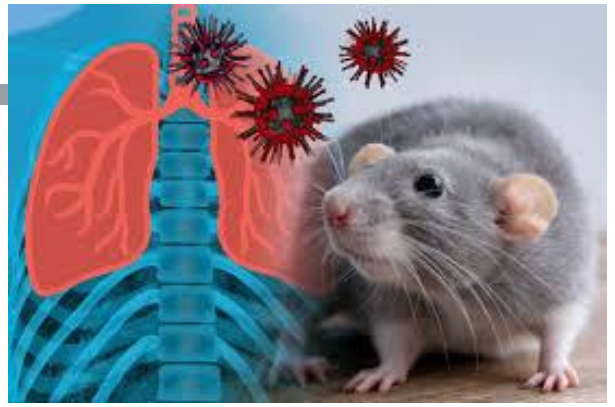

Hantavirus Pulmonary Syndrome

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Case presentation

- **A 29-year-old male construction worker presented to the emergency department with a 5-day history of fever, severe myalgia, fatigue, headache, nausea, and vomiting.**
- **Initially, he was diagnosed with influenza at a local clinic and treated symptomatically.(CXR : NL)**
- **However, his condition rapidly worsened, and he developed progressive shortness of breath and chest tightness.**

Case presentation

- **The patient reported recent exposure to a rodent-infested warehouse during a renovation project.**
- **He had cleaned dust and debris without wearing respiratory protection.**

Case presentation

- Within 24 hours of admission, the patient developed severe hypoxemia and acute respiratory distress syndrome (ARDS).
- His oxygen saturation dropped to 78% despite supplemental oxygen.

Case Presentation
PH/EX

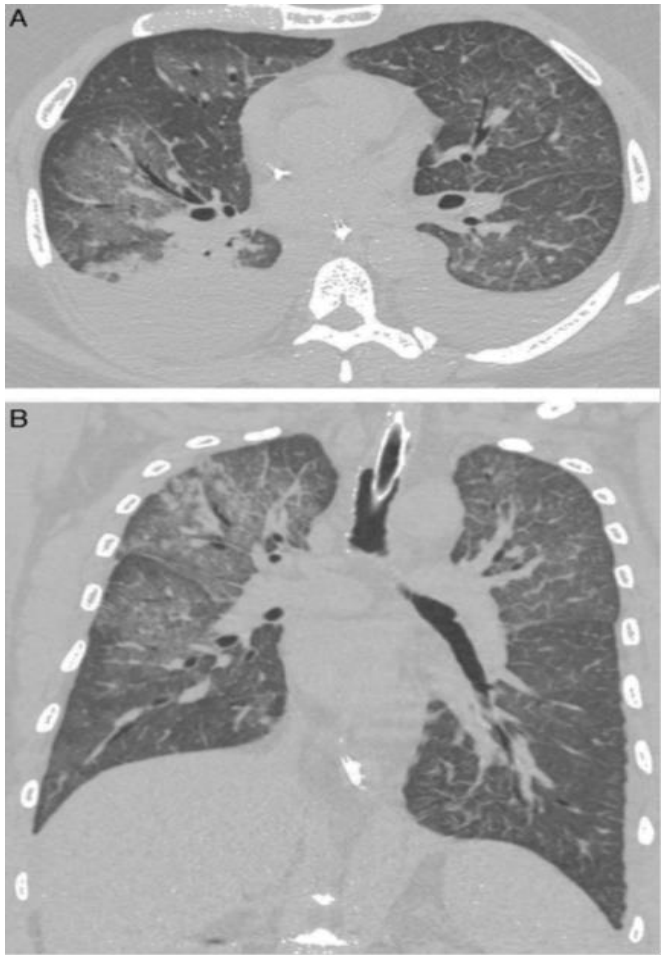
Respiratory rate: 34/min

Blood pressure: 85/55 mmHg

Tachycardia: 128/min

Bilateral diffuse crackles

Radiological finding



- **Chest CT scan demonstrated extensive bilateral pulmonary infiltrates and pulmonary edema.**

Laboratory evaluation

CBC:

- **WBC=19000 (Atypical Lymph:15%)**
- **Hct= 55%**
- **PLT=85000**
- **ESR:35**
- **CRP: 12**
- **Cr: 1.8**

- **AST=145**
- **ALT=110**
- **Lactate= 4 mmol/L**
- **HIV Ab: Neg**

Patient Process

The patient developed hypotension and shock requiring vasopressor support.

Managing fluid therapy became difficult because excessive intravenous fluids could worsen pulmonary edema.

