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Health Quality Ontario

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Diagnosing and Managing Early Lyme Disease in Ontario

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Public Health Ontario Grand Rounds

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Overview

- Epidemiology of Lyme disease in Ontario
- Description of the three clinical stages of Lyme disease
- Diagnostic testing for Lyme disease
- Use of the Health Quality Ontario Clinical Guidance Document: Management of Tick Bites and Investigation of Early Localized Lyme Disease
- Case studies

Lyme Disease (Lyme borreliosis)

- Vector-borne disease caused by infection with the spirochaete *Borrelia burgdorferi* in North America
- In Ontario, *B. burgdorferi* is transmitted by the bite of an infected blacklegged tick (*Ixodes scapularis*) that has been attached for sufficient time to a human host (> 24 hours)
- Has a range of clinical manifestations and is diagnosed through clinical symptoms and serological testing

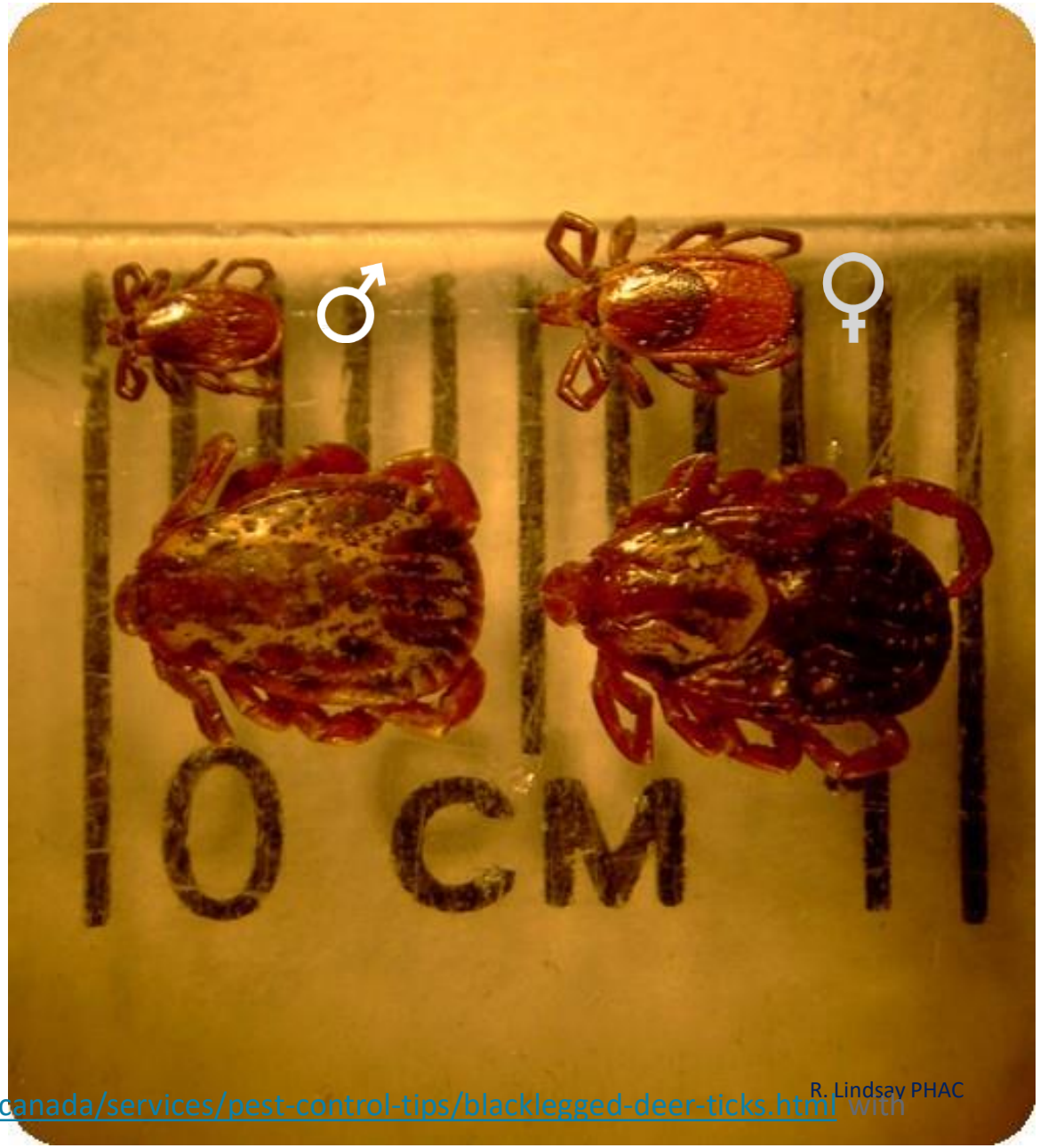
The Blacklegged Tick

The blacklegged tick (*Ixodes scapularis*) is the vector responsible for transmitting Lyme disease in Ontario

Source: https://www.canada.ca/en/health-canada/services/pest-control-tips/blacklegged-deer-ticks.html with permission from R Lindsay at PHAC

Blacklegged Tick

American Dog Tick



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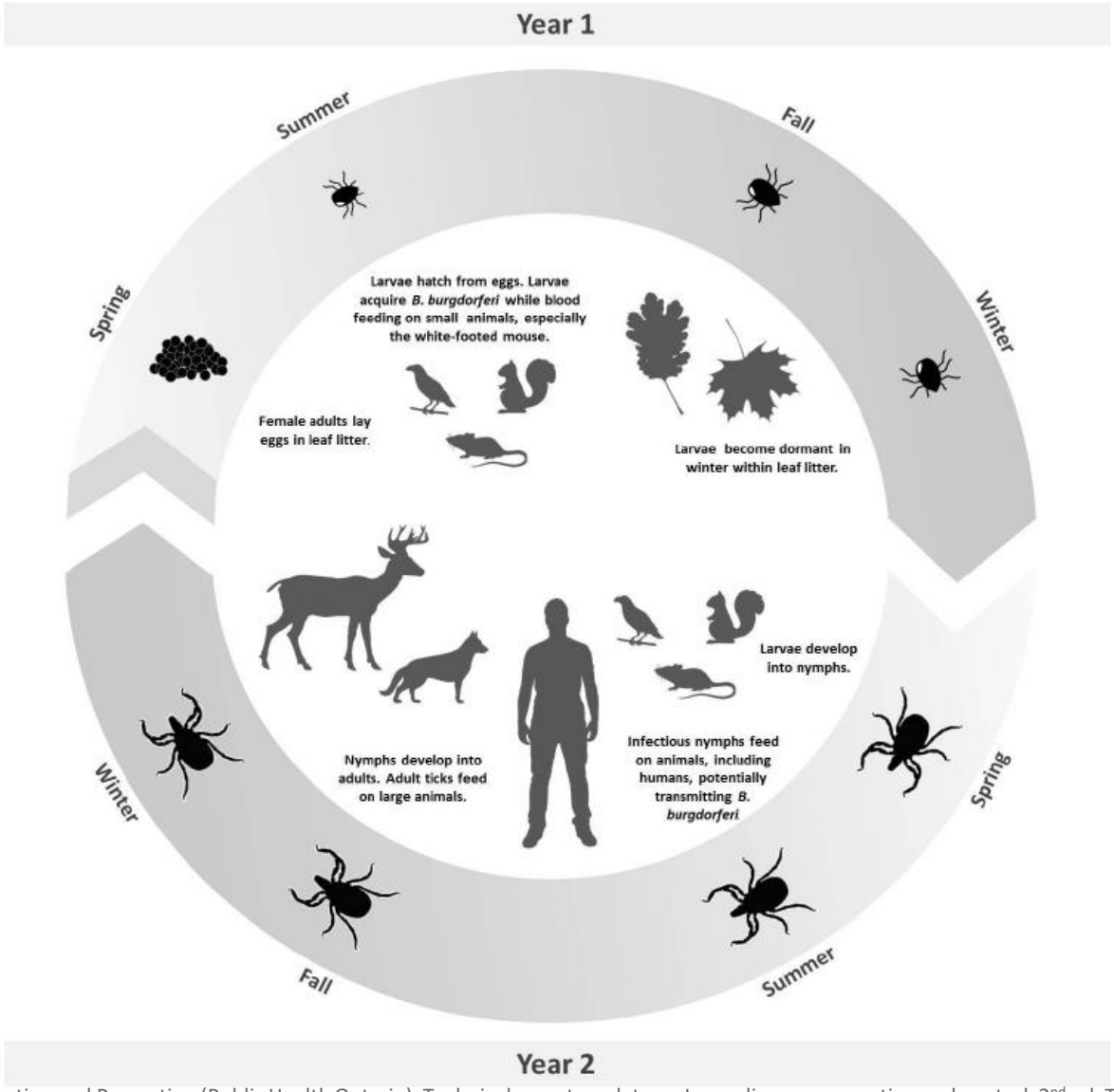
Life Cycle of a Blacklegged Tick



Source: Ontario Agency for Health Protection and Promotion (Public Health Ontario). Technical report: update on Lyme disease prevention and control. 2nd ed. Toronto, ON: Queen's Printer for Ontario; 2016. Available from: http://www.publichealthontario.ca/en/eRepository/Technical_report_update_on_Lyme_disease_prevention_and_control.pdf

Lyme Disease Transmission

- Nymphal ticks are most likely to transmit *B. burgdorferi* because they are:
  - active at times when humans are most often in areas where ticks live
  - small so easy to miss on the person
- The incidence rate of Lyme disease in humans peaks in late spring/summer, when nymphal ticks are active

Steere AC, Strle F, Wormser GP, Hu LT, Branda JA, Hovius JW, et al. Lyme borreliosis. Nat Rev Dis Primers. 2016;2:16090. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5539539/
Shapiro ED. *Borrelia burgdorferi* (Lyme disease). Pediatr Rev. 2014;35(12):500-9. Available from: https://pedsinreview.aappublications.org/content/35/12/500.long

Blacklegged Tick Size Comparison

R. Lindsay PHAC

R. Lindsay PHAC

Source: https://www.canada.ca/en/health-canada/services/pest-control-tips/blacklegged-deer-ticks.html with permission from R Lindsay at PHAC

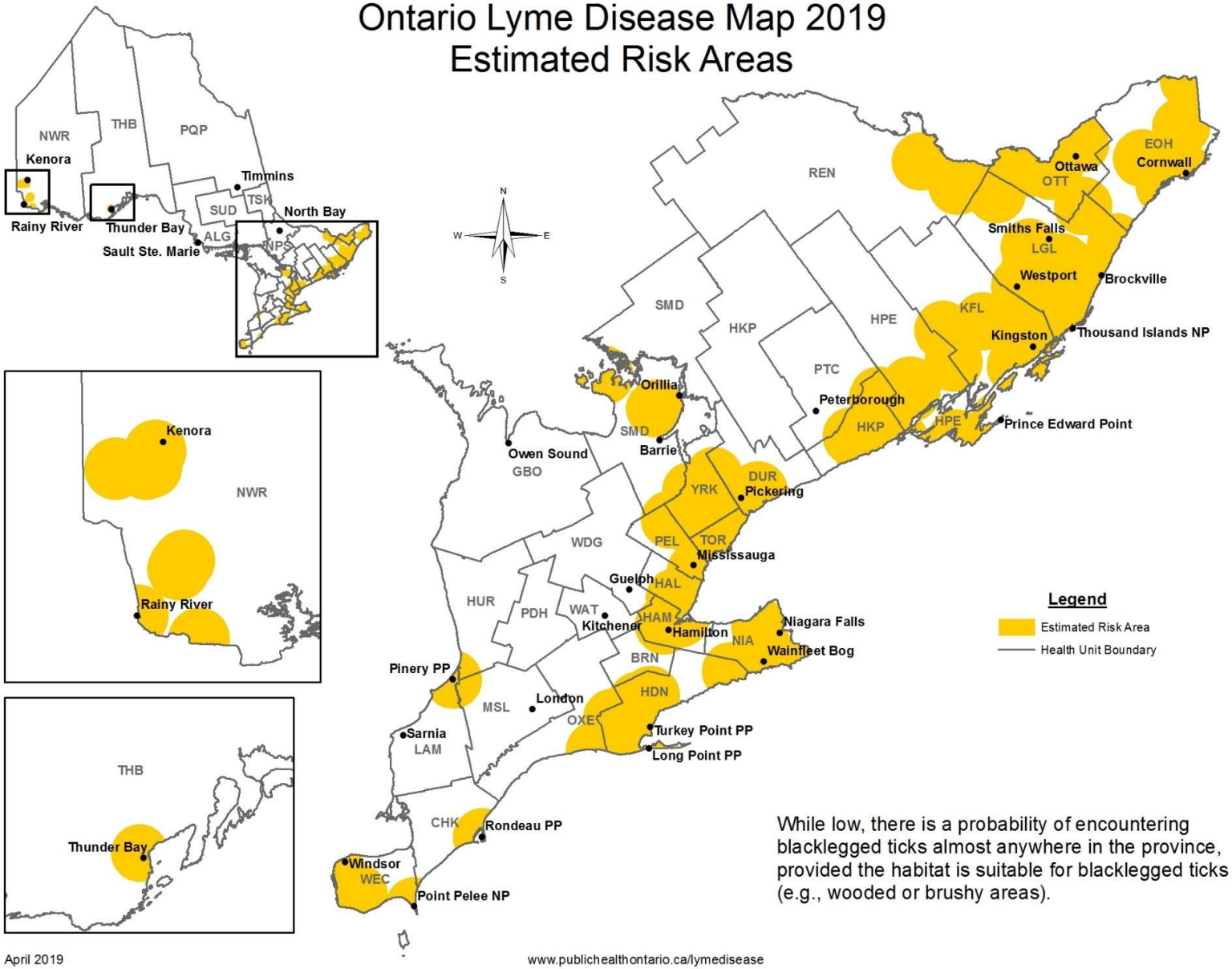
Lyme Disease Surveillance in Ontario

Passive Surveillance

- Ticks are submitted by the public or physicians
- Ticks are identified at the species level
- Tick testing – blacklegged ticks tested for *Borrelia burgdorferi*
- Human case surveillance – cases reported through reportable disease system (iPHIS)

