

Diagnostic Stewardship Considerations in Pediatric Populations

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Disclosures

- Agency for Healthcare Research and Quality (AHRQ) funding for QI project improving surgical prophylaxis (OPERATIC).
- Johns Hopkins/Donaghue Foundation funding for QI work improving diagnostic testing in critically ill children (BrighT STAR).

Objectives

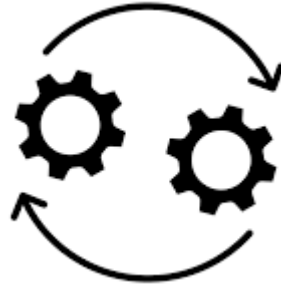
- Define diagnostic stewardship and its role in improving patient care.
- Describe the relationship between diagnostic stewardship and antimicrobial stewardship.
- Recognize common barriers to diagnostic stewardship.
- Identify limitations and interpretative challenges of commonly used pediatric ID diagnostic tests.

Diagnostic Stewardship

Coordinated efforts to ensure the ***right*** diagnostic test is ordered for the ***right*** patient at the ***right*** time, and that ***results are interpreted correctly*** to guide safe, effective treatment.



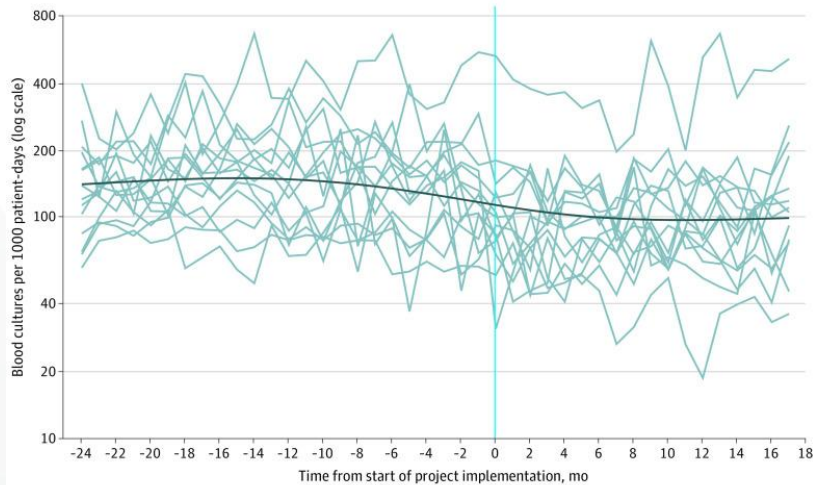
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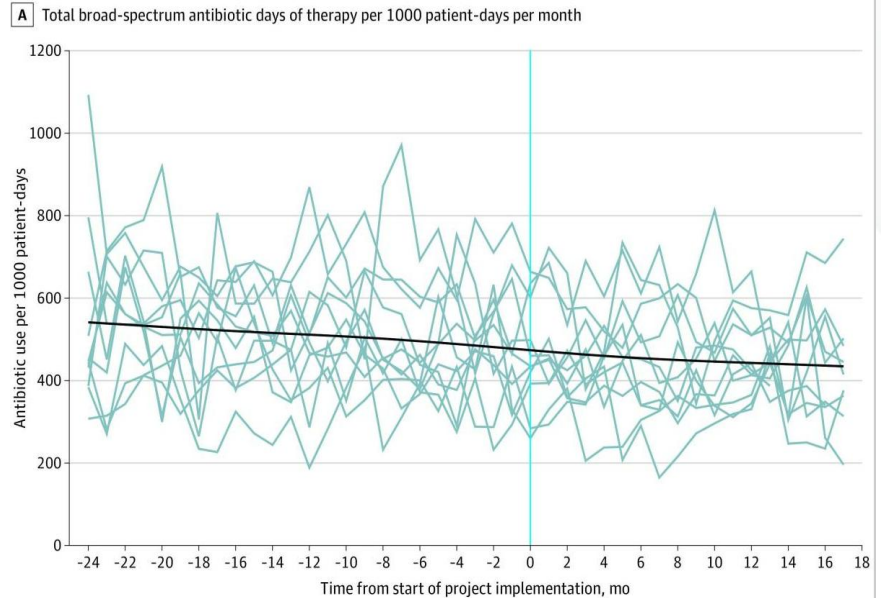
Coordinated efforts to ensure the ***right*** antibiotic is selected for the ***right*** patient at the ***right*** time and ***right*** dose to provide safe, effective treatment.