There is no specific antiviral treatment for HPS

Supportive treatment:
Oxygen therapy
Intensive care monitoring
Mechanical ventilation

Patient Process

- At this time, (day 7 of symptom onset), serum PCR test was reported positive for hantavirus.

Patient Process

- The patient required mechanical ventilation for 8 days and vasopressor therapy for circulatory shock.

- After two weeks of intensive supportive care, his respiratory status gradually improved, and he was discharged with stable vital signs.

Discussion

Clinical Challenges in This Case

DISCUSSION

1. Nonspecific Early Symptoms

- **One of the major challenges in HPS is that the early phase mimics common viral illnesses such as influenza or COVID-19.**
- **Because of the nonspecific presentation, early diagnosis is often delayed.**

EARLY CLINICAL MANIFESTATIONS: HPS VS. INFLUENZA

- **Distinguishing early HPS from influenza can be challenging because both conditions present with fever, malaise, headache, and myalgia.**

- **Clinical Clues Favoring HPS Symptoms Commonly Seen in HPS:**

EARLY CLINICAL MANIFESTATIONS: HPS VS. INFLUENZA

Clinical Clues Favoring HPS Symptom

- High fever
- Severe myalgia (especially thighs, hips, and lower back)
- Headache
- Fatigue
- **Nausea and vomiting**
- **Abdominal pain**
- Diarrhea (occasionally)

Symptoms More Typical of Influenza

- Sore throat
- Rhinorrhea
- Nasal congestion
- Early cough

FEATURES SUGGESTING HPS RATHER THAN INFLUENZA

Significant gastrointestinal symptoms
History of rodent exposure.

Rapid progression to dyspnea within 24–48 hours.

Absence of prominent upper respiratory symptoms

CLINICAL CHALLENGES IN THIS CASE

Several laboratory abnormalities may appear before respiratory failure develops.
Characteristic Laboratory Pattern:

1. Thrombocytopenia

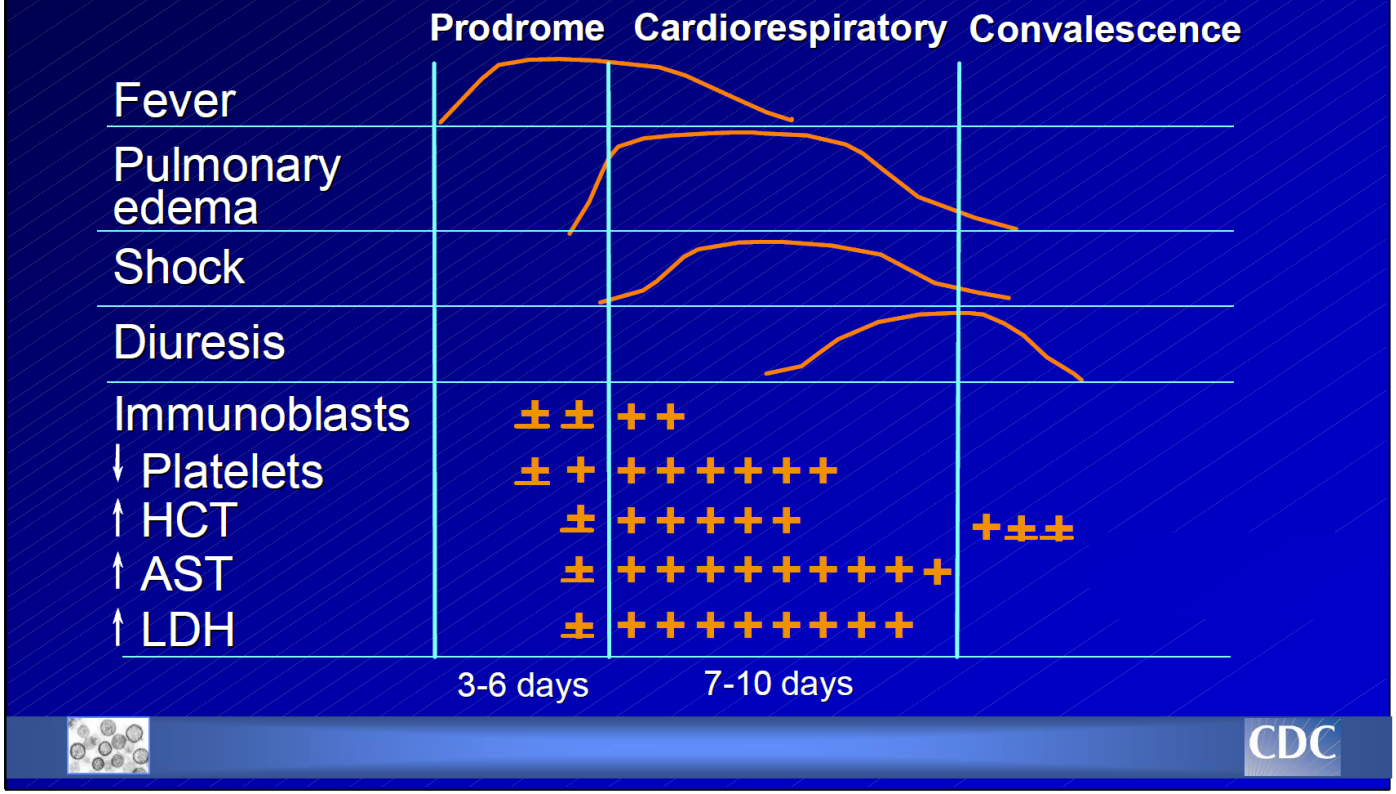
- Often the **earliest** laboratory abnormality
- **Platelet count usually <150,000/μL**