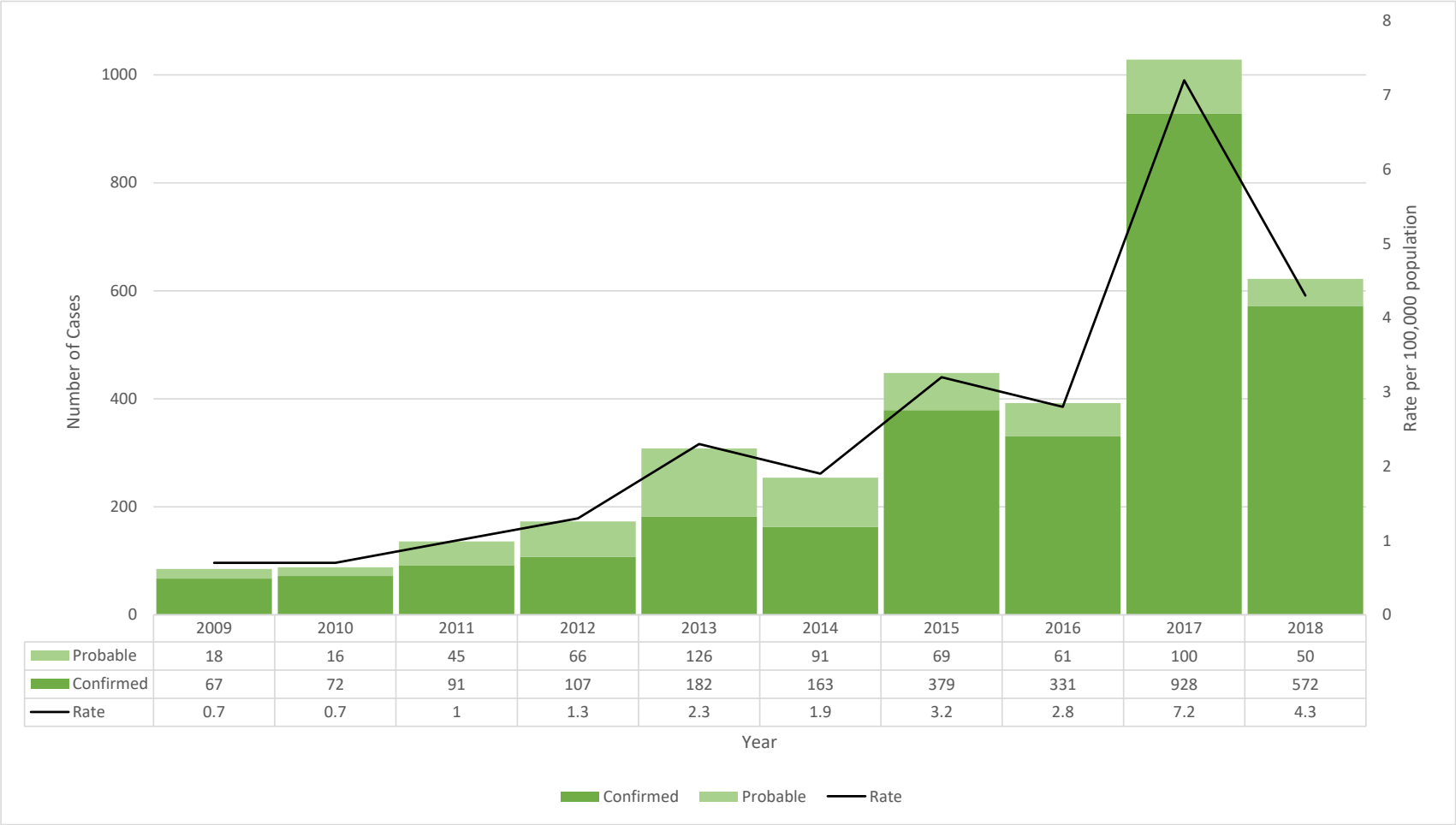
Active Surveillance (looking for ticks in the environment)

- Tick dragging – determine estimated risk areas
- Small mammal trapping – trapping rodents to test them and their ticks for *B. burgdorferi*



Ontario Agency for Health Protection and Promotion (Public Health Ontario). Ontario Lyme disease map 2019: estimated risk areas. Toronto, ON: Queen's Printer for Ontario; 2019. [cited 2019 May 10]. Available from: https://www.publichealthontario.ca/-/media/documents/lyme-disease-risk-area-map-2019.pdf?la=en

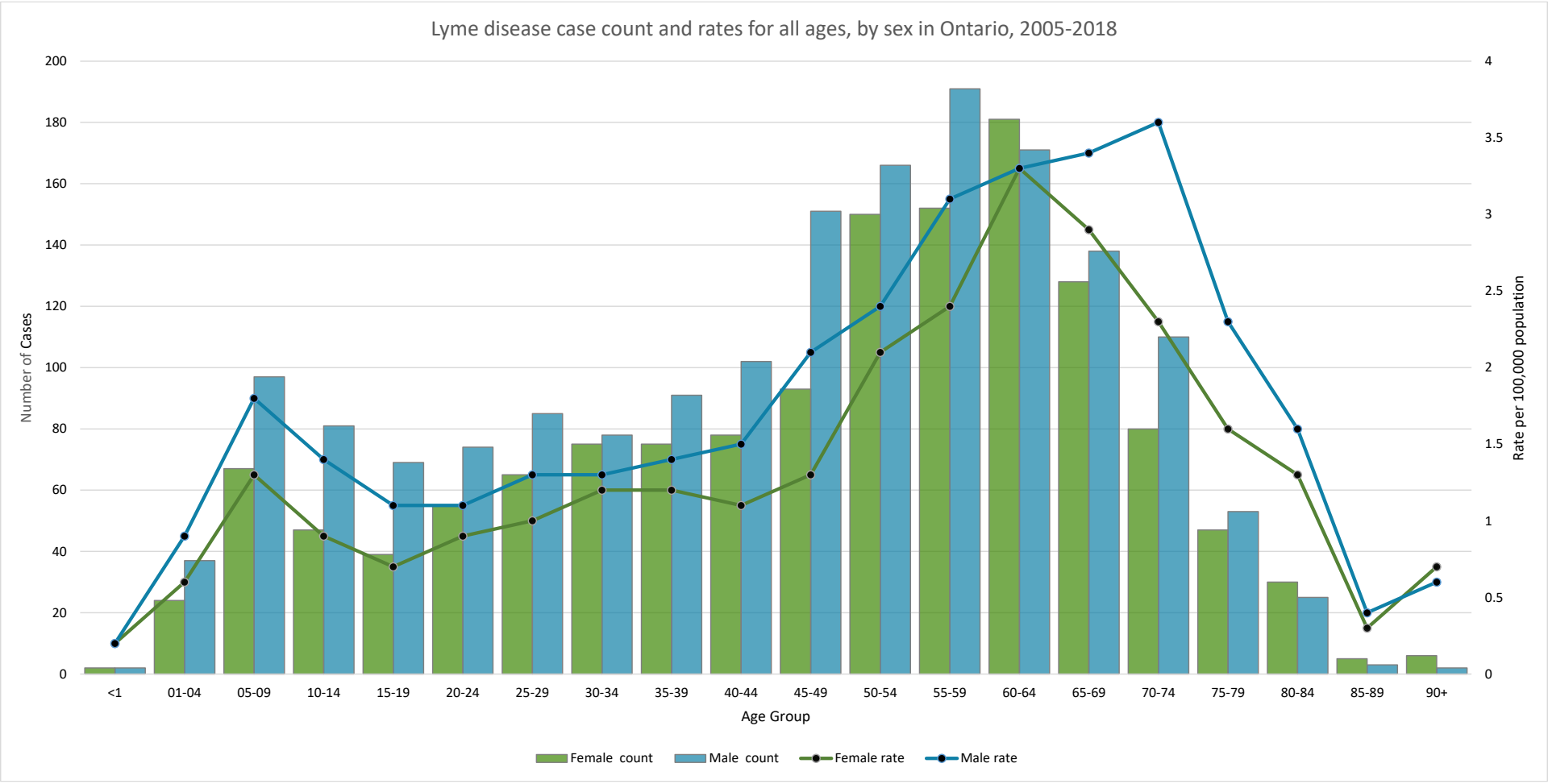
Annual Lyme Disease Confirmed and Probable Case Counts and Incidence Rate per 100,000 Population: Ontario, 2009-2018



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Probable	18	16	45	66	126	91	69	61	100	50
Confirmed	67	72	91	107	182	163	379	331	928	572
Rate	0.7	0.7	1	1.3	2.3	1.9	3.2	2.8	7.2	4.3

Ontario Cases: Ontario. Ministry of Health and Long-Term Care. Integrated Public Health Information System (iPHIS) [database]. Toronto, ON: Queen's Printer for Ontario [producer and distributor]; [data extracted 2019 Apr 24].
Ontario Population: Statistics Canada. Population Projections 2017-2018 and Estimates 2009-2016 [data file]. Ottawa ON: Government of Canada [producer], Toronto, ON: Ontario. Ministry of Health and Long-Term Care, IntelliHEALTH Ontario [distributor]; [data extracted 2019 Apr 24].
*Case counts account for the 2009 change in the Lyme disease case definition.

Human Lyme Disease Case Counts and Rates for All Ages, by Sex in Ontario, 2005-2018



Data source:
Ontario. Ministry of Health and Long-Term Care, Integrated Public Health Information System (iPHIS)[database]. Toronto, ON: Queen's Printer for Ontario [producer and distributor]; 2018 [data extracted 2019 Apr 10].

Lyme Disease Clinical Features

- Three different stages
  - Early localized
  - Early disseminated
  - Late disseminated
- Post-treatment Lyme disease syndrome (PLDTS)

Early Localized Lyme Disease

- Time frame 3-30 days after tick bite (usually 7-14 days)
- Rash (erythema migrans)
  - Usually occurs at site of tick-bite
  - Only present in subset (~70%) of patients
  - ‘Bull’s eye’ rash occurs in minority of patients
- Other potential symptoms:
  - Headache, fatigue, myalgia, arthralgia, malaise, fever, regional lymphadenopathy

Steere AC, Strle F, Wormser GP, Hu LT, Branda JA, Hovius JW, et al Lyme borreliosis. Nat Rev Dis Primers. 2016;2:16090. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5539539/
Shapiro ED. *Borrelia burgdorferi* (Lyme disease). Pediatr Rev. 2014;35(12):500-9. Available from: https://pedsinreview.aappublications.org/content/35/12/500.long

Early Disseminated Lyme Disease

- Within days to weeks, *B. burgdorferi* can spread to other sites/organs if untreated
  - Additional skin lesions (multiple erythema migrans)
  - Peripheral/central nervous system
    - Cranial nerve palsies (often 7th)
    - Meningitis or episodic headaches
  - Systemic symptoms
    - Can include fever, myalgia, arthralgia, headache, or fatigue
  - Cardiac symptoms
    - Atrioventricular (AV) node block
  - Arthritis

Steere AC, Strle F, Wormser GP, Hu LT, Branda JA, Hovius JW, et al Lyme borreliosis. Nat Rev Dis Primers. 2016;2:16090. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5539539/
Shapiro ED. *Borrelia burgdorferi* (Lyme disease). Pediatr Rev. 2014;35(12):500-9. Available from: https://pedsinreview.aappublications.org/content/35/12/500.long

Late Disseminated Lyme Disease

- Weeks to months after the initial infection, late symptoms can occur if untreated, including:
  - Arthritis
    - Often monoarticular
    - Usually involves large joints, especially the knee
  - Neurological
    - Encephalitis/encephalopathy
    - Polyneuropathy
    - Stroke-like illness

Steere AC, Strle F, Wormser GP, Hu LT, Branda JA, Hovius JW, et al Lyme borreliosis. Nat Rev Dis Primers. 2016;2:16090. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5539539/
Shapiro ED. *Borrelia burgdorferi* (Lyme disease). Pediatr Rev. 2014;35(12):500-9. Available from: https://pedsinreview.aappublications.org/content/35/12/500.long

Post-Treatment Lyme Disease Syndrome (PTLDS)

- After treatment for Lyme disease, ~10% of patients report symptoms for at least six months
- PTLDS can be defined by symptoms that began within six months of treatment of Lyme disease infection and persist for at least six months. These include:
  - Fatigue
  - Cognitive complaints
  - Musculoskeletal pain

Steere AC, Strle F, Wormser GP, Hu LT, Branda JA, Hovius JW, et al Lyme borreliosis. Nat Rev Dis Primers. 2016;2:16090. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5539539/

Diagnosis of Lyme Disease

Tick bites and Prevention of Lyme Disease

- For prevention of Lyme disease after a tick bite:
  - Routine abx prophylaxis and serological testing is not recommended
  - A single dose of doxycycline can be offered if:
    - Tick can be identified as black legged tick
    - Attached for at least 24-36 hours
    - Prophylaxis can be started within 72 hours
    - Prevalence of *B. burgdoferi* infection rate in ticks is ≥ 20%
    - Doxycycline is not contraindicated

- Persons should be monitored for signs and symptoms for up to 30 days for development of rash at the site of bite

What is the Role of Tick testing in Diagnosis of Lyme Disease?

