Background. Rickettsial diseases (RD) include Spotted Fever Group (SFG) Rickettsiosis, Ehrlichiosis, Anaplasmosis, Typhus Group (TG) and Rickettsialpox, among others. Doxycycline is the treatment of choice in all age groups; recent treatment based on clinical diagnosis is important to prevent severe and fatal outcomes. SFG, Ehrlichiosis, and Anaplasmosis are nationally notifiable in the United States, but data on treatment patterns are not collected.

Methods. We conducted a retrospective analysis using Truven Health MarketScan Commercial Claims and Encounters databases. We included any individual with an outpatient claim using an ICD-9/10-CM code for RD, who had one-year continuous pre- and 3 months post-diagnosis enrollment and pharmaceutical claim data. The first outpatient record with RD was considered the incident diagnosis, and those with an RD hospitalization in the prior year were excluded. Epidemiologic characteristics, treatment patterns, and outcomes were summarized.

Results. 13,353 individuals were included; median age was 45 years (IQR: 28–55 years), 2,045 (15%) were under 18 years of age, and 51% were male. The most common diagnosis was SFG (7,133; 50%), followed by Ehrlichiosis (3,920; 30%), and Typhus (1,281; 10%); 36 individuals had >1 diagnosis. Over half (7,075; 53%) received doxycycline within 14 days. 4,093 (28%) were not prescribed any antibiotic. Hospitalization within 30 days of the index date was infrequent (149, 1.1%), and the majority were due to either SFR (47%) without a claim for doxycycline, 2,185 (35%) were prescribed another antibiotic; 4,093 (28%) were not prescribed any antibiotic. Hospitalization within 30 days of the incident diagnosis was infrequent (149, 1.1%), and the majority were due to either SFR (47%) or Ehrlichiosis (37%). No in-hospital deaths were recorded.

Conclusion. RD continues to be an important cause of disease in the outpatient population, but providers are still only prescribing the recommended treatment to about half of those in whom they suspect the disease. Continued education and increased awareness is critical to prevent severe outcomes from RD.

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664. Factors Associated with the Need for ICU Care Among Patients with Human Ehrlichiosis

Kevin Kuriakose, MD1; April Pettit, MD, MPH2; Jonathan Schmitz, PhD, MD3; Abelardo Moncayo, PhD4 and Karen Bloch, MD, MPH, FIDSA5; “Division of Infectious Diseases, Department of Medicine, Vanderbilt University Medical Center, Nashville, Tennessee, 2Department of Medicine, Division of Infectious Diseases, Vanderbilt University Medical Center, Nashville, Tennessee, 3Vanderbilt University Medical Center, Nashville, Tennessee, 4Division of Communicable and Environmental Diseases and Emergency Preparedness, Tennessee Department of Health, Nashville, Tennessee, 5Medicine and Health Policy, Vanderbilt University Medical Center, Nashville, Tennessee

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Background. Despite the availability of effective therapy, the case fatality rate of human monocytic ehrlichiosis (HME) is 3%, and has been reported to be higher among the immunocompromised. Little is known about predictors of severe disease.

Methods. We performed an observational cohort study at a tertiary care medical center in Nashville, TN. Patients with a positive whole blood or cerebrospinal fluid Ehrlichia polymerase chain reaction between 2007 and 2017 were included. Clinical and demographic data were obtained by chart abstraction. Modified Poisson Regression was used to estimate the adjusted relative risk (aRR) of requiring intensive care unit (ICU) care, adjusting for age, sex, race, Charlson Comorbidity Index, immunosuppression, patient-reported tick exposure, and number of days from first contact with healthcare system to treatment initiation.

Results. We included 155 patients; median age was 48 years, 64% were male, 94% were Caucasian, 74% reported a tick exposure, and 21% were immunocompromised. 28% of patients required ICU care. Immunosuppression and reported tick exposure were associated with a decreased risk of requiring ICU care. An increasing number of days from first contact with the healthcare system to treatment initiation were associated with an increased risk of requiring ICU care.

Conclusion. Twenty-eight percent of patients required ICU care. We found that a delay in initiation of therapy was associated with an increased risk of requiring ICU care. In contrast to other studies, we found immunosuppression to be associated with milder clinical illness, perhaps reflecting a lower threshold to seek care and thus earlier presentation. Patients with recent tick exposure were also less likely to require ICU care, potentially reflecting a higher index of suspicion for HME among providers. Future studies evaluating the impact of provider education on early recognition and treatment may lead to a decreased need for ICU care in patients with HME.