Bright STAR

(Testing Stewardship for Antibiotic Reduction)

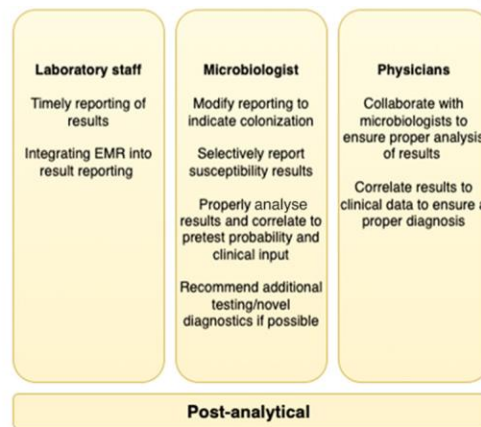
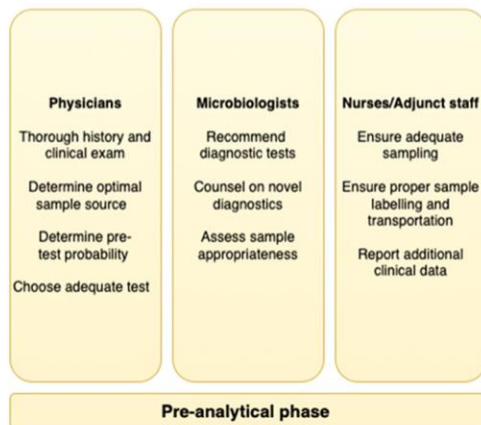


Monthly blood culture rates



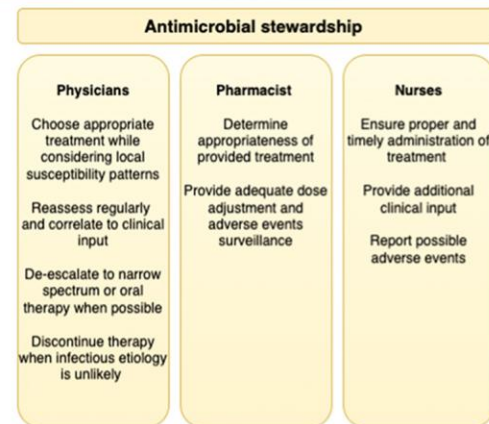
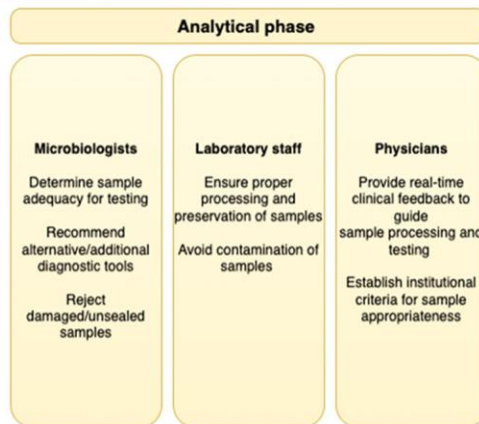
Total broad-spectrum antibiotic DOT

Source: Woods-Hill, et al, JAMA Peds, 2022



Diagnostic stewardship

Antimicrobial stewardship



Source: Zakhour J, et al. Int J Antimicrob Agents. 2023.

