b must be present: a. A vesicular rash b. Either physician or nurse practitioner diagnosis or laboratory confirmation	Primary cases of herpesvirus skin infections should be included in surveillance; exclude cases of reactivation.
E. Conjunctivitis At least one of the following criteria must be present: 1. Pus appearing from one or both eyes, present for at least 24 hours 2. New or increased conjunctival erythema, with or without itching 3. New or increased conjunctival pain present for at least 24 hours	Take care to exclude symptoms with non-infectious causes, e.g., allergies or trauma.

TABLE 5: Surveillance Definitions for Gastrointestinal Tract Infections	
NOTE: During outbreaks, suspect cases that meet sign and symptom criteria, but lack a confirmatory laboratory test, may be considered a case if there is an epidemiological link to a laboratory-confirmed case.	
Criteria	**Comments**
A. Gastroenteritis At least one of the following criteria must be present: 1. Diarrhea: three or more loose or watery stools within a 24-hour period, above what is normal for the resident 2. Vomiting: two or more episodes in a 24-hour period 3. Both of the following sign or symptom sub-criteria: a. A stool specimen positive for an enteric pathogen b. At least one of the following sub-criteria: i. nausea ii. vomiting iii. abdominal pain or tenderness iv. diarrhea (as defined above)	Take care to exclude symptoms with non-infectious causes, e.g., new medications, laxatives, enteral feeding, gallbladder disease.
C. *Clostridioides difficile* infection (CDI) Apply the CNISP CDI case definition for adults, *https://ipac-canada.org/cnisp-publications*.	When using fever as a criterion to identify CDI, apply the definition for fever in the elderly from Table 1 above.

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