Table 1: Modified Poisson Regression Model for Relative Risk of Requiring ICU Care

| Variable                | Adjusted RR (95% CI) |
|-------------------------|-----------------------|
| Age (per year)          | 0.99 (0.97–1.01)      |
| Female sex              | 1.38 (0.81–2.35)      |
| White race              | 1.48 (0.76–2.94)      |
| Immunosuppression       | 0.39 (0.17–0.88)      |
| Charlson Comorbidity Index (per 1) | 1.15 (0.95–1.38) |
| Patient-reported tick exposure | 0.56 (0.34–0.91) |
| Days from first contact to treatment initiation | 1.07 (0.83–1.32) |

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665. Key Clinical and Laboratory Features in Early Diagnosis of Ehrlichiosis in an Endemic Area of Long Island, New York

Olga Kaplan, MD1; Kalie Smith, BS2; Teresa Khoo, MD1; Eric Spitzer, MD, PhD3; Frederic Weitbaum, MD4 and Luis A. Marcos, MD, MPH5; “Infectious Diseases, Stony Brook University Hospital, Stony Brook, New York, 2Stony Brook University Hospital, Stony Brook, New York, 3Stony Brook Southampton Hospital, Southampton, New York

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Background. Human monocytic ehrlichiosis (HME) is a tick-borne disease caused by Ehrlichia chaffeensis in the northeast United States. Suffolk County, New York has the highest amount of HME cases in NY (176 from 2010 to 2014). Our aim is to identify risk factors for HME and compare clinical presentation and laboratory findings of young vs. older adults.

Methods. A retrospective chart review from January 1, 2014 to December 31, 2017 was performed on all patients ≥18 years who presented to the ER at Stony Brook University Hospital (SBHU) or Stony Brook Southampton Hospital (SBSH) with (i) ICD-9 code 082.4 or ICD-10 code A77.40 and (ii) a positive E. chaffeensis PCR. Data were collected on demographics, clinical presentation, and laboratory results.

Results. Twenty-seven cases of HME were found and separated into Group 1 (G1, n = 10) and Group 2 (G2, n = 17) based on age (Table 1). G1 had a significantly higher chance of being Hispanic than G2. Twenty-four of the 27 patients (89%) were hospitalized with an average length of stay of 3.4 days (range: 1–4 days). The only significant difference in clinical presentation was that G1 was more likely to have myalgia (P = 0.02). 40% or more of patients in both groups presented with an acute kidney injury and the average length of hospital stay in days was 4.0 ± 2.9 versus 3.2 ± 3.1 for G1 and G2, respectively. The number of cases overall have increased 6.0% per year between 2014 and 2017. Thrombocytopenia was presented in all cases.
Background. Suffolk County (Long Island, New York) reports annually the highest absolute number of tick-borne diseases in New York. A new Borrelia species, Borrelia miyamotoi which causes a relapsing fever, has been reported in New York recently. The aim of this study was to identify the number of cases of B. miyamotoi diagnosed in Suffolk County.

Methods. A retrospective chart review was performed in Stony Brook (SB) Medicine hospitals, SB University Hospital (the only tertiary medical center in Suffolk County) and Southampton Hospital (a major hospital in the east end of Suffolk County). Laboratory records were queried for a positive B. miyamotoi PCR test from blood or a positive IgG antibody with a B. miyamotoi specific ELISA that utilizes a recombinant GlpQ antigen (both tests performed in a commercial laboratory).

Results. Twenty-eight cases were positive for serology (IgG EIA; n = 19) or PCR (n = 9). None of the IgG-positive cases had a positive PCR result indicating that individuals were only exposed to B. miyamotoi in the environment. Of the nine PCR-positive cases (median age 67 years), eight were men, three were diagnosed in the outpatient clinic (33.3%) and six were diagnosed through the emergency department and required hospitalization (66.6%). Thrombocytopenia and transaminases were common findings. Two-thirds of these nine cases were diagnosed in the period of 2016–2017 and one-third in the period, 2013–2015 (P = 0.17).

Conclusion. An increasing number of cases of B. miyamotoi were observed in Suffolk County during 2013–2017 and two-thirds required hospitalization. The real burden of this tick borne disease in Suffolk County and the rest of the state is unknown.