Physicians

Thorough history and clinical exam

Determine optimal sample source

Determine pre-test probability

Choose adequate test

Microbiologists

Recommend diagnostic tests

Counsel on novel diagnostics

Assess sample appropriateness

Nurses/Adjunct staff

Ensure adequate sampling

Ensure proper sample labelling and transportation

Report additional clinical data

Pre-analytical phase

Diagnostic stewardship

Analytical phase

Microbiologists

Determine sample adequacy for testing

Recommend alternative/additional diagnostic tools

Reject damaged/unsealed samples

Laboratory staff

Ensure proper processing and preservation of samples

Avoid contamination of samples

Physicians

Provide real-time clinical feedback to guide sample processing and testing

Establish institutional criteria for sample appropriateness

Laboratory staff

Timely reporting of results

Integrating EMR into result reporting

Microbiologist

Modify reporting to indicate colonization

Selectively report susceptibility results

Properly analyse results and correlate to pretest probability and clinical input

Recommend additional testing/novel diagnostics if possible

Physicians

Collaborate with microbiologists to ensure proper analysis of results

Correlate results to clinical data to ensure a proper diagnosis

Post-analytical

Antimicrobial stewardship

Antimicrobial stewardship

Physicians

Choose appropriate treatment while considering local susceptibility patterns

Reassess regularly and correlate to clinical input

De-escalate to narrow spectrum or oral therapy when possible

Discontinue therapy when infectious etiology is unlikely

Pharmacist

Determine appropriateness of provided treatment

Provide adequate dose adjustment and adverse events surveillance

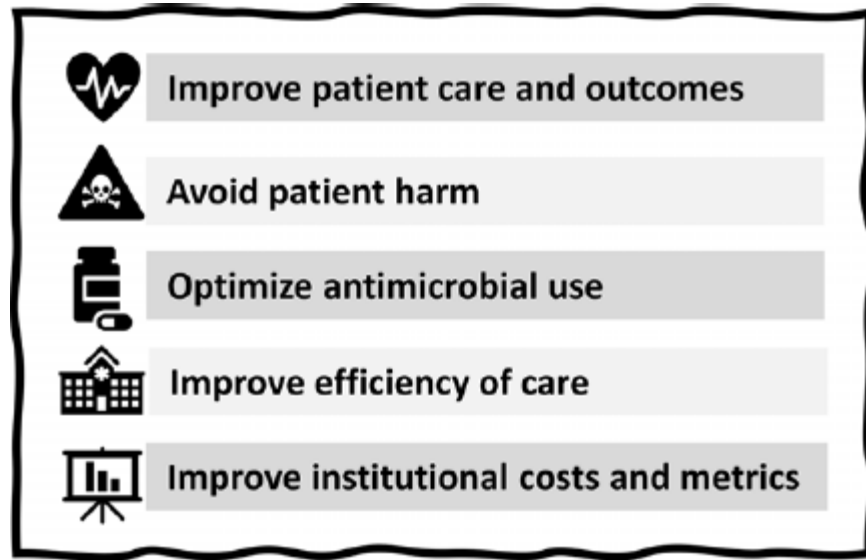
Nurses

Ensure proper and timely administration of treatment

Provide additional clinical input

Report possible adverse events

Diagnostic Stewardship Objectives



Source: Fabre et al., Infect Control Hosp Epidemiol, 2023.

Diagnostic Stewardship

***“Don’t order a test
unless you know how to
interpret it, and the
result will impact your
management of the
patient.”***

LeeRoy Meyer, M.D.





Source: Chatterjee, S. Am J Med. 2025



Source: Chatterjee, S. Am J Med. 2025



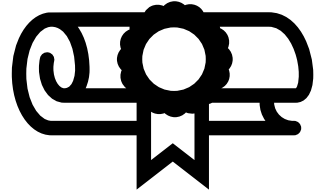
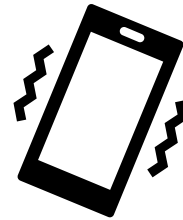
Pediatric Diagnostic Stewardship Cases

The Tired Teenager



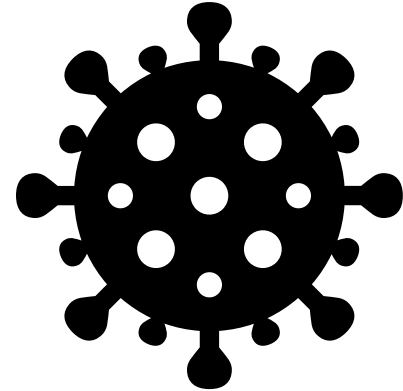
Former “go-getter”

