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Clinical Review

THE EVALUATION AND MANAGEMENT OF ROCKY MOUNTAIN SPOTTED FEVER IN THE EMERGENCY DEPARTMENT: A REVIEW OF THE LITERATURE

Michael Gottlieb, MD, RDMS,* Brit Long, MD,† and Alex Koyfman, MD‡

*Department of Emergency Medicine, Rush University Medical Center, Chicago, Illinois, †Department of Emergency Medicine, San Antonio Military Medical Center, Fort Sam Houston, Texas, and ‡Department of Emergency Medicine, The University of Texas Southwestern Medical Center, Dallas, Texas

Corresponding Address: Brit Long, MD, Department of Emergency Medicine, San Antonio Military Medical Center, 3841 Roger Brooke Drive, Fort Sam Houston, TX 78234

☐ **Abstract—Background: Rocky Mountain spotted fever (RMSF) is potentially deadly and can present subtly with signs and symptoms overlapping with other clinical conditions. Delayed diagnosis can be fatal. Objective: This review provides an evidence-based summary of the current data for the evaluation and management of RMSF in the emergency department. Discussion: RMSF occurs through transmission of *Rickettsia rickettsii* by an infected tick. Exposure in the United States occurs most commonly from April to September, and high-risk locations include wooded, shrubby, or grassy areas. Approximately half of patients with infection do not recall tick exposure. Symptoms can include fever, headache, photophobia, malaise, myalgias, and a petechial rash that begins on the wrists and ankles and spreads to the trunk. Rash may not occur in ≤15% of patients, and the classic triad of fever, headache, and rash is also not definitive. Laboratory evaluation may demonstrate hyponatremia, anemia, thrombocytopenia, abnormal liver enzymes, and elevated coagulation tests. Antibody testing can be helpful, but these results are not typically available to the emergency clinician. Doxycycline is the treatment of choice in adults, children, and pregnant patients. Patients should be advised about prevention strategies and effective techniques for removing ticks. Conclusions: RMSF is a potentially deadly disease that requires prompt recognition and management. Focused history, physical examination, and testing are important in the diagnosis of this disease. Understanding the clinical features, diagnostic tools, and proper treatment can assist emergency clinicians in the management of RMSF. Published by Elsevier Inc.**

☐ **Keywords—fever; petechiae; rash; Rocky Mountain spotted fever; tick; tick-borne; vasculitis**

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INTRODUCTION

Rocky Mountain spotted fever (RMSF) is a tick-borne illness that was first recognized in the late 1800s (1–6). The causative bacteria, *Rickettsia rickettsii*, is a Gram-negative, obligate intracellular bacteria, and infection may result in a systemic small vessel vasculitis ranging from mild to deadly (6–9). The varied clinical presentation and signs and symptoms that overlap with many other clinical conditions can make diagnosis challenging in the emergency department (ED) (2,3,9–12). Delayed diagnosis of this virulent disease may be fatal (6).

METHODS

We searched PubMed and Google Scholar for articles using the keyword and Medical Subject Heading "Rocky Mountain spotted fever" and primarily included studies evaluating epidemiology, history and physical examination

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findings, diagnosis, and management of RMSF. The literature search was restricted to studies published in English. We decided which studies to include for the review by consensus. A total of 85 references were selected for inclusion in this review, which focuses on providing a focused update of the literature concerning epidemiology, history and examination, diagnosis, complications, preventative strategies, and management.

DISCUSSION

Epidemiology

RMSF was originally discovered in the Rocky Mountains but is now endemic in many areas in the United States (12–15). The most common regions include the U.S. Southeast, Pacific, and West (Figure 1) (12–15). However, the disease has also been found in several areas outside of the United States, including Argentina, Brazil, Colombia, Costa Rica, Mexico, and Panama (6,9,15). The incidence has been steadily increasing over the past 20 years in the United States, with a peak in 2012 (9,15). The Centers for Disease Control and Prevention (CDC) reported fewer than 500 cases in 1993, which steadily increased to an all-time high of 4470 reported cases in 2012. This decreased to just over 3500 cases in 2014 (16). One study found that 12% of pediatric patients have antibodies to *R. rickettsii*, though none of these patients displayed signs or symptoms of RMSF at the time of testing (9). Most cases occur in pediatric patients, with two-thirds occurring in those <15 years of age, and males are affected more commonly than females (9,15–18). While disease incidence has increased, the case fatality rate has remained low, occurring in <0.5% of treated patients (1). Mortality is higher in patients >60 years of age, those with delayed diagnosis (a >5-day interval between disease onset and treatment), and patients who are not treated with tetracyclines (15–20).

