

Evaluation of pediatric patients diagnosed with Lyme disease in the Lehigh Valley

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Published In/Presented At

Kim, G., Vottero, K., Villalobos, T., Held Wheatley, K., Klocksieben, F., Kincaid, H., & Rooney, K. (2022). *Evaluation of pediatric patients diagnosed with Lyme disease in the Lehigh Valley*. Poster presented at Lehigh Valley Health Network, Allentown, PA.

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Evaluation of pediatric patients diagnosed with Lyme disease in the Lehigh Valley

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Background

Lyme disease is endemic to the Northeastern US. Initial diagnosis of Lyme disease is complicated by the difficulty of detecting tick bites and by the presentation of non-specific symptoms such as rash, fever, myalgias, and headache. As Lyme disease progresses, it can affect several organ systems and manifest as carditis, meningitis, arthritis, etc. With its increasing prevalence and potential for severe complications, it is important to have a thorough understanding of its epidemiology. Complications of Lyme disease can be prevented through early and adequate treatment. In 2018, the *Red Book* guidelines were updated to recommend the use of doxycycline instead of amoxicillin as first-line treatment of pediatric Lyme disease for all age groups.

Problem Statement

The goal of this project is to characterize the presentation, diagnosis, and treatment of pediatric Lyme disease in Eastern Pennsylvania and to describe the changes to provider practice in the management of pediatric Lyme disease after the 2018 changes of standard of care guidelines.

Methods

- Retrospective chart review of data from January 2014-March 2020
 - Approved by Lehigh Valley Health Network (LVHN) Institutional Review Board (Pro00001409)
- Inclusion criteria:
 - Younger than 18 years old
 - Lyme disease ICD diagnosis codes: 088.81, A69.20, A69.21, A69.22, A69.33, A69.29, Z86.19, R76.8, B94.8, and B94.9
 - Presentation for Lyme disease and record of symptoms and diagnosis at LVHN in Epic
- Exclusion criteria:
 - Seen by outside providers
 - No chart documentation
 - Incidental mention of Lyme disease with no record of symptoms and diagnosis at visit
- REDCap used to collect data
- Descriptive analyses of demographics and analyses of clinical presentation, diagnosis, and treatment

Results

- 2594 charts were identified and 1193 were analyzed (Figure 1).