- RFC: 16-year-old previously healthy girl with fatigue x 6 months—“sleeps all of the time”
- Initially started with sore throat, fevers, swollen nodes
- Diagnosed with mono with + Monospot
- Monospot continues to be positive
- Mom concerned that daughter has “chronic mono”



Infectious Mononucleosis

- Epstein-Barr virus (EBV)
 - 90-95% adults have been infected
- Signs and symptoms
 - Fever
 - Pharyngitis
 - Lymphadenopathy
 - Hepatosplenomegaly



Monospot

THE GOOD...

- Easy to obtain
- Rapid turnaround
- Low cost



THE BAD...

- False negatives
 - Early infection
 - Small children
- False positives
 - Infectious (adeno, HIV)
 - Non-infectious (SLE)
- Can persist + for 1 year



Red Book: 2024–2027 Report of the Committee on Infectious Diseases, 2024

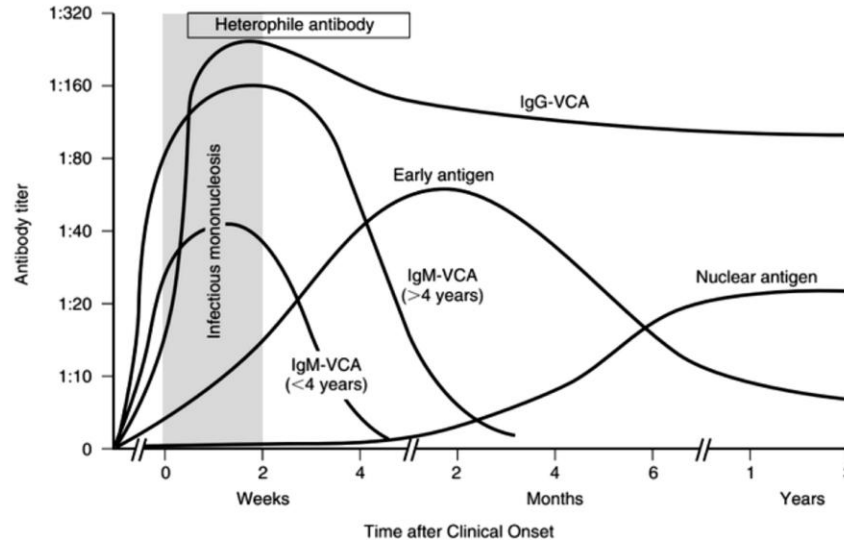


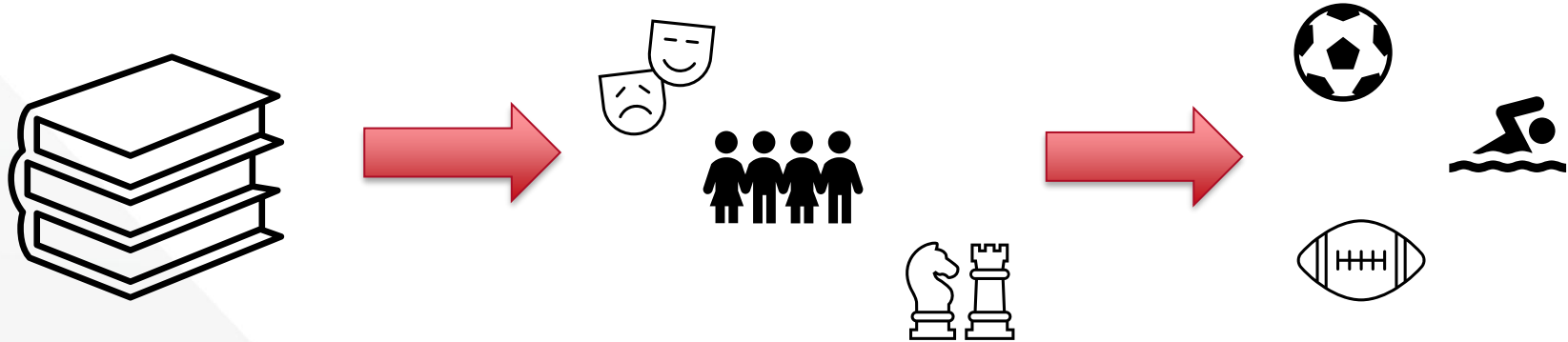
Figure Legend:

Source: Manual of Clinical Laboratory Immunology. Washington, DC: American Society for Microbiology; 1997:636. © 1997 American Society for Microbiology. Used with permission. No further reproduction or distribution is permitted without the prior written permission of American Society for Microbiology.

Post-IM Pearls



- Persistently + Monospot $\neq$ problem with immune system
- Prolonged fatigued (≥ 6 months) $\sim 10\%$ cases
- Identify priorities with return of activities!

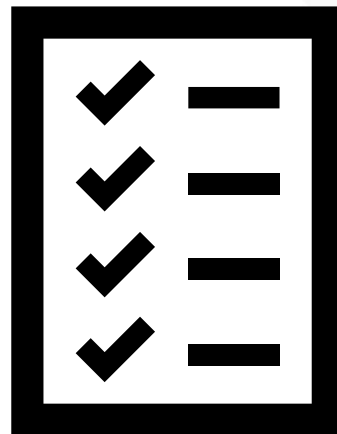


Recurrent Strep: A Clinical Conundrum



It's always positive!

- RFC: 8-year-old boy with recurrent strep throat; 4 positive tests over past year
- Sore throats sometimes accompanied by:
 - Runny nose
 - Body aches
 - Cough
 - Low-grade fevers
- Group A Strep test obtained q visit, always +



Group A Strep Pharyngitis

- **Signs and symptoms**
 - Sore throat with tonsillar inflammation
 - Tender anterior cervical lymphadenopathy
 - Palatal petechiae
 - “Strawberry” tongue



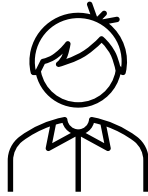
Source: AAP Red Book 2024-27, 33rd ed.

Who gets strep throat?

- Most common in school-aged children and adolescents
 - Peak: age 7-8 years
- Rare in children < 3 years
 - Immunologic immaturity?
 - Anatomic factors limits symptomatic infection?
 - Lower exposure intensity prior to school entry?



Who has GAS in their throat?



Group A Strep Pharyngitis Pearls



- Positive pharyngeal Group A Strep test *does not* distinguish between infection and carriage.
- If viral symptoms present, do not test.
- Clinical decision support tools may be helpful!



Hamdy, et al., J Pediatric Infect Dis Soc, 2025

Respiratory Pathogen Panels

To swab or not to swab...great question!

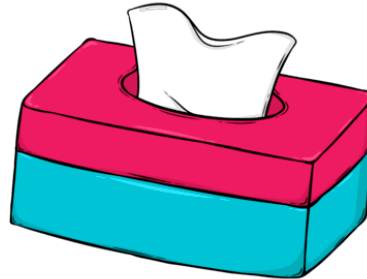
Prove that it is a virus!

- 6-year-old boy brought to ED by family with 3 days of low-grade fever, malaise, runny nose and cough
- Seen by PCP day prior with negative 4-plex
- Family concerned for a “sinus infection”



A common pediatric ED visit

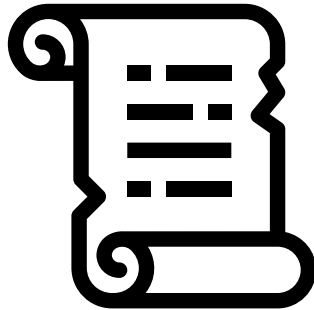
- ~50% of pediatric ED visits are due to respiratory infection
- Young children have 5-10 acute respiratory infections/year
- Large molecular respiratory pathogen panels (RPPs) have become widespread



- Ashman JJ, et al. Natl Health Stat Report, 2021
- Monto AS, et al. JID, 2014

Pros and Cons of RPPs

👍	👎
Multiple targets in one test	High cost (>\$400)
Rapid results	Does not distinguish between infection and disease



Do they reduce unnecessary antibiotic Rx?

