Hantavirus Cardiopulmonary Syndrome
Information for New Mexico Physicians and Health Care Workers

July 12, 2017

Dear Colleagues:

Five recent cases of hantavirus cardiopulmonary syndrome (HCPS, also known as Hantavirus Pulmonary Syndrome (HPS)) in New Mexico residents, including 2 fatalities, has raised the concern of physicians, health care workers and the public. These cases highlight the potential lethality of HCPS, for which the mortality rate in North America is at 36%. Cases can and do occur during any month of the year, but more cases do occur in the late spring and summer, especially in the southwest United States. Given the rapidity of onset of shock and respiratory failure, early recognition of the illness and early, emergent transfer (if feasible) to a facility with extracorporeal membrane oxygenation (ECMO) is critical in reducing the risk of mortality. This letter is to inform you of the early signs and symptoms of HCPS and to let you know what resources are available for diagnosis, treatment and prevention of the disease.

Clinical Recognition of the Hantavirus Prodrome.

- HCPS begins one to eight weeks after exposure to infected rodents or their excreta, although not all patients will give a history of rodent exposure.
- **A prodromal phase** is experienced by all patients, with fever, chills and myalgias persisting for 1 to 7 days before progression to the cardiopulmonary phase. Pain in the legs and back can be severe. Headache, nausea, vomiting, diarrhea and abdominal pain can be the primary presenting complaints.
- Cough and other upper respiratory symptoms are not present among the first symptoms but begin at the onset of the cardiopulmonary phase.

Presumptive Laboratory Recognition of the Hantavirus Prodrome.

- The liberal use of the **complete blood count (CBC) with platelet count** is recommended because there is no way to use symptoms alone to distinguish between the prodrome of HCPS and that of many other viral and bacterial infections.
- A **specific rapid hantavirus antibody diagnostic test** should be ordered early for any patient who demonstrates low platelet count and should also be considered for rural patients without a low platelet count if they demonstrate multiple clinical findings compatible with the prodromal stage of HCPS and have a history of recent exposure to wild rodents or their excreta.
- A **low platelet count** (<150,000 in 98% of cases; <130,000 in 92%) is the only CBC abnormality consistently seen during the prodromal phase; left shift and immunoblasts are not seen during the prodrome. All HCPS cases eventually have platelets <100,000. Patients with symptoms consistent with early HCPS but with platelet counts of >150,000 should be advised to return to your clinic in 24 hours for re-evaluation, because serious infections associated with thrombocytopenia (HCPS, sepsis, plague, etc.) exhibit rapid falls in platelet counts of greater than 40,000 per 24-hour period.
- **Other nonspecific lab results** include elevated LDH and AST, and reduced serum bicarbonate.

Presumptive Clinical and Laboratory Recognition of HCPS.

- The **transition from the prodrome to the cardiopulmonary phase** is typically heralded by the abrupt onset of cough, shortness of breath, hypoxia, and the appearance of pulmonary edema on chest radiographs. In most cases, there is rapid progression to respiratory failure and cardiogenic shock, typically within 4 to 12 hours after the onset of cough and shortness of breath.
- With the **onset of pulmonary edema**, the CBC now shows thrombocytopenia, leukocytosis with circulating myelocytes and promyelocytes, and immunoblasts (recognized as large atypical lymphocytes with deep blue cytoplasm), and an absence of toxic changes in leukocytes. Hgb/Hct may also be increased, but only in the most severe cases. Acidosis, mild coagulopathy, elevated LDH and hepatic enzymes, and reduced serum albumin are usually seen. Serum creatinine is usually not elevated unless dehydration due to vomiting and diarrhea is severe.
- **Hypotension** in HCPS is due to cardiogenic shock with low cardiac output and normal or elevated peripheral vascular resistance and elevated plasma lactate.

Source of More General Information on HCPS.

- The Centers for Disease Control and Prevention (CDC) maintains a comprehensive educational website including technical information for clinicians: https://www.cdc.gov/hantavirus/technical/hps/index.html

Immediate Consultation and Referral.

- Patients with suspected HCPS (thrombocytopenia and compatible clinical picture) should be admitted to the ICU for careful observation, judicious fluid management, and supportive care.
- Fluid resuscitation should be restricted, even before ICU admission.
- If hantavirus is suspected, immediate consultation should be obtained with the infectious diseases or critical care faculty on call at the University of New Mexico Hospital (UNMH).
- If hantavirus is considred likely or a presumptive diagnosis is established, emergency transfer to UNMH may be arranged with with the goal of minimizing delay in gaining access to ECMO.
- Not all patients require ECMO, but wherever possible, patients should be managed with immediate access to ECMO until resolution of the cardiopulmonary phase.
- All patients with suspected HCPS should be under droplet isolation until pneumonic plague can be ruled out (when an alternative presumptive diagnosis is established).
- For immediate consultation with an infectious disease specialist, 24 hours a day, for suspected cases of HCPS, call **1- 888-UNM-PALS** (**1-888-866-7257**). This number is for health-care professionals only. Do not call the hospital's general number.

Rapid Diagnostic Testing.

- Diagnostic testing for hantavirus infections is available at commercial laboratories.
- Both specific IgM and IgG tests are used to distinguish between acute and past infection with Sin Nombre hantavirus.
- Blood for serologic testing should be drawn into a serum separator tube, spun to separate the serum, and held at refrigerator temperature. Specimens should be sent on cold pack via same-day or next-day delivery.

Specific Treatment Options for HCPS.

- No approved antiviral treatment is available for HCPS. Although controlled trials have not been performed, **extracorporeal membrane oxygenation (ECMO)**, which is available at UNMH, appears to reduce mortality among patients with severe HCPS.

For general questions about HCPS.

- If you or your patients have general questions about the signs and symptoms of HCPS, what to do after exposure to rodents, prevention of hantavirus infections, or other issues not related to a specific case of suspected HCPS, the New Mexico Department of Health's (NMDOH) Epidemiology and Response Division has a toll-free number that can be accessed from 8:00 A.M. until 5:00 P.M. Monday to Friday. That number is **1-800-879-3421**.
- Reporting of suspect HCPS cases and other calls to the NMDOH should be directed to **505-827-0006.** Someone is available to answer that number 24 hours a day, each day of the week. Other information about prevention of hantavirus infections and New Mexico statistics is available at NMDOH's website: https://nmhealth.org/about/erd/ideb/zdp/hps/ and the CDC website: https://www.cdc.gov/hantavirus/index.html

- Be aware that HCPS can occur anywhere in the state, not just the northwestern corner where it was first recognized in 1993. Prevention of further deaths will depend upon the ability of clinicians like you to recognize the disease early in its course. Please take time to familiarize yourself with the information presented herein and to access other sources of information if you have further questions.