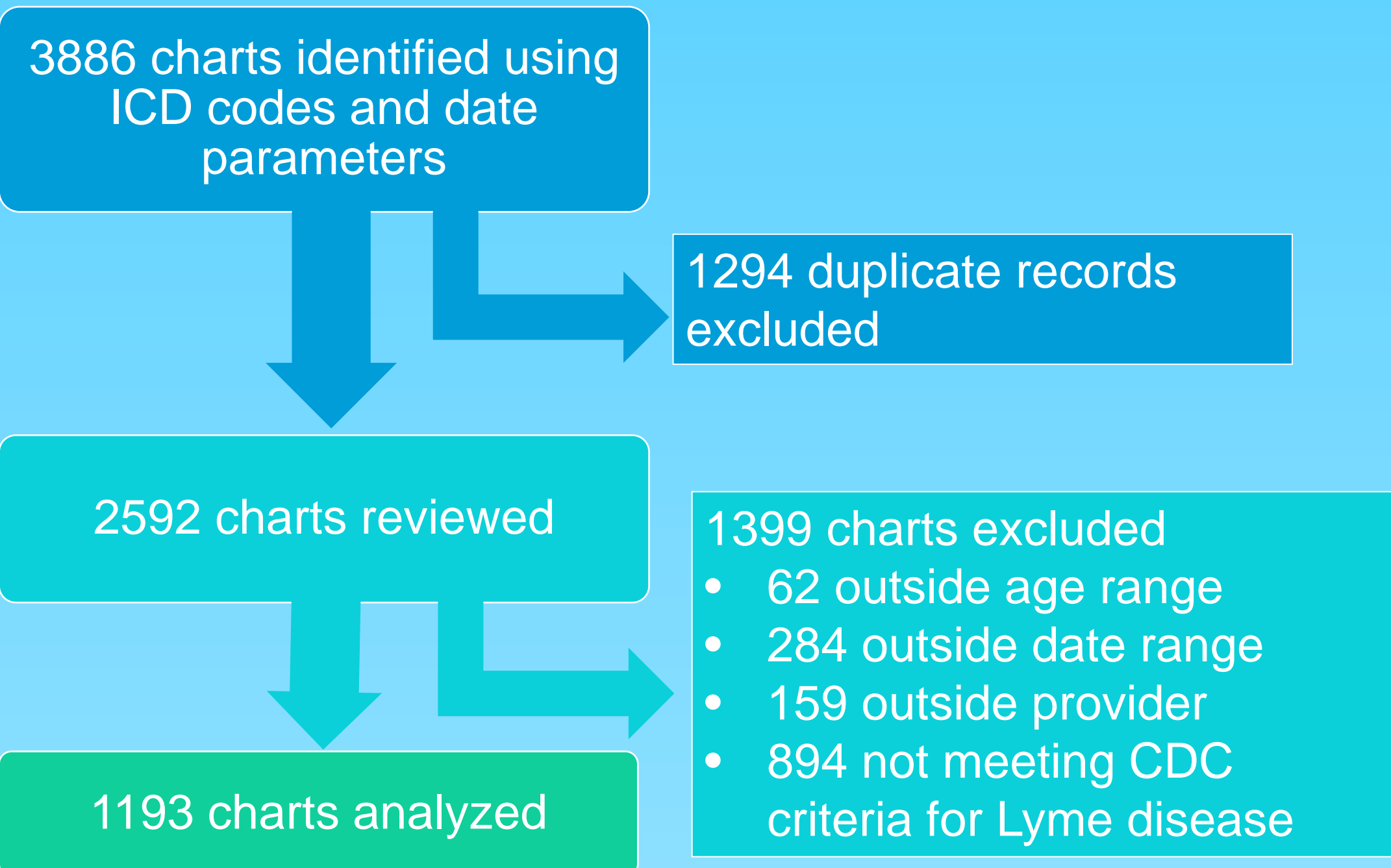


Figure 1. Review of medical record charts included in study

- Mean age 8.8 years, consistent with CDC peak incidence 5-9 years old (Table 1).
- Higher incidence during summer months
- Pre- and post-guideline change groups had similar demographics

Table 1. Demographic data (N=1193)

		Overall	Pre 06/2018 (n=684)	Post 06/2018 (n=509)
Age	Mean ± SD (yrs)	8.8 ± 4.4	8.8 ± 4.3	8.7 ± 4.5
Sex	Male	55.0% (656)	53.9% (369)	56.4% (287)
	Female	45.0% (537)	46.1% (315)	43.6% (222)
Race	White	84.7% (1011)	84.8% (580)	84.7% (431)
	Hispanic/Latino	6.3% (75)	6.0% (41)	6.7% (34)
	Other	9.0% (107)	9.2% (63)	8.6% (44)
Setting	ER	17.1% (204)	17.1% (117)	17.1% (87)
	PCP	56.4% (673)	60.0% (410)	51.7% (263)
	Inpatient	3.5% (42)	3.5% (24)	3.5% (18)
Diagnosis month	Urgent care	19.6% (234)	15.5% (106)	25.1% (128)
	Subspecialty	3.4% (40)	3.9% (27)	2.6% (13)
	Jan-Apr	8.8% (105)	10.5% (72)	6.5% (33)
Category	May-Aug	70.2% (838)	71.2% (487)	69.0% (351)
	Sept-Dec	21.0% (250)	18.3% (125)	24.6% (125)
	Early localized	59.0% (704)	58.6% (401)	59.5% (303)
Category	Early disseminated	23.6% (282)	24.6% (168)	22.4% (114)
	Late disseminated	17.4% (207)	16.8% (115)	18.1% (92)

Early localized Lyme disease cases (n=704)

- 310 cases of tick bites noted
- 656 cases of erythema migrans (EM)
- 178 ELISA tests performed; 87.1% positive test results
 - 141 (79.2%) of ELISA in EM positive patients

Results (continued)

- Significant difference between the pre- and post-guideline groups (Table 2)
- Similar results for subgroup analysis of early localized Lyme disease
 - Doxycycline treatment length also significantly different pre- and post- guideline changes ($p<0.001$)

Table 2. Prescribing patterns of providers for children <8 yrs old at initial presentation pre- and post-guideline changes (n=542)

		Pre 06/2018 (n=314)	Post 06/2018 (n=228)	p-value
Antibiotic	Doxycycline	4.5% (14)	22.8% (52)	<0.0001**
	Amoxicillin	86.0% (270)	74.6% (170)	0.0008**
	Ceftriaxone	1.9% (6)	0.9% (2)	0.3246
	Cefuroxime	6.1% (19)	1.3% (3)	0.0058*
	Azithromycin	0.6% (2)	0.0% (0)	---
	Other	1.0% (3)	0.4% (1)	0.4816
Length of treatment (days)	Doxycycline	17.9 ± 8.0	14.4 ± 5.4	0.0375
	Amoxicillin	19.1 ± 5.1	16.4 ± 4.9	<0.0001**
	Ceftriaxone	14.3 ± 13.5	1.5 ± 0.7	---
	Cefuroxime	18.3 ± 4.9	16.3 ± 4.0	---
	Azithromycin	10.5	---	---
	Other	---	---	---

Key: * $p<0.01$; ** $p<0.001$

Discussion and Conclusions

- Demographics of Eastern PA pediatric population with Lyme characterized; concordant with results published by CDC
- Shift in provider prescribing practices from amoxicillin to doxycycline
- Limitations:
 - May not fully capture epidemiology of Lyme disease in Lehigh Valley as only LVHN records were used
 - Antibiotic allergies/adverse reactions not accounted for
 - Small sample size for further analysis
- Next steps: identify settings with high and low provider adherence; assess provider awareness of guidelines

SELECT Summary

- SDL reflection:
 - Overambitious with deadlines; communicated delays and revised timeline with Gantt chart
 - Difficulty in utilizing resources due to availability of individuals; allow for more time and communication in future
- Results of project will be the foundation for QI measures regarding provider awareness and compliance of guidelines
 - Impact on health system and resource utilization
 - Improve values-based patient-centered care practices at LVHN

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