Table 4. Outcomes Before and After Rapid Respiratory Panel (RRP) Implementation Regardless of Whether the Test Result Was Positive or Negative

Variable	Pre-RRP (n = 365)	Post-RRP (n = 771)	P Value
Time to test result, mean (SD), min	1119 (492)	383 (293)	<.001
PCR results received in ED before admission, No. (%)	19 (13.4)	398 (51.6)	<.001
Antibiotic prescribed, No. (%)	268 (73.4)	555 (72.0)	.61
Antibiotic use, mean (SD), d	3.2 (1.6)	2.8 (1.6)	.003
Inpatient LOS, mean (SD), d	3.1 (1.7)	3.2 (1.6)	.16
ED LOS, mean (SD), min	256 (97)	282 (115)	.002
Time in isolation, mean (SD), h	73 (41)	70 (38)	.27

Abbreviations: ED, emergency department; LOS, length of stay; PCR, polymerase chain reaction.

Table 5. Outcomes Before and After Rapid Respiratory Panel (RRP) Implementation Based on Whether the Test Result Was Positive or Negative

Variable	Viral Negative			Viral Positive		
	Pre-RRP (n = 145)	Post-RRP (n = 169)	P Value	Pre-RRP (n = 216)	Post-RRP (n = 597)	P Value
Time to test result, mean (SD), min	1129 (511)	377 (275)	<.001	1113 (482)	385 (298)	<.001
PCR results received in ED before admission, No. (%)	26 (17.9)	89 (52.7)	<.001	23 (10.7)	309 (51.8)	<.001
ED LOS, mean (SD), min	248 (232)	277 (122)	.05	262 (98)	284 (113)	.02
Antibiotic prescribed, No. (%)	109 (75.2)	136 (80.5)	.26	157 (72.7)	416 (69.7)	.41
Antibiotic use, mean (SD), d	3.1 (1.6)	3.1 (1.7)	.99	3.2 (1.6)	2.7 (1.5)	<.001
Inpatient LOS, mean (SD), d	3.2 (1.6)	3.2 (1.6)	.88	3.3 (1.6)	3.2 (1.6)	.03
Time in isolation, mean (SD), h	60 (36)	43 (36)	.13	82 (43)	74 (38)	.03

Abbreviations: ED, emergency department; LOS, length of stay; PCR, polymerase chain reaction.

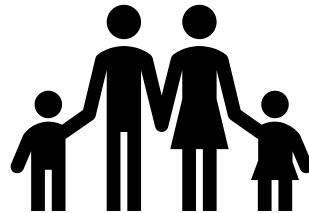
Do results change management?

- Retrospective single-center study (CHLA)
- **Aims** 
 - Impact on clinical management in PED
 - Hospital admission
 - Repeated visits within a 10-day period
 - Change in treatment (prescribing or d/c abx)
 - Effect of implementing restrictive criteria for RPP orders
- **Results**
 - RPPs had minimal impact on real-time clinical management
 - Restrictive criteria for RPPs can reduce lab costs

RPP Pearls



- If clinical presentation consistent with viral etiology and patient is not critically ill, not needed.
- Ask yourself... "how will this change my management?"
- Providing positive recommendations with negative recommendations = ↓ antibiotics + high visit ratings
- However...we treat anxiety too...