2-Rapid Respiratory Deterioration

- **2. Hemoconcentration**
  - Elevated hematocrit
  - Reflects capillary leak syndrome
- **3. Leukocytosis with Left Shift**
  - Elevated white blood cell count
  - Presence of immature granulocytes
- **4. Atypical Lymphocytes**
  - Frequently >10% on peripheral smear

- **5. Elevated LDH**
  - Often markedly increased
- **6. Mild-to-Moderate** Transaminase Elevation
  - AST and ALT elevated
  - AST often exceeds ALT
- **7. Hypoalbuminemia**
  - Due to vascular leakage

Clinical Progression of HPS



CDC

IMMUNE RESPONSES UPON HANTAVIRUS INFECTION

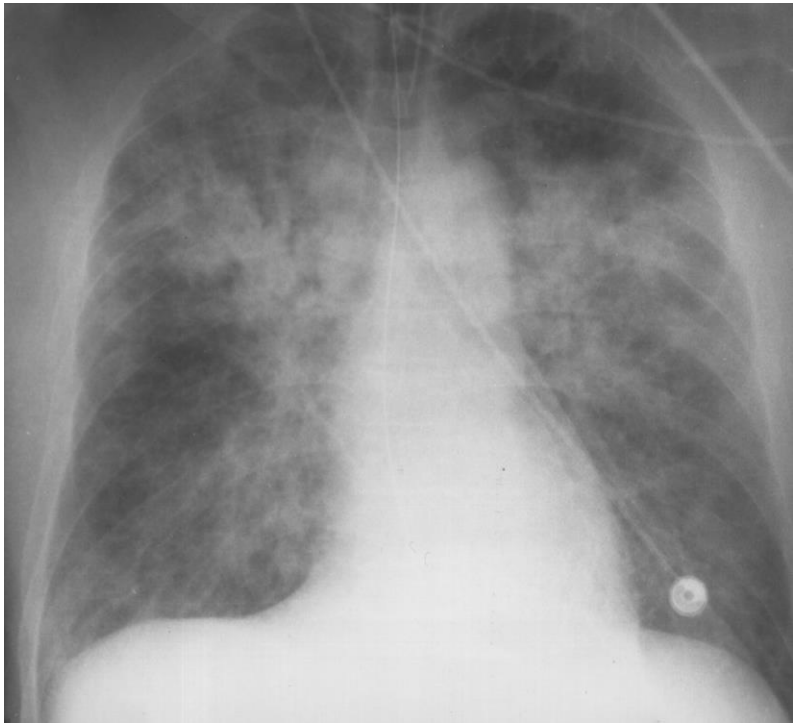
- **The proinflammatory cytokines IL-1β, IL-6, and IL-15 as well as ferritin were all associated with a more severe disease in univariate analyses**