Table 1: Clinical-Demographics Features of B. miyamotoi Cases Diagnosed by PCR Blood Test

| Year of Presentation | Age (Years) | Gender | Symptoms | Leukocytes (mm3) | Hemoglobin (g/dL) | Platelets (U/L) | Creatinine (mg/dL) | AST (U/L) | ALT (U/L) |
|----------------------|------------|--------|----------|-----------------|-----------------|-----------------|-----------------|----------|----------|
| 2013                 | 74         | M      | Fever    | 4,600           | 14.2            | 154,000         | 0.7             | 21        | 28        |
| 2015                 | 67         | F      | Flu-like syndrome | 5,500           | 14.7          | 260,000         | 0.8             | 33        | 23        |
| 2016                 | 64         | M      | Syndrome | 3,600           | 14.1          | 109,000         | 0.7             | 65        | 74        |
| 2017                 | 32         | M      | N/A      | 3,000           | 15.6          | 166,000         | 1.0             | 98        | 65        |
| 2018                 | 68         | M      | N/A      | N/A             | N/A           | N/A             | N/A             | 20        | 18        |
| 2019                 | 74         | F      | Flu-like | 6,800           | 15.6          | 51,000          | 3.1             | 212       | 165       |
| 2017                 | 90         | M      | Fever and vomiting | 4,100           | 9.7            | 91,000          | 1.48            | 74        | 46        |
| 2017                 | 72         | M      | Fever and diarrhea | 3,200           | 14.7          | 99,000          | 0.8             | 73        | 117       |
| 2017                 | 26         | M      | Fever and diarrhea | 5,400           | 16.3          | 12,000          | 1.05            | 51        | 68        |

AST, aspartate transaminase; ALT, alanine transaminase; N/A, no available.

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666. Clinical Spectrum of Powassan Virus Infection in Patients Presenting with Suspected Acute Tick-Borne Illness From a Lyme-Endemic Focus in the Midwest

Sue Kehl, PhD; Steven Callister, PhD; Dean Jobe, MSc; Angela Thomun, BS; Ziyun Yin, MSc; Sooyoung Kim, PhD; Phillip Pratt, PhD and Konstance Knox, PhD; 1Pathology, Medical College of Wisconsin, Milwaukee, Wisconsin. 2Microbiology Research Laboratory, Gundersen Health System, La Crosse, Wisconsin. 3Microbiology Research Laboratory, Gundersen Health System, La Crosse, Wisconsin. 4Copeland Healthcare Solutions, Waukesha, Wisconsin. 5Biostatistics, Medical College of Wisconsin, Milwaukee, Wisconsin.

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Background. Powassan virus (POWV) is the North American member of the tick-borne encephalitis complex of viruses. The potential for concurrent transmission with other tick-borne pathogens, particularly the Lyme disease agent Borrelia burgdorferi, is under studied. To better understand the clinical spectrum of POWV infection patient health records were reviewed and laboratory studies performed to evaluate the frequency of tick-borne pathogen exposure in patients presenting with suspected acute tick-borne illness (TBI) from a Lyme-endemic focus in the Midwest.

Methods. One hundred and thirty-five samples collected from patients seen at Gundersen Health System presenting during 2016 with Lyme-like symptoms were tested for Anaplasma, Babesiosis, Lyme disease and POWV. PCR testing was performed for Anaplasma and Babesia. Serologic testing for B. burgdorferi was performed using two-tier serologic testing. POWV infection was confirmed by POWV-EIA/IFA (Coppe Laboratories). IRB approval was obtained.

Results. Anaplasma infection was seen in 44/88 (50%), Babesia infection in 5/67 (7.5%), Lyme disease in 45/135 (33.3%) and POWV infection in 16/132 (12.1%) patients. Co-infections were seen in 21/135 (15.3%) patients. Patients with Babesia more often presented with anemia, myalgia and decreased appetite. Patients with Anaplasma presented with fever, chills/sweats, nausea/vomiting, rash, elevated liver function tests, thrombocytopenia, leukopenia, and remembered the tick exposure. Lyme disease patients complained of fatigue, rash, chills/sweats, headache and remembered the tick exposure. Co-infection with both Lyme and Powassan virus was seen in 10/45 (23%) of patients. Patients with Lyme, Powassan virus or co-infection had no other significant difference in symptoms.

Conclusion. POWV infection is more prevalent in the Midwest than previously appreciated. Clinical data suggest that symptoms of POWV infection may be...