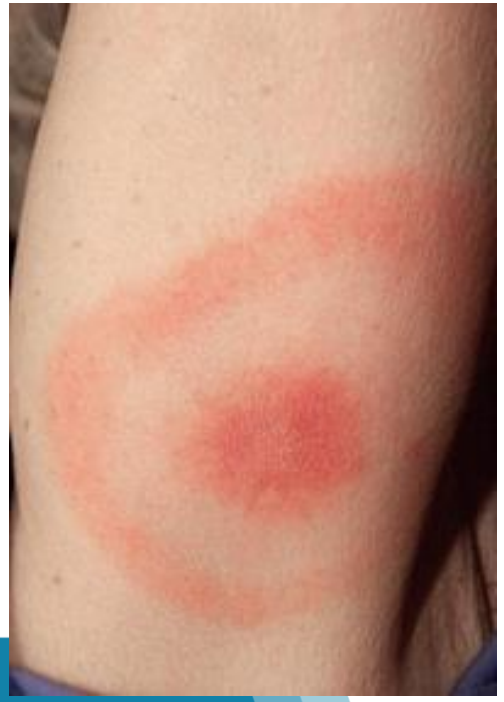
- IDSA guidelines
  - Testing ticks for tick borne pathogens is not recommended
  - Primarily used for research and surveillance
  - Health care practitioners in areas of endemicity should learn how to identify black legged ticks and differentiate level of engorgement

- PHOL currently identifies ticks and where appropriate send it to NML for Borrelia testing.

Diagnosis of Lyme Disease

Acute: Clinical presentation with epidemiological link

Late: Clinical presentations with laboratory testing



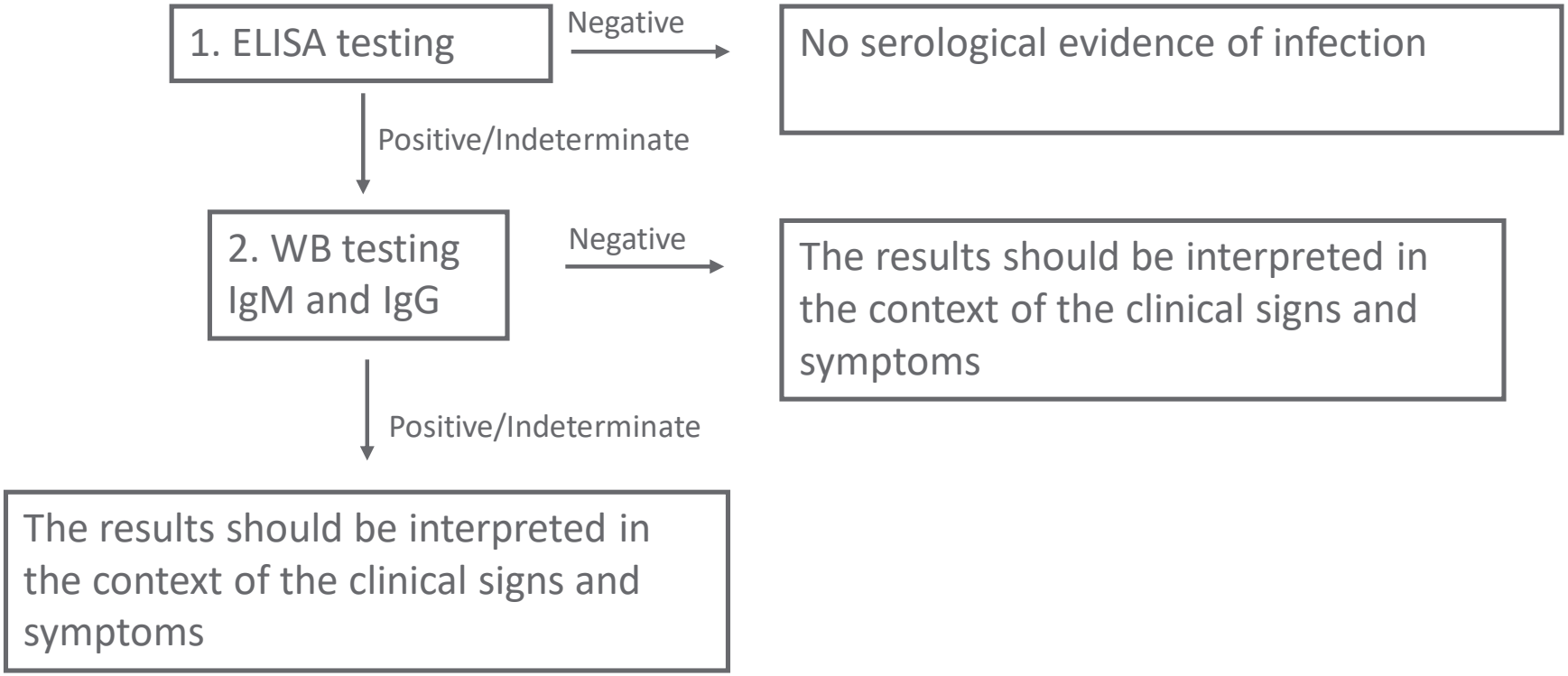
Performance Characteristics of Each Assay in Patients with Lyme Disease

- Slide presents data on test performance (Whole cell ELISA, IgM, IgG, two-tier testing) from "Table 4. Reactivities obtained using different methods to detect antibodies to B. burgdorferi in Lyme borreliosis in patients from the United States" from Aguero-Rosenfeld ME, Wang G, Schwartz I, Wormser GP. Diagnosis of Lyme borreliosis. Clin Micro Rev. 2005;18(3):484-509. Available from: https://cmr.asm.org/content/18/3/484.full

Aguero-Rosenfeld ME, Wang G, Schwartz I, Wormser GP. Diagnosis of Lyme borreliosis. Clin Micro Rev. 2005;18(3):484-509. Available from: https://cmr.asm.org/content/18/3/484.full

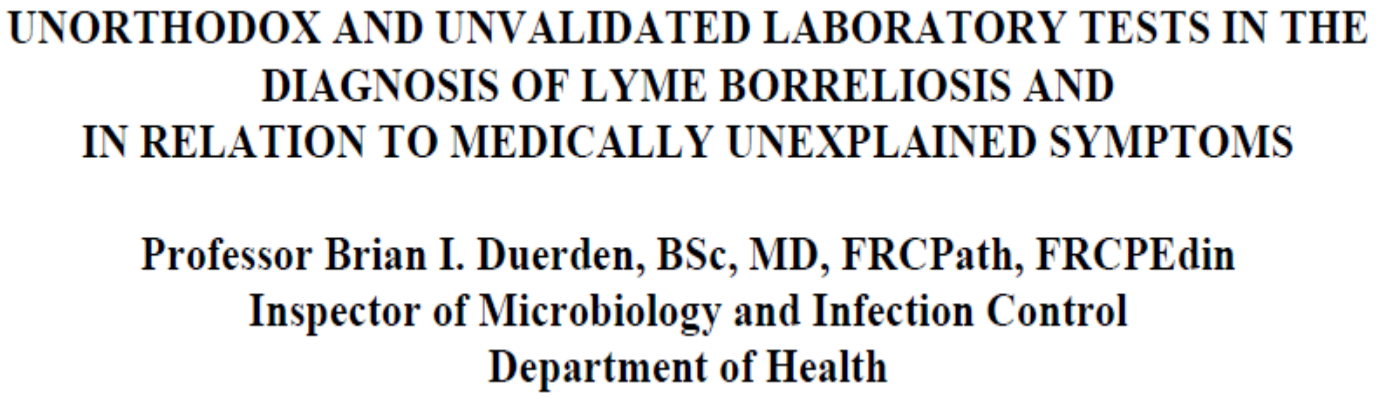
Testing Algorithm at PHO's Laboratories

2-tier testing (Recommended by IDSA/CDC and CPHLN)



Challenges Posed by Private Laboratories in USA

- Private labs uses variety of different assays to diagnose Lyme disease
- None of them are scientifically validated
- In 2005 the CDC placed a notice in their Morbidity and Mortality Weekly Report (MMWR) cautioning about using these private laboratories: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5405a6.htm



UNORTHODOX AND UNVALIDATED LABORATORY TESTS IN THE DIAGNOSIS OF LYME BORRELIOSIS AND IN RELATION TO MEDICALLY UNEXPLAINED SYMPTOMS

Professor Brian I. Duerden, BSc, MD, FRCPath, FRCPEdin
Inspector of Microbiology and Infection Control
Department of Health

CDC. Notice to readers: caution regarding testing for Lyme disease. MMWR Morb Mortal Wkly Rep. 2005;54(5):125. Available from: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5405a6.htm
Duerden BI. Unorthodox and unvalidated laboratory tests in the diagnosis of Lyme borreliosis and in relation to medically unexplained symptoms [Internet]. London, UK: Crown Copyright; 2006 [cited 2019 May 9]. Available from: https://webarchive.nationalarchives.gov.uk/20080205204935/http://www.dh.gov.uk/prod_consum_dh/idcplg?IdcService=GET_FILE&dID=3278&Rendition=Web

Alternative Testing Leads to High False-Positive Results

- Slide presents data on false positive and test discordance rates for testing (ELISA, WB IgM (CDC), WB IgM (Lab), WB IgG (CDC), WB IgG (Lab), 2 tier testing) at a university reference laboratory versus commercial or speciality laboratories on 40 medically health control patients from “Table 2. Number and Percentage of False-Positive Serologic Test Results and Discordant Pairs for 40 Medically Healthy Controls (University Reference Laboratory Versus Commercial and Lyme Specialty Laboratories)” from:
  - Fallon BA, Pavlicova M, Coffino SW, Brenner C. A comparison of Lyme disease serologic test results from 4 laboratories in patients with persistent symptoms after antibiotic treatment. Clin Infect Dis. 2014;59(12):1705-10. Available from: https://academic.oup.com/cid/article/59/12/1705/2895616

Tests That Should Be Avoided

Some laboratories offer Lyme disease testing using assays whose accuracy and clinical usefulness have not been adequately established. Unvalidated tests available as of 2011 include:

- Capture assays for antigens in urine
- Culture, immunofluorescence staining, or cell sorting of cell wall-deficient or cystic forms of *B. burgdorferi*
- Lymphocyte transformation tests
- Quantitative CD57 lymphocyte assays
- “Reverse Western blots”
- In-house criteria for interpretation of immunoblots
- Measurements of antibodies in joint fluid (synovial fluid)
- IgM or IgG tests without a previous ELISA/EIA/IFA
- Cytokine biomarkers