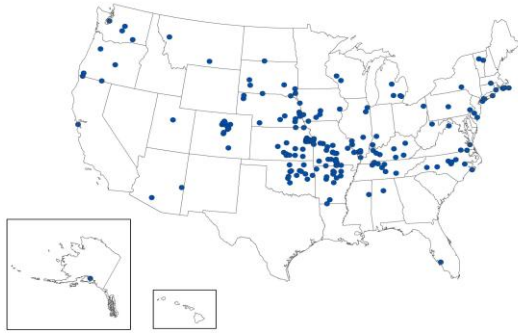
Tickborne Illness Testing



Tick Exposure

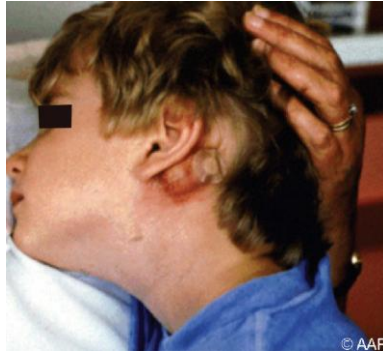
- 7-year-old boy presents to pediatrician with 3 days of fever and enlarged cervical lymph node.
- Tick removed from scalp the week prior
- Lyme serology and RMSF obtained
- Doxycycline initiated
- Fevers persist→Peds ID consulted

Tularemia



Map of the U.S. showing states with reported cases of Tularemia in 2023.

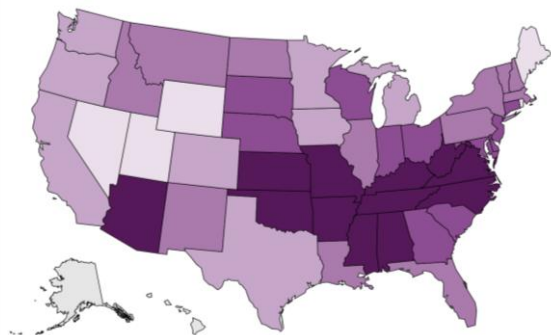
Source: CDC, "Tularemia Data and Statistics", 2025.



Source: AAP Red Book 2024-27, 33rd ed.

- Tick bites cause most U.S. cases
- Clinical presentations
 - Ulceroglandular
 - Glandular
 - Oculoglandular
 - Oropharyngeal
 - Typhoidal
 - Meningitis
 - Pneumonic
- Rx: gentamicin, +/- cipro

Rocky Mountain Spotted Fever (RMSF)



● 0 ● 0 to < 0.71 ● 0.71 to < 2.04 ● 2.04 to < 4.85 ● 4.85+ ● Not Notifiable

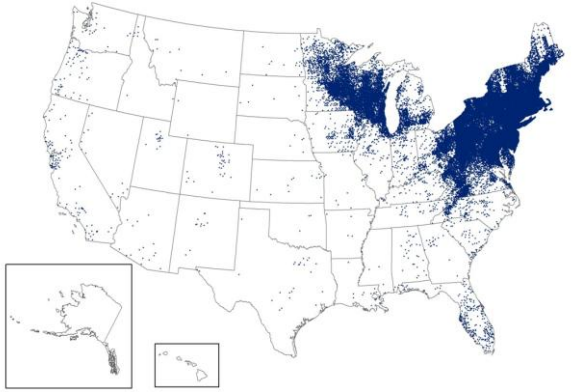
Annual incidence (per million population) of reported spotted fever rickettsiosis—United States for 2023



Source: AAP Red Book 2024-27, 33rd ed.

- Systemic, small-vessel vasculitis
- Signs and symptoms
 - High fever
 - Myalgia
 - Headache
 - Nausea, vomiting
 - Abdominal pain, diarrhea
 - Rash 2-4 days after onset of fever
- If testing, start Rx with doxy!
- Acute serology may be negative

Lyme Disease



Reported cases of Lyme disease, 2023

Source: CDC, "Lyme Disease Case Maps". 2025



Source: AAP Red Book 2024-27, 33rd ed.

- Nebraska a low-prevalence state
- Signs and symptoms
 - Early localized
 - Erythema migrans (EM)
 - Early disseminated
 - Multiple EM lesions
 - Cranial neuritis
 - Radiculitis
 - Carditis
 - Late manifestations
 - Mono- or oligoarticular large joint arthritis
- Before you test, consider a call to your ID friend!



Tickborne Diseases in Nebraska

Source: NHHS, Health Alert Network Update: Tickborne Disease in Nebraska 2026

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