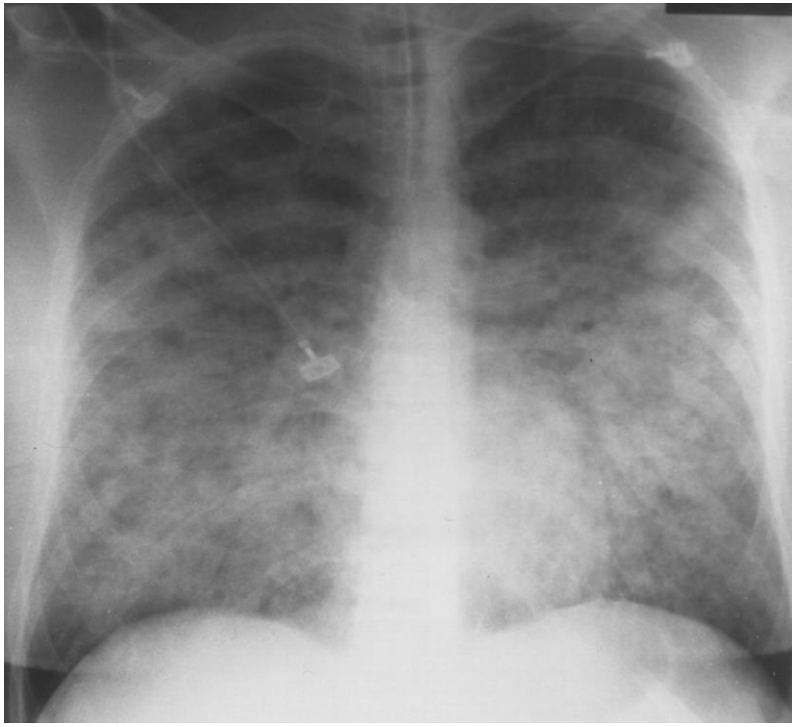
- **This suggests that certain inflammatory pathways might be more active in patients with severe HPS.**

- **In addition, during Ebola virus disease, dengue virus infection, and Crimean–Congo hemorrhagic fever, elevated levels of IL-6 have been linked to disease severity , suggesting that this is a common characteristic of viral hemorrhagic fevers.**

RADIOGRAPHIC FINDINGS

- **Early Phase**
  - Chest radiograph may be normal
- **Progressive Disease**
  - Bilateral interstitial infiltrates
    - Diffuse pulmonary edema
    - Non-cardiogenic pulmonary edema resembling ARDS

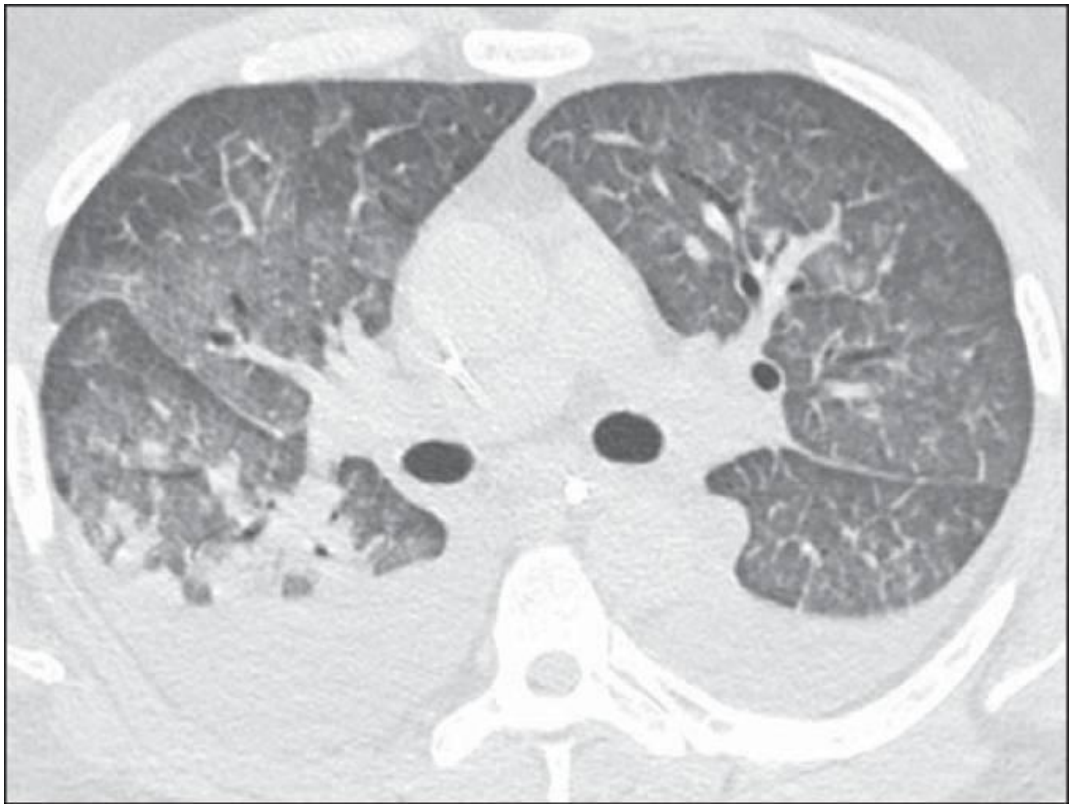