Lyme Disease

Clinical Guidance Document

GRACIA MABAYA & LACEY PHILLIPS | MAY 14, 2019

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Health Quality Ontario

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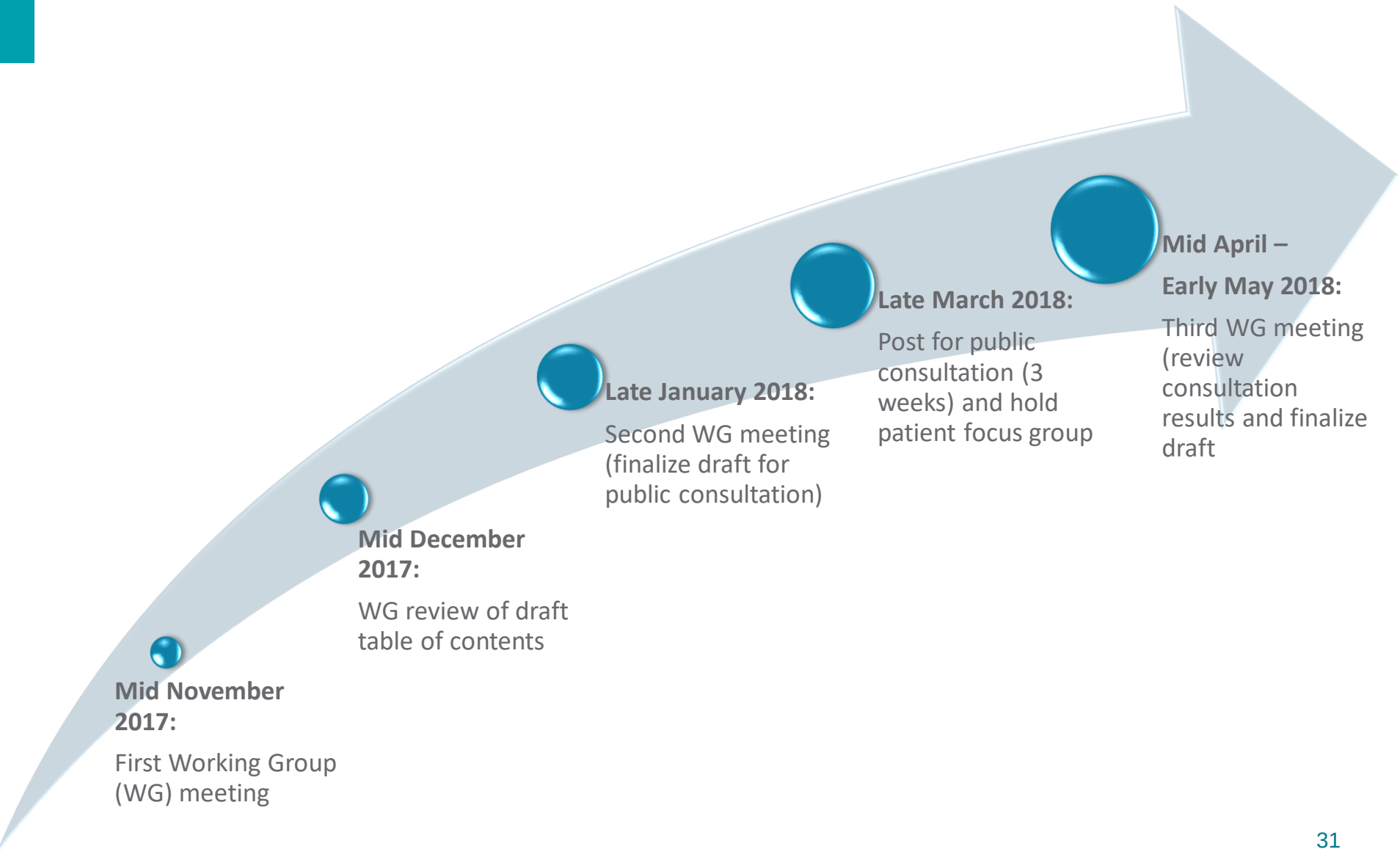
Clinical Guidance Document

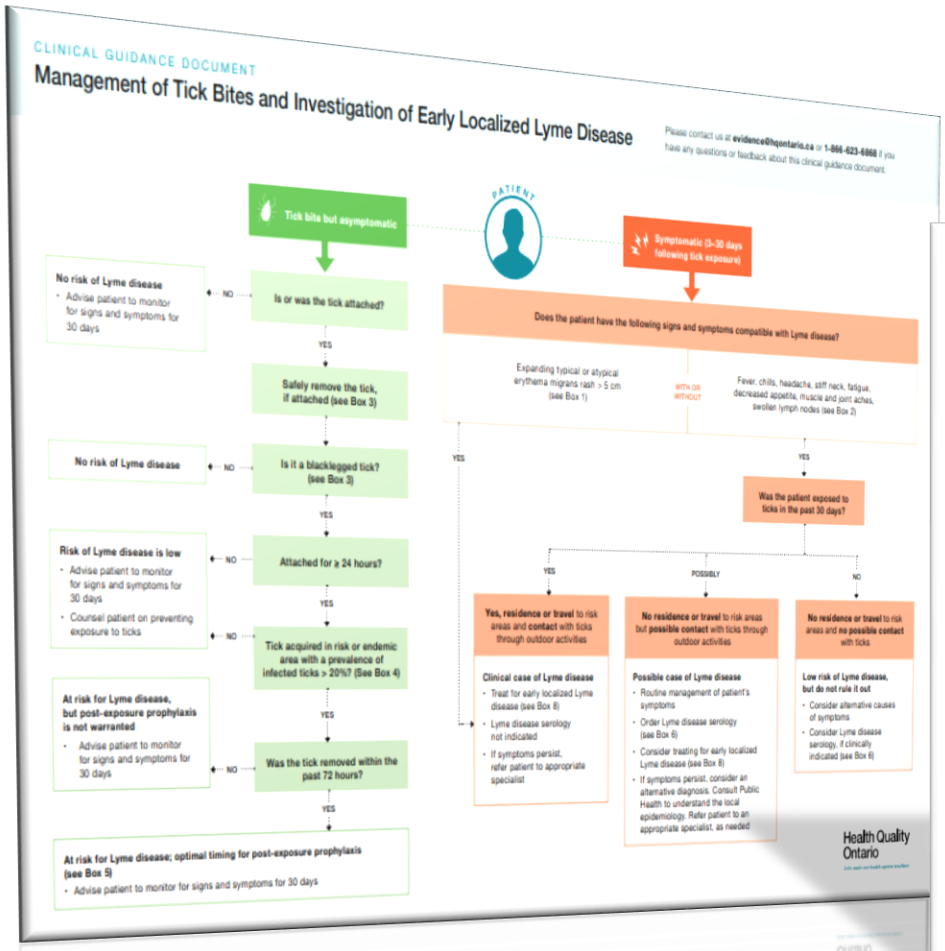
Project Objectives

- Health Quality Ontario (HQO) and Public Health Ontario (PHO), in collaboration with clinical experts, patients, and caregivers across the province, jointly developed a clinical guidance document on tick bite management and the diagnosis and treatment of early localized Lyme disease
- The clinical guidance document was developed for use in primary care, community-based care, and emergency department settings

Development Timeline



Lyme Disease Clinical Guidance Document



CLINICAL GUIDANCE DOCUMENT

Management of Tick Bites and Investigation of Early Localized Lyme Disease

Please contact us at evidence@hqontario.ca or 1-866-623-6868 if you have any questions or feedback about this clinical guidance document.

Tick bite but asymptomatic

PATIENT

Symptomatic (3–30 days following tick exposure)

No risk of Lyme disease
- Advise patient to monitor for signs and symptoms for 30 days

NO

Is or was the tick attached?

YES

Safely remove the tick, if attached (see Box 3)

No risk of Lyme disease

NO

Is it a blacklegged tick? (see Box 3)

YES

Risk of Lyme disease is low
- Advise patient to monitor for signs and symptoms for 30 days
- Counsel patient on preventing exposure to ticks

NO

Attached for ≥ 24 hours?

YES

NO

Tick acquired in risk or endemic area with a prevalence of infected ticks > 20%? (See Box 4)

At risk for Lyme disease, but post-exposure prophylaxis is not warranted
- Advise patient to monitor for signs and symptoms for 30 days

YES

NO

Was the tick removed within the past 72 hours?

YES

At risk for Lyme disease; optimal timing for post-exposure prophylaxis (see Box 5)
- Advise patient to monitor for signs and symptoms for 30 days

Does the patient have the following signs and symptoms compatible with Lyme disease?

Expanding typical or atypical erythema migrans rash > 5 cm (see Box 1)

WITH OR WITHOUT

Fever, chills, headache, stiff neck, fatigue, decreased appetite, muscle and joint aches, swollen lymph nodes (see Box 2)

YES

YES

Was the patient exposed to ticks in the past 30 days?

YES

POSSIBLY

NO

Yes, residence or travel to risk areas and contact with ticks through outdoor activities

Clinical case of Lyme disease
- Treat for early localized Lyme disease (see Box 8)
- Lyme disease serology not indicated
- If symptoms persist, refer patient to appropriate specialist

No residence or travel to risk areas but possible contact with ticks through outdoor activities

Possible case of Lyme disease
- Routine management of patient's symptoms
- Order Lyme disease serology (see Box 6)
- Consider treating for early localized Lyme disease (see Box 8)
- If symptoms persist, consider an alternative diagnosis. Consult Public Health to understand the local epidemiology. Refer patient to an appropriate specialist, as needed

No residence or travel to risk areas and no possible contact with ticks

Low risk of Lyme disease, but do not rule it out
- Consider alternative causes of symptoms
- Consider Lyme disease serology, if clinically indicated (see Box 6)

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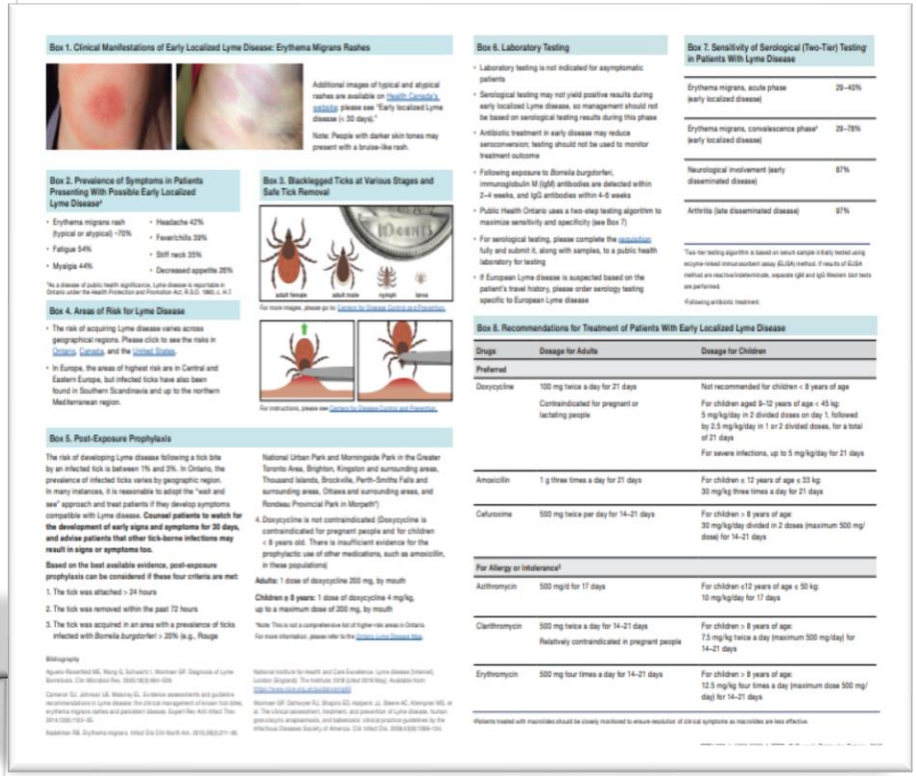


Box 1. Clinical Manifestations of Early Localized Lyme Disease: Erythema Migrans Rashes

Additional images of typical and atypical rashes are available on Health Canada's website; please see "Early localized Lyme disease (< 30 days)."

Note: People with darker skin tones may present with a bruise-like rash.

Box 2. Prevalence of Symptoms in Patients Presenting With Possible Early Localized Lyme Disease[a]
- Erythema migrans rash (typical or atypical) ~70%
- Fatigue 54%
- Myalgia 44%
- Headache 42%
- Fever/chills 39%
- Stiff neck 35%
- Decreased appetite 26%

[a]As a disease of public health significance, Lyme disease is reportable in Ontario under the Health Protection and Promotion Act, R.S.O. 1990, c. H.7.

Box 3. Blacklegged Ticks at Various Stages and Safe Tick Removal

For more images, please go to Centers for Disease Control and Prevention.

For instructions, please see Centers for Disease Control and Prevention.

Box 4. Areas of Risk for Lyme Disease
- The risk of acquiring Lyme disease varies across geographical regions. Please click to see the risks in Ontario, Canada, and the United States.
- In Europe, the areas of highest risk are in Central and Eastern Europe, but infected ticks have also been found in Southern Scandinavia and up to the northern Mediterranean region.

