Evaluating Practice Changes and Learning Curve When Lyme Disease Becomes Endemic in a Treatment Area

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INTRODUCTION:

In the last decade, Lyme disease has been spreading rapidly from the Northeastern United States to the Midwest and Mid-Atlantic. The state of West Virginia has seen a tremendous rise in incidence; from 7.1 cases per 100,000 individuals in 2008 to 138 cases per 100,000 in 2022. Among its many sequelae, Lyme disease may present with joint pain and swelling. In newly endemic areas, clinicians are forced to alter their practice algorithms to properly diagnose and treat atraumatic inflammatory joint pathology, particularly in pediatric patients. Lyme arthritis (LA) can manifest very similarly to early septic arthritis (SA), leading to incorrect diagnosis and over-treatment. Although these pathologies may manifest similarly, oral antibiotics are sufficient to treat LA, while urgent surgical debridement (I&D) is needed for SA. Our study aims to assess the diagnostic and treatment learning curve of providers and facilities in areas that transition from low to high Lyme disease prevalence.

METHODS:

We conducted a retrospective review of all pediatric patients presenting with concern for joint infection, inflammation, or Lyme related process to a single health system in West Virginia between 2011 and 2022. Patients were initially identified using ICD-9/10 codes suggestive of joint infection, inflammation, or Lyme related process. Patients were then excluded for insufficient or no infectious diagnostic workup, lack of orthopaedic complaint, or lack of joint involvement. Patient charts were reviewed for physical exam and lab findings, admission status and duration, and treatment course. Patients were considered to have LA if they had a positive IgG Lyme titer or a positive PCR. Diagnostic and treatment learning curve was assessed by identifying time of presentation and sorting subject counts both by year and time-period. Three time periods were identified: before rapid increase in Lyme incidence (January 1, 2011-December 31, 2013) (pre phase), early rapid increase in Lyme incidence (January 1, 2014-August 31, 2019) (early phase), and late rapid increase in Lyme incidence and introduction of rapid Lyme testing (September 1, 2019- December 31, 2022) (late phase).

RESULTS:

A total of 1407 patients were identified with a presentation concerning for infection. Three-hundred twenty-four patients were diagnosed with LA. In the pre phase, eight patients were diagnosed with LA, none (0%) were admitted or underwent I&D; seven patients were diagnosed with SA, all (100%) were admitted and underwent I&D. In the early phase, 42 patients were diagnosed with LA, eighteen (43%) were admitted and six (14%) underwent I&D; 34 patients were diagnosed with SA, all (100%) were admitted and underwent I&D. In the late phase, 274 patients were diagnosed with LA, 22 (8%) were admitted and one (0.4%) underwent I&D; fifteen patients were diagnosed with SA, all (100%) were admitted and underwent I&D. In the LA group, average length of stay (LOS) was four in the early phase, and two in the late phase. There was a significant negative correlation of -0.488 between LOS and year from 2014 to 2022 ($p<0.0014$).

DISCUSSION AND CONCLUSION:

Despite seeing a tremendous rise in Lyme disease in West Virginia, our hospital system did not see a similar increase in admissions or surgical debridement for LA. In fact, there was a decrease in both outcomes as well as a decreasing average LOS for patients that were admitted. These trends are likely attributed to increased familiarity in the presentation of LA patients, and more importantly, to the introduction of rapid Lyme testing. Rapid Lyme testing allows physicians to diagnose LA with greater confidence when pediatric patients present with joint pain and swelling concerning for SA without having to admit patients for observation. Patients were also able to avoid I&D of their affected joint. These improvements in diagnostic speed and accuracy provide a cost benefit and decreased morbidity to patients.

Lyme Arthritis (n=324)	Pre Phase (n=8)	Early Phase (n=42)	Late Phase (n=274)
Admissions, n (%)	0 (0)	18 (43)	22 (8%)
Length of Stay, d	n/a	4	2
Surgeries, n (%)	0 (0)	6 (14)	1 (0.4%)