Most cases are diagnosed between April and September (90%), in which outdoor activity and tick exposure are highest (9,15,21). The geographic distribution in the United States reflects the tick vectors and hosts required for transmission (Figure 1). Transmission occurs primarily through the American dog tick (*Dermacentor variabilis)* and the Rocky Mountain wood tick (*Dermacentor andersoni*), while the Lone

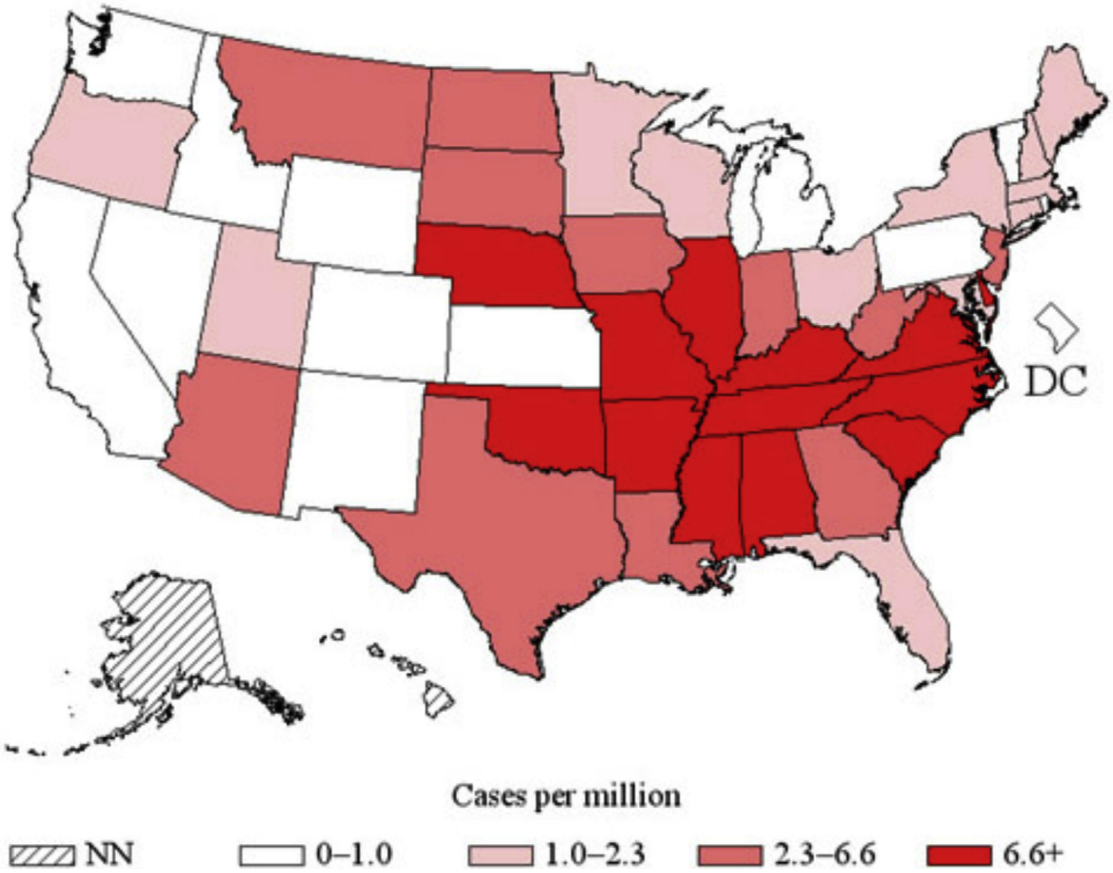

Figure 1. Rocky Mountain spotted fever incidence per million population in the United States in 2014. Obtained from the Centers for Disease Control and Prevention (https://www.cdc.gov/rmsf/stats/index.html). NN = Not notifiable.