Box 5. Post-Exposure Prophylaxis

The risk of developing Lyme disease following a tick bite by an infected tick is between 1% and 3%. In Ontario, the prevalence of infected ticks varies by geographic region. In many instances, it is reasonable to adopt the "wait and see" approach and treat patients if they develop symptoms compatible with Lyme disease. **Counsel patients to watch for the development of early signs and symptoms for 30 days, and advise patients that other tick-borne infections may result in signs or symptoms too.**

Based on the best available evidence, post-exposure prophylaxis can be considered if these four criteria are met:

1. The tick was attached > 24 hours
2. The tick was removed within the past 72 hours
3. The tick was acquired in an area with a prevalence of ticks infected with *Borrelia burgdorferi* > 20% (e.g., Rouge National Urban Park and Morningside Park in the Greater Toronto Area, Brighton, Kingston and surrounding areas, Thousand Islands, Brockville, Perth–Smiths Falls and surrounding areas, Ottawa and surrounding areas, and Rondeau Provincial Park in Morpeth[a])
4. Doxycycline is not contraindicated (Doxycycline is contraindicated for pregnant people and for children < 8 years old. There is insufficient evidence for the prophylactic use of other medications, such as amoxicillin, in these populations)

Adults: 1 dose of doxycycline 200 mg, by mouth

Children ≥ 8 years: 1 dose of doxycycline 4 mg/kg, up to a maximum dose of 200 mg, by mouth

[a]Note: This is not a comprehensive list of higher-risk areas in Ontario. For more information, please refer to the Ontario Lyme Disease Map.

Box 6. Laboratory Testing
- Laboratory testing is not indicated for asymptomatic patients
- Serological testing may not yield positive results during early localized Lyme disease, so management should not be based on serological testing results during this phase
- Antibiotic treatment in early disease may reduce seroconversion; testing should not be used to monitor treatment outcome
- Following exposure to *Borrelia burgdorferi*, immunoglobulin M (IgM) antibodies are detected within 2–4 weeks, and IgG antibodies within 4–6 weeks
- Public Health Ontario uses a two-step testing algorithm to maximize sensitivity and specificity (see Box 7)
- For serological testing, please complete the requisition fully and submit it, along with samples, to a public health laboratory for testing
- If European Lyme disease is suspected based on the patient's travel history, please order serology testing specific to European Lyme disease

Box 7. Sensitivity of Serological (Two-Tier) Testing in Patients With Lyme Disease

Erythema migrans, acute phase (early localized disease)	29–40%
Erythema migrans, convalescence phase[a] (early localized disease)	29–78%
Neurological involvement (early disseminated disease)	87%
Arthritis (late disseminated disease)	97%

Two-tier testing algorithm is based on serum sample initially tested using enzyme-linked immunosorbent assay (ELISA) method. If results of ELISA method are reactive/indeterminate, separate IgM and IgG Western blot tests are performed.

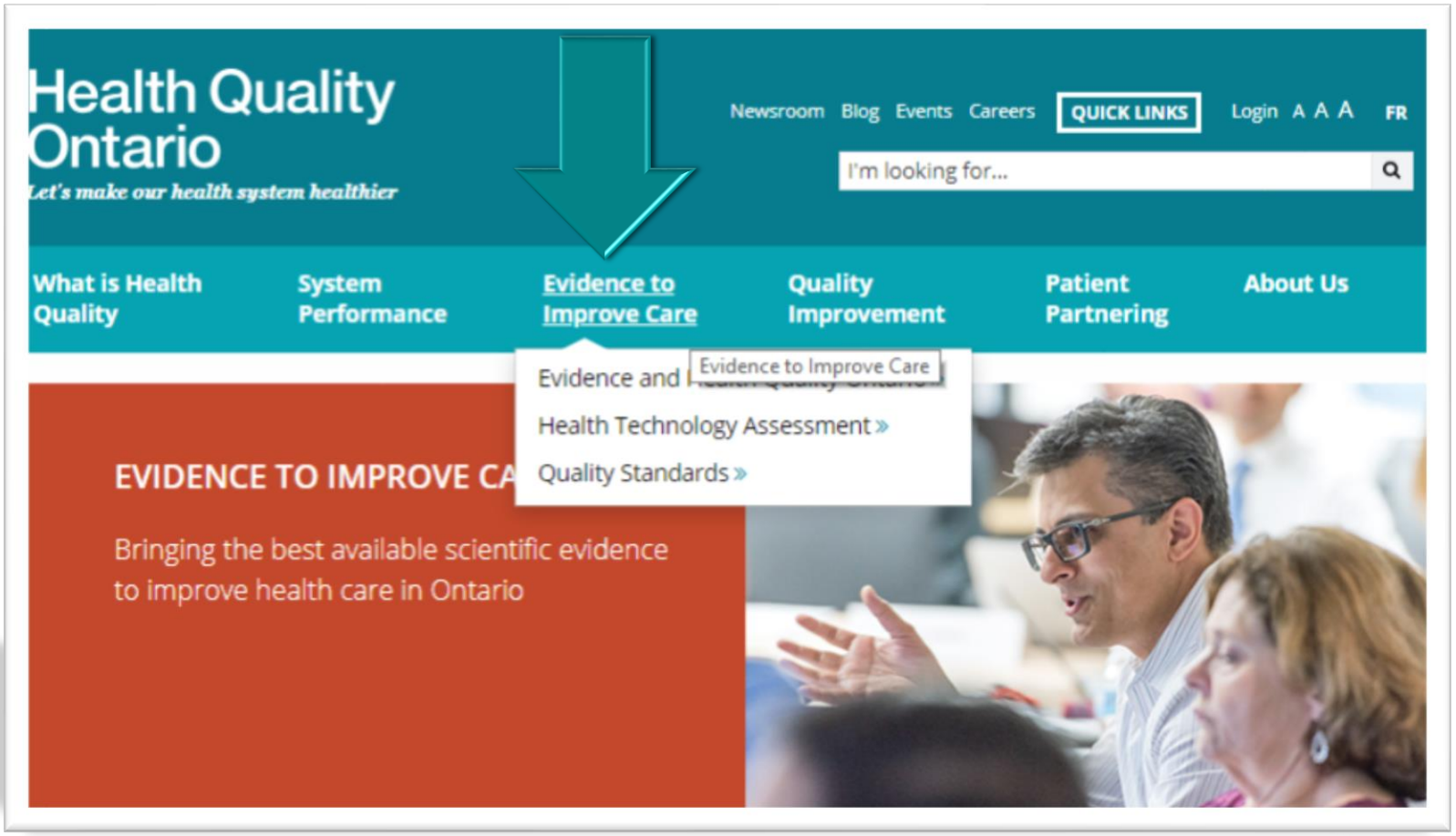
[a]Following antibiotic treatment.

Box 8. Recommendations for Treatment of Patients With Early Localized Lyme Disease

Drugs	Dosage for Adults	Dosage for Children
Preferred		
Doxycycline	100 mg twice a day for 21 days Contraindicated for pregnant or lactating people	Not recommended for children < 8 years of age For children aged 8–12 years of age < 45 kg: 5 mg/kg/day in 2 divided doses on day 1, followed by 2.5 mg/kg/day in 1 or 2 divided doses, for a total of 21 days For severe infections, up to 5 mg/kg/day for 21 days
Amoxicillin	1 g three times a day for 21 days	For children ≤ 12 years of age ≤ 33 kg: 30 mg/kg three times a day for 21 days
Cefuroxime	500 mg twice per day for 14–21 days	For children > 8 years of age: 30 mg/kg/day divided in 2 doses (maximum 500 mg/dose) for 14–21 days
For Allergy or Intolerance[a]		
Azithromycin	500 mg/d for 17 days	For children ≤12 years of age ≤ 50 kg: 10 mg/kg/day for 17 days
Clarithromycin	500 mg twice a day for 14–21 days Relatively contraindicated in pregnant people	For children > 8 years of age: 7.5 mg/kg twice a day (maximum 500 mg/day) for 14–21 days
Erythromycin	500 mg four times a day for 14–21 days	For children > 8 years of age: 12.5 mg/kg four times a day (maximum dose 500 mg/day) for 14–21 days

[a]Patients treated with macrolides should be closely monitored to ensure resolution of clinical symptoms as macrolides are less effective.

Lyme Disease Clinical Guidance Document



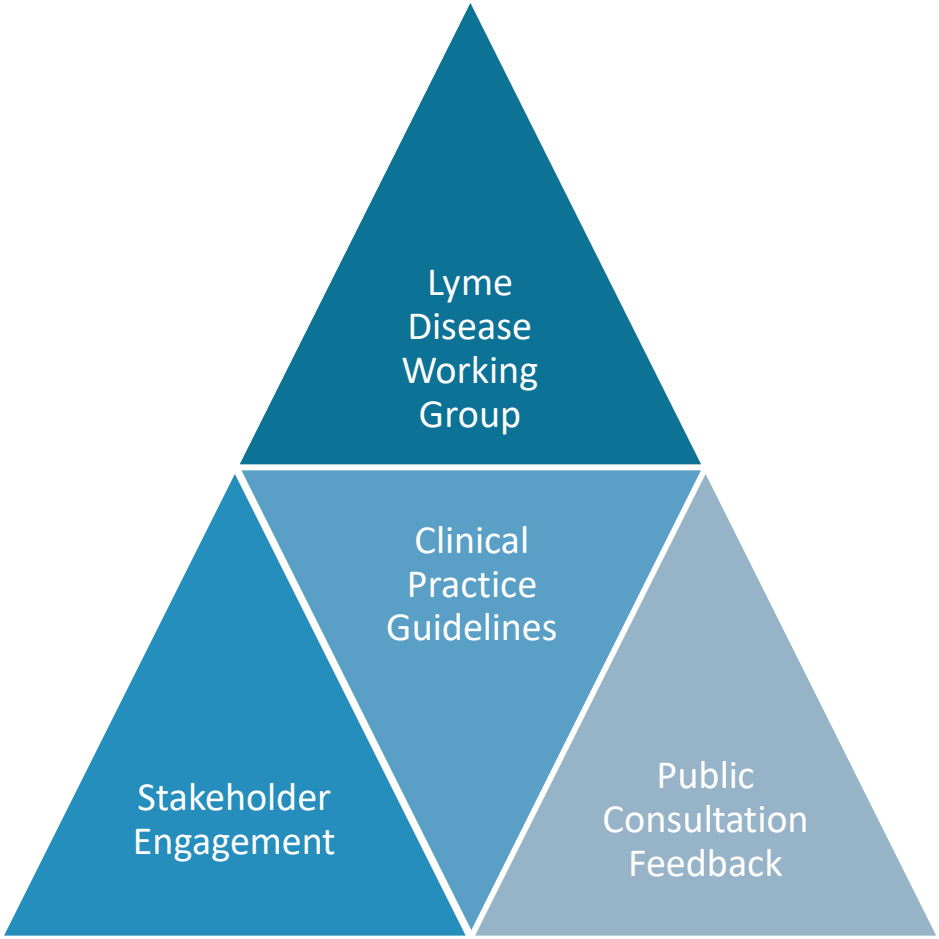
Scope of Clinical Guidance Document

Inclusion Criteria	Exclusion Criteria

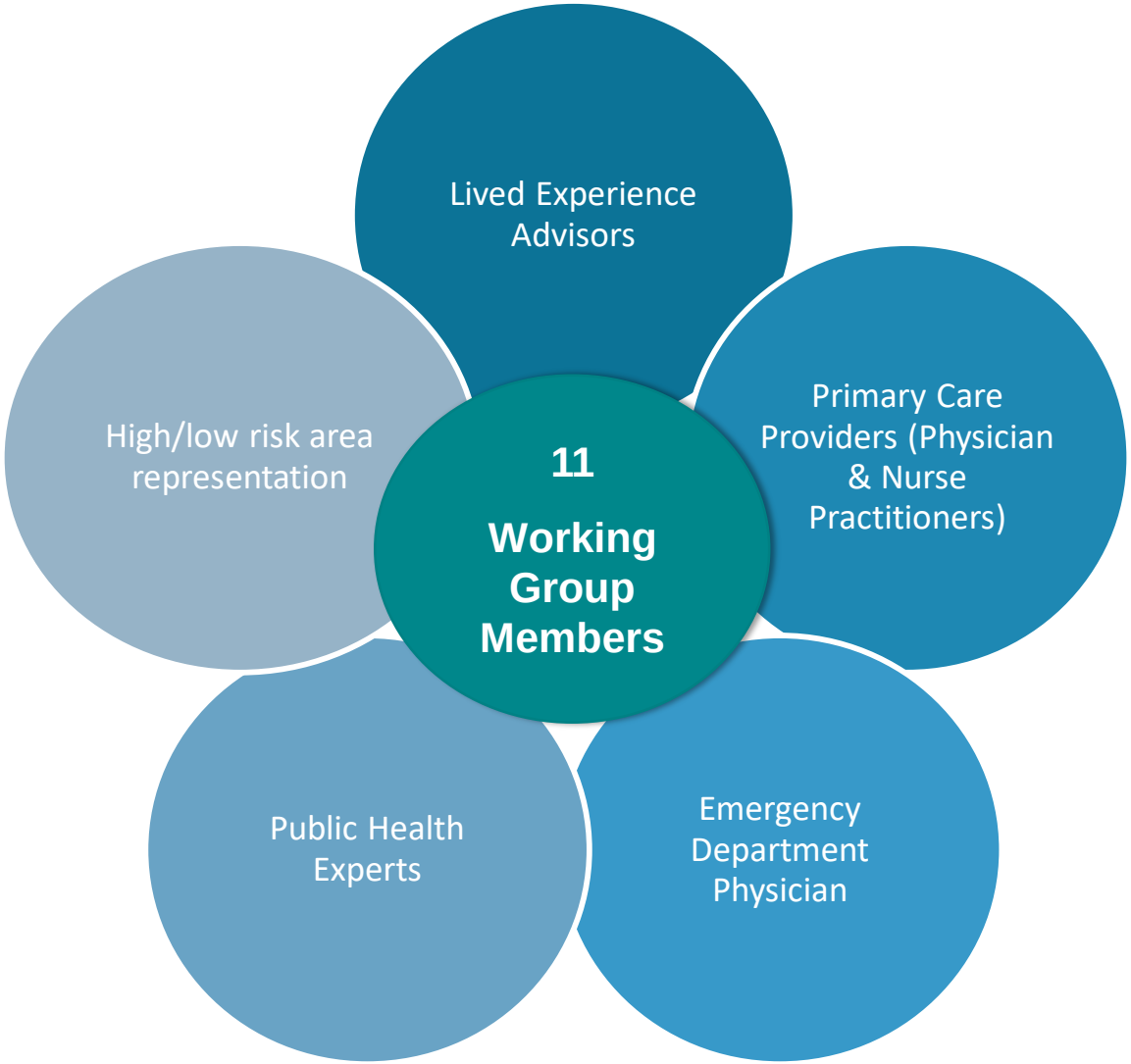
• Patient Population
  • Children and adults
• Tick bite management
• Diagnosis and management of early localized disease (<30 days)
  • Including post-exposure prophylaxis
• Clinical setting
  • Primary care and emergency department
	• Prevention of Lyme disease
	• Diagnosis and management of early and late disseminated disease (≥ 30 days but < 3 months or ≥ 3 months)
	  • Including indication for laboratory testing
	  • Diagnosis and management of coinfections

Clinical Guidance Document Development Process

Key Development Inputs



Working Group Composition



Lyme Disease Clinical Practice Guidelines

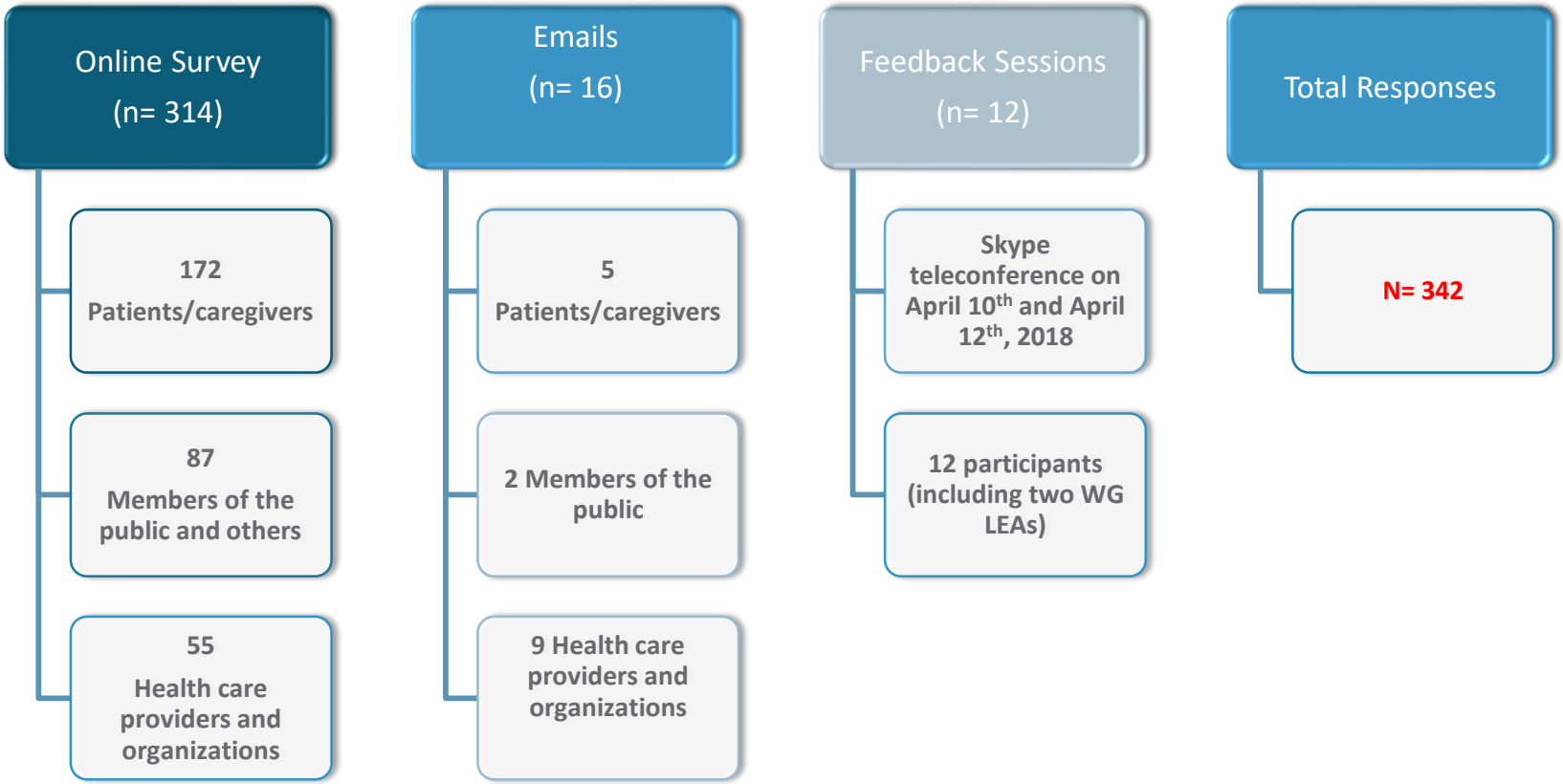
	Year	Author	Country	Title
1	2006	Infectious Diseases Society of America (IDSA)	United States of America	The Clinical Assessment, Treatment, and Prevention of Lyme Disease, Human Granulocytic Anaplasmosis, and Babesiosis: Clinical Practice Guidelines by the Infectious Diseases Society of America
2	2014	International Lyme and Associated Diseases Society (ILADS)	International	Evidence assessments and guideline recommendations in Lyme disease: the clinical management of known tick bites, erythema migrans rashes and persistent disease
3	2018	National Institute for Health and Care Excellence (NICE)	United Kingdom	Lyme Disease

Additional Documents

1. Canadian Public Health Laboratory Network. The laboratory diagnosis of Lyme borreliosis: guidelines from the Canadian Public Health Laboratory Network. Can J Infect Dis Med Microbiol. 2007;18(2):145-8. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2533539/
2. British Infection Association. The epidemiology, prevention, investigation and treatment of Lyme borreliosis in United Kingdom patients: a position statement by the British Infection Association. J Infect. 2011;62(5):329-38.
3. Hu LT. Lyme disease. Ann Intern Med. 2016;164(9):ITC65-80.
4. Sanchez E, Vannier E, Wormser GP, Hu LT. Diagnosis, treatment, and prevention of Lyme disease, human granulocytic anaplasmosis, and babesiosis: a review. JAMA. 2016;315(16):1767-77.
5. Moore A, Nelson C, Molins C, Mead P, Schriefer M. Current guidelines, common clinical pitfalls, and future directions for laboratory diagnosis of Lyme disease, United States. Emerg Infect Dis. 2016;22(7):1169-77. Available from: https://wwwnc.cdc.gov/eid/article/22/7/15-1694_article

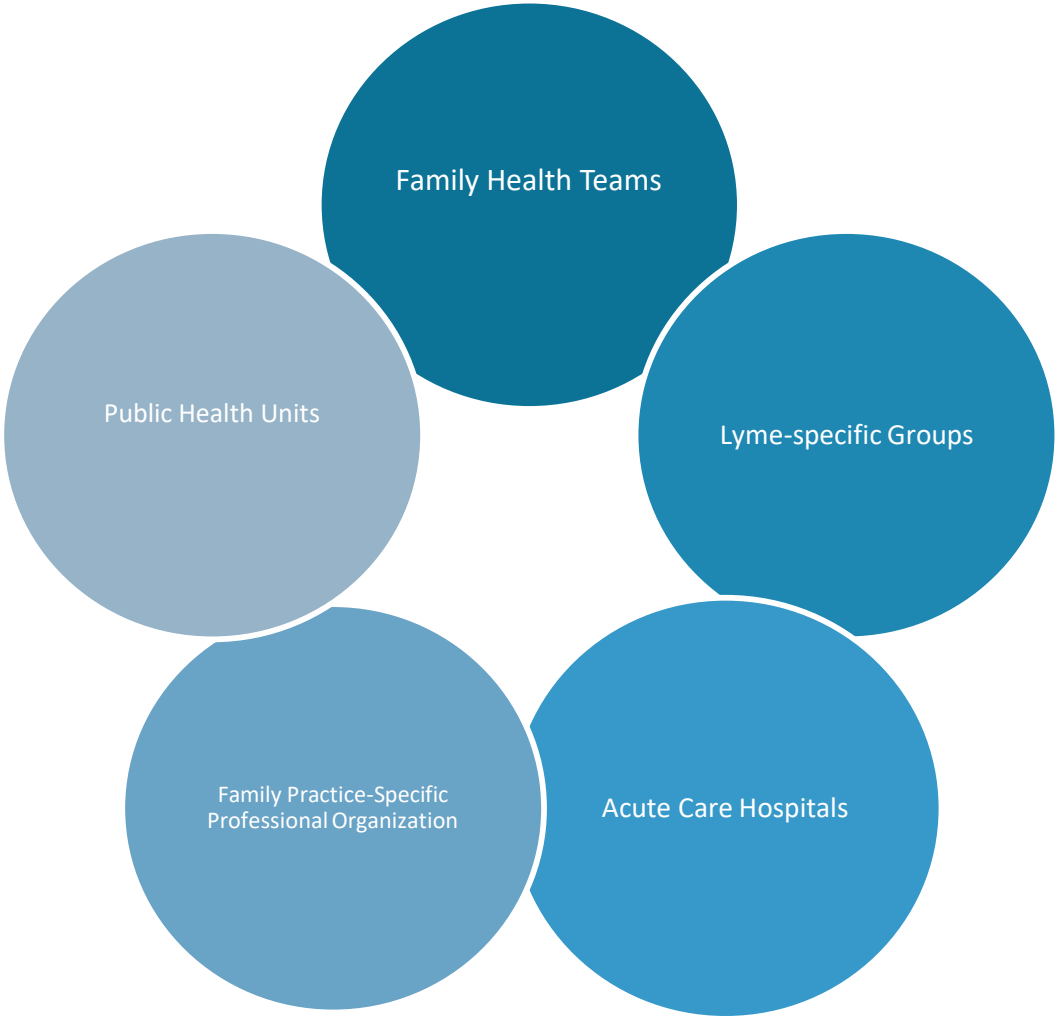
Public Consultation Process

March 23 – April 16, 2018



Feedback from Health Care Professionals, Clinicians, and Researchers

Feedback from Organizations



Case Studies

Case #1

- A 30 year old **asymptomatic** patient presented with a tick that was attached to her for over a day
- She was hiking in Kingston area two days ago
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- How long should symptoms be monitored for?
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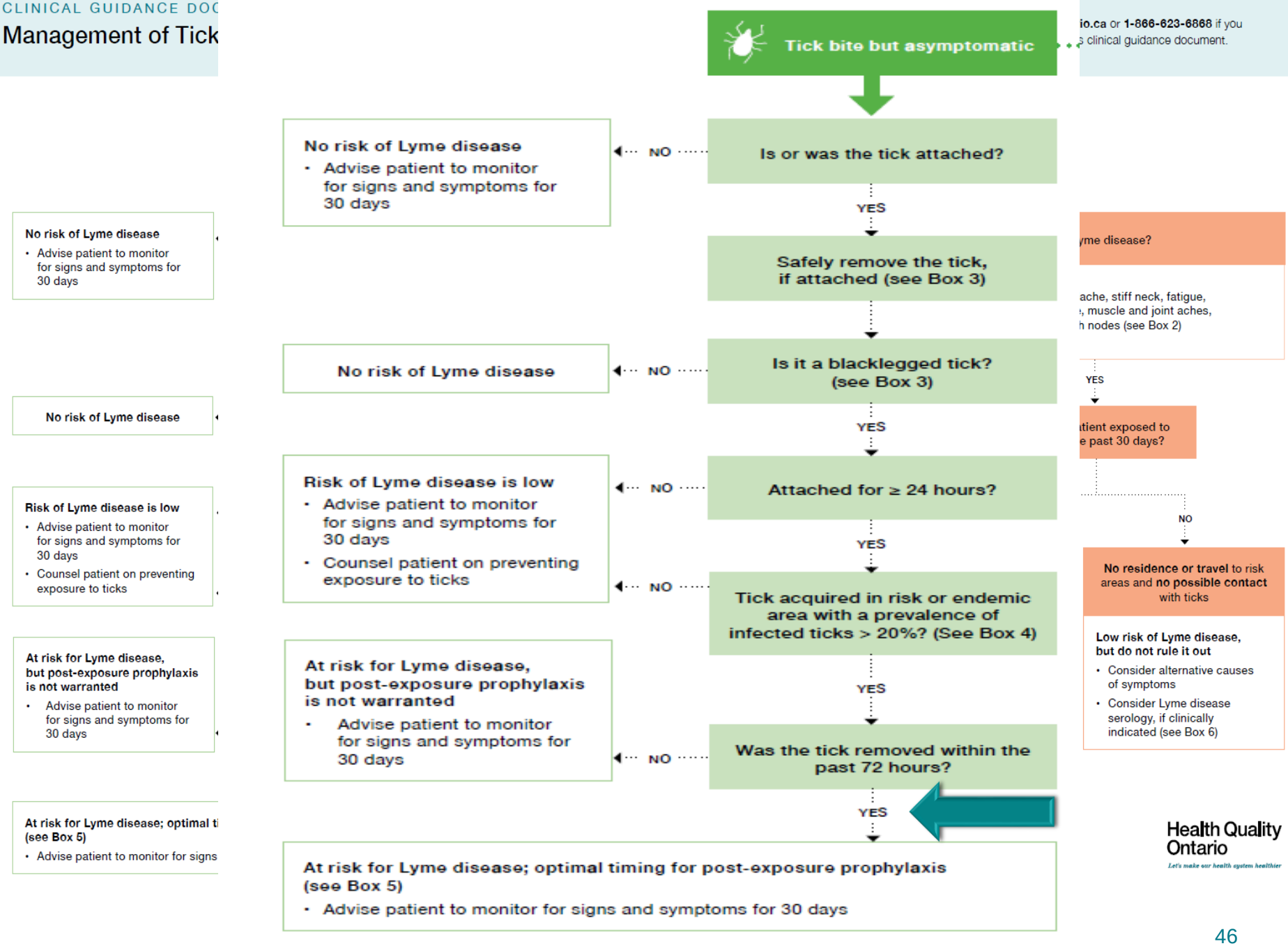

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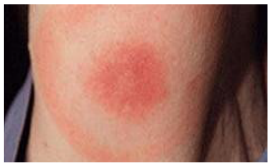
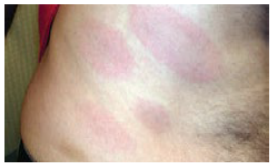
Box 1. Clinical Manifestations of Early Localized Lyme Disease: Erythema Migrans Rashes





Additional images of typical and atypical rashes are available on Health Canada's website; please see "Early localized Lyme disease (< 30 days)."

Note: People with darker skin tones may present with a bruise-like rash.

Box 2. Prevalence of Symptoms in Patients Presenting With Possible Early Localized Lyme Disease[#]

- Erythema migrans rash (typical or atypical) ~70%
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- Myalgia 44%
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- Decreased appetite 26%

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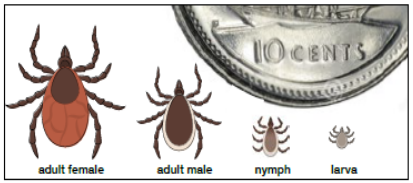

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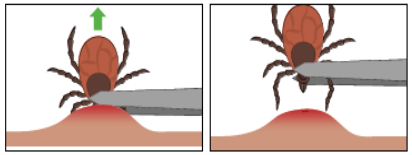

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1. The tick was attached > 24 hours
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Bibliography

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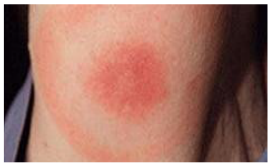

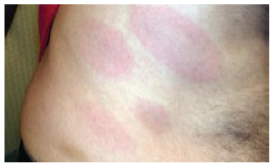

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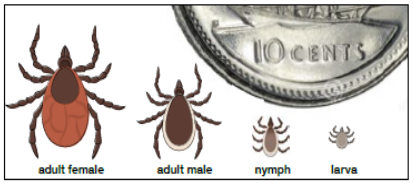

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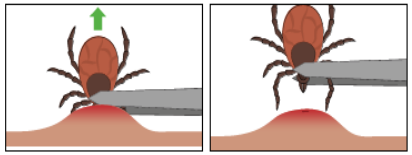

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Case #2

- 68-year-old retired nurse living in Ottawa area was bitten by a tick while gardening
- She took the tick to her local public health unit
- Tick was not sent to the laboratory at Public Health Ontario for identification
- A few days later she developed a rash and “flu-like” symptoms
- Upon examination – erythematous rash at the site of the lesion measuring 8 cm
- Treated with amoxicillin for two weeks
- Doctor did not test her for Lyme disease antibodies

Case #2 Questions

- What evidence supports the diagnosis of early localized Lyme disease?
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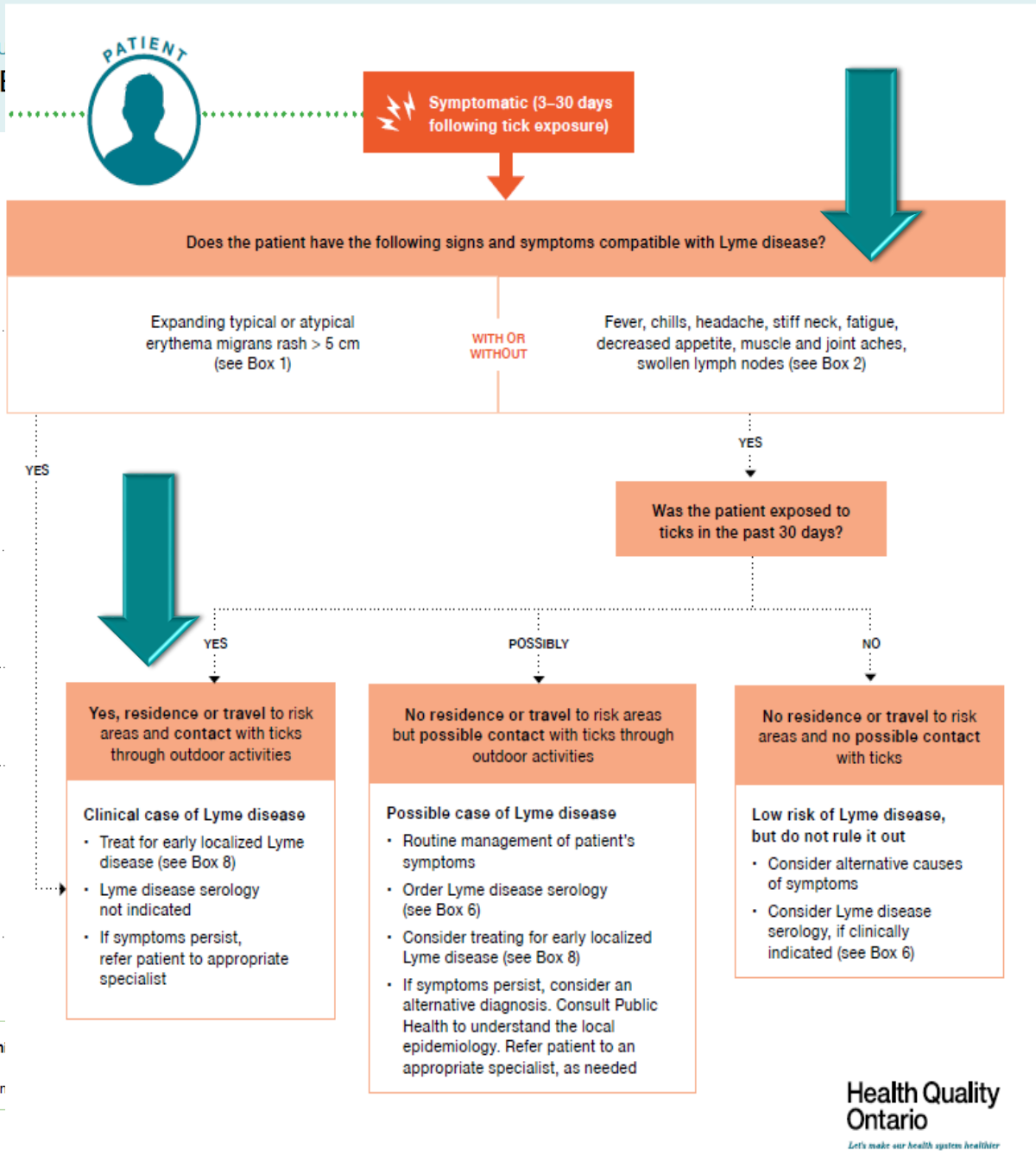

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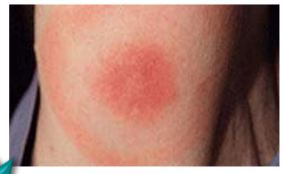

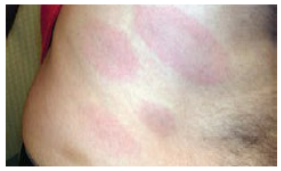

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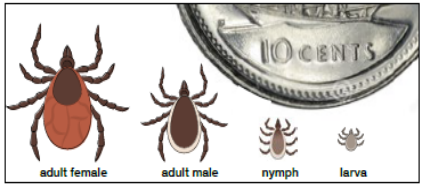

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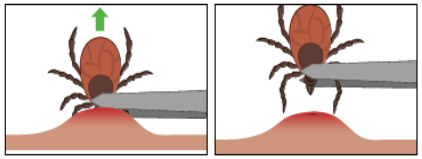

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Neurological involvement (early disseminated disease)	87%
Arthritis (late disseminated disease)	97%

[†]Two-tier testing algorithm is based on serum sample initially tested using enzyme-linked immunosorbent assay (ELISA) method. If results of ELISA method are reactive/indeterminate, separate IgM and IgG Western blot tests are performed.

[‡]Following antibiotic treatment.

Box 8. Recommendations for Treatment of Patients With Early Localized Lyme Disease

Drugs	Dosage for Adults	Dosage for Children
Preferred		
Doxycycline	100 mg twice a day for 21 days Contraindicated for pregnant or lactating people	Not recommended for children < 8 years of age For children aged 9–12 years of age < 45 kg: 5 mg/kg/day in 2 divided doses on day 1, followed by 2.5 mg/kg/day in 1 or 2 divided doses, for a total of 21 days For severe infections, up to 5 mg/kg/day for 21 days
Amoxicillin	1 g three times a day for 21 days	For children ≤ 12 years of age ≤ 33 kg: 30 mg/kg three times a day for 21 days
Cefuroxime	500 mg twice per day for 14–21 days	For children > 8 years of age: 30 mg/kg/day divided in 2 doses (maximum 500 mg/dose) for 14–21 days
For Allergy or Intolerance[§]		
Azithromycin	500 mg/d for 17 days	For children ≤12 years of age ≤ 50 kg: 10 mg/kg/day for 17 days
Clarithromycin	500 mg twice a day for 14–21 days Relatively contraindicated in pregnant people	For children > 8 years of age: 7.5 mg/kg twice a day (maximum 500 mg/day) for 14–21 days
Erythromycin	500 mg four times a day for 14–21 days	For children > 8 years of age: 12.5 mg/kg four times a day (maximum dose 500 mg/day) for 14–21 days

[§]Patients treated with macrolides should be closely monitored to ensure resolution of clinical symptoms as macrolides are less effective.

Bibliography

Aguero-Rosenfeld ME, Wang G, Schwartz I, Wormser GP. Diagnosis of Lyme Borreliosis. Clin Microbiol Rev. 2005;18(3):484–509.

Cameron DJ, Johnson LB, Maloney EL. Evidence assessments and guideline recommendations in Lyme disease: the clinical management of known tick bites, erythema migrans rashes and persistent disease. Expert Rev Anti Infect Ther. 2014;12(9):1103–35.

Nadelman RB. Erythema migrans. Infect Dis Clin North Am. 2015;29(2):211–39.

National Institute for Health and Care Excellence. Lyme disease [Internet]. London (England): The Institute; 2018 [cited 2018 May]. Available from: https://www.nice.org.uk/guidance/ng95

Wormser GP, Dattwyler RJ, Shapiro ED, Halperin JJ, Steere AC, Klempner MS, et al. The clinical assessment, treatment, and prevention of Lyme disease, human granulocytic anaplasmosis, and babesiosis: clinical practice guidelines by the Infectious Diseases Society of America. Clin Infect Dis. 2006;43(9):1089–134.

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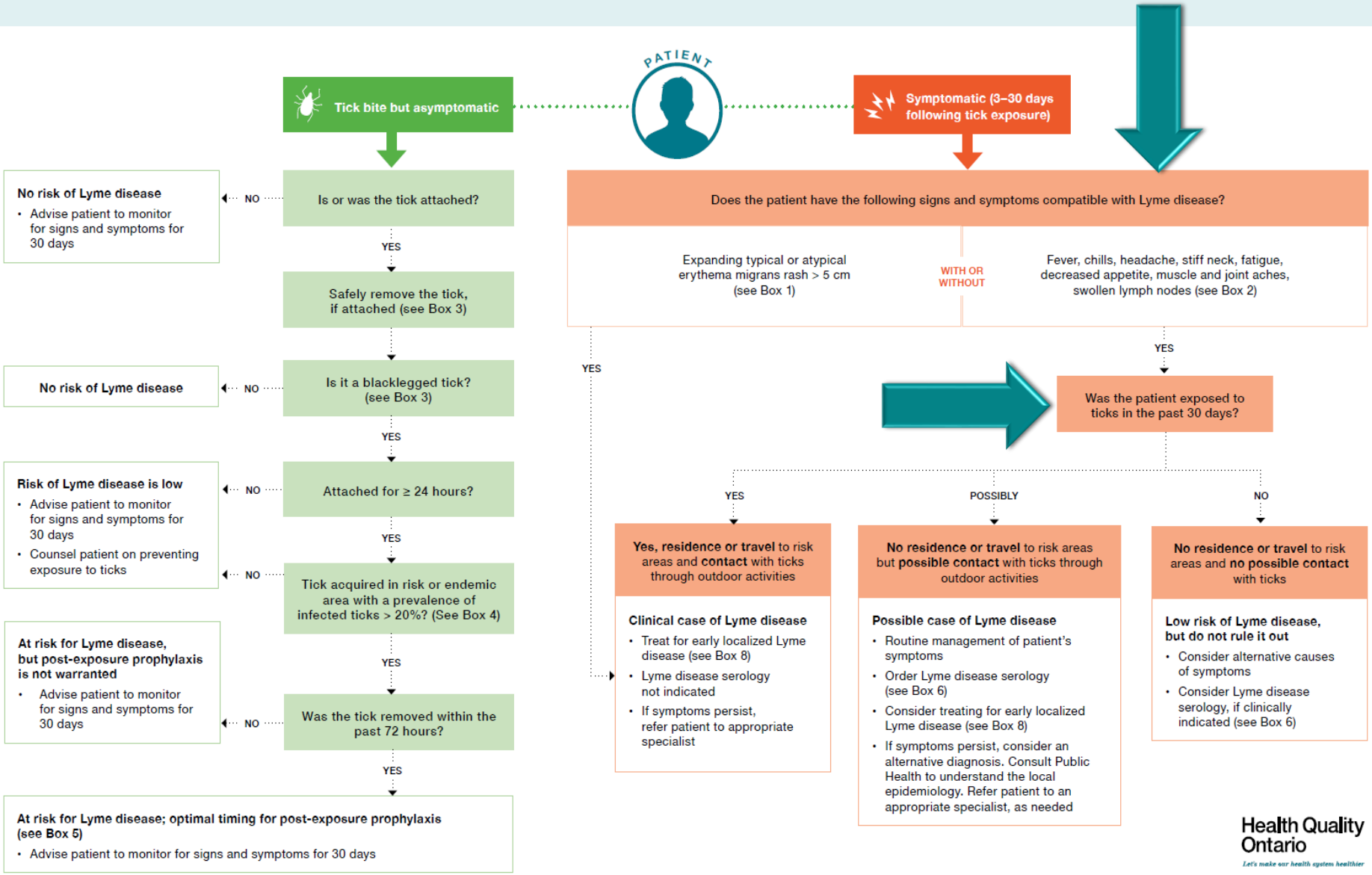
Case #3

- 19 year old student lives in **Kitchener**
- Presented to a doctor with history of rash (circular erythematous patch) for ~1 week in April
- General “flu-like” symptoms (i.e., fatigue, chills, fever, headache, muscle and joint aches, and swollen lymph nodes)
- No travel history **to risk areas and no possible contact with ticks** in past month
- Initial thoughts and work-up?

Management of Tick Bites and Investigation of Early Localized Lyme Disease

Please contact us at **evidence@hqontario.ca** or **1-866-623-6868** if you have any questions or feedback about this clinical guidance document.



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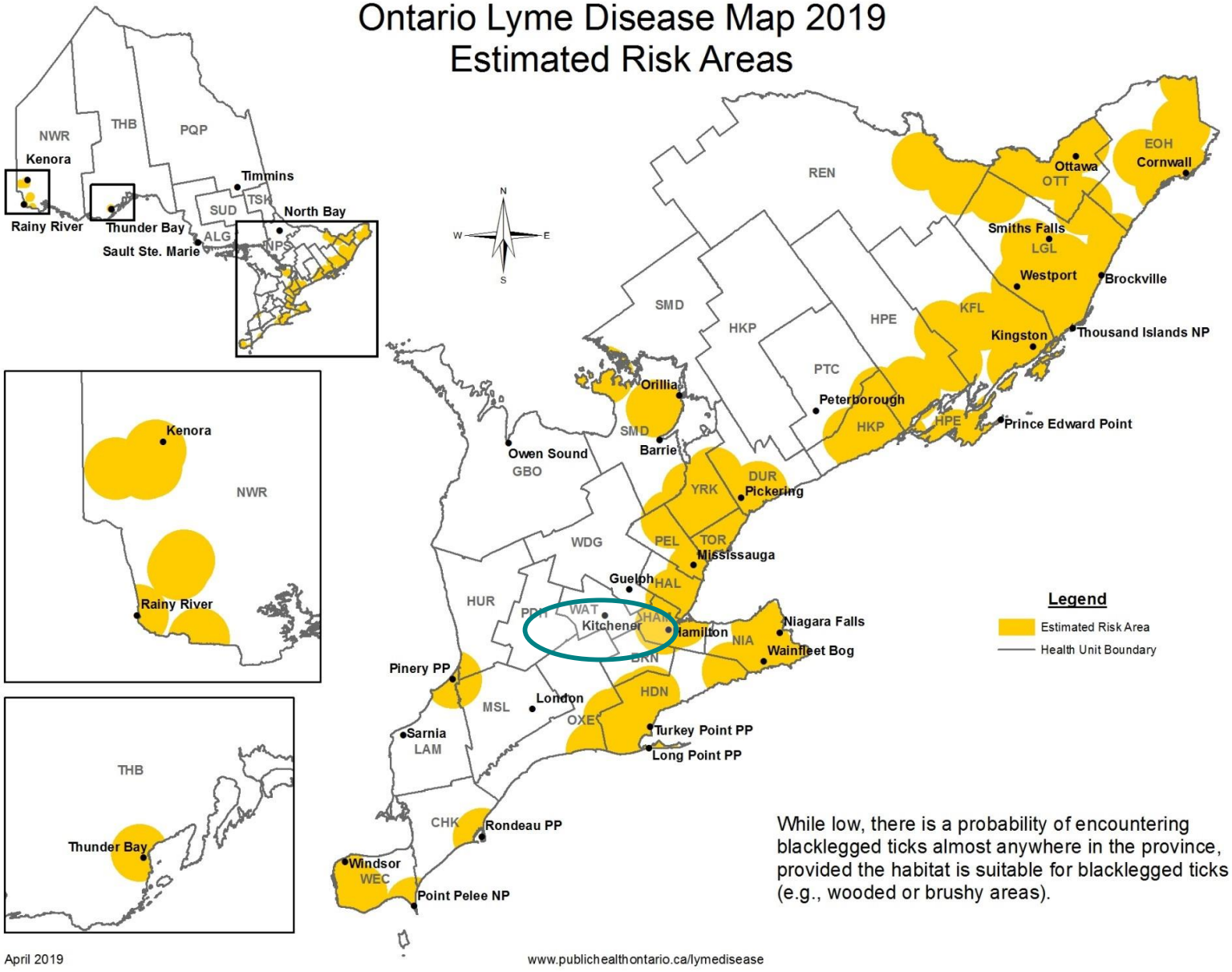

Source: Ontario Agency for Health Protection and Promotion (Public Health Ontario). Ontario Lyme disease map 2018 estimated risk areas [Internet]. Toronto, ON: Queen's Printer for Ontario; 2018 [cited 2018 June 14]. Available from: http://www.publichealthontario.ca/en/eRepository/Lyme_disease_risk_areas_map.pdf

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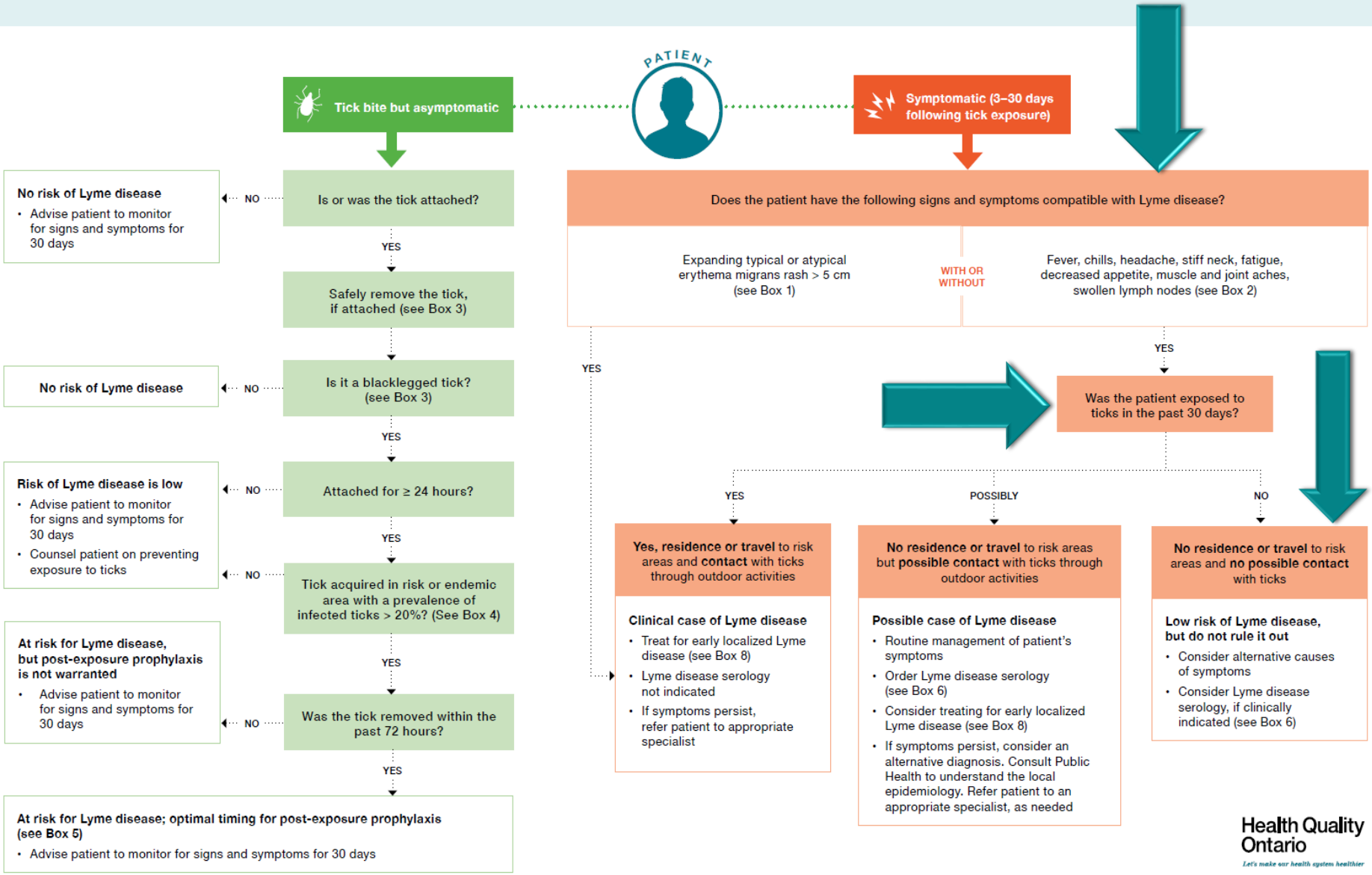

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Differential

- Parvovirus
- Enterovirus
- Syphilis
- Epstein-Barr Virus
- Cellulitis
- Ringworm
- Eczema or atopic dermatitis
- List goes on

- If nothing else found and symptoms worsen, consider ordering Lyme serology

Questions?

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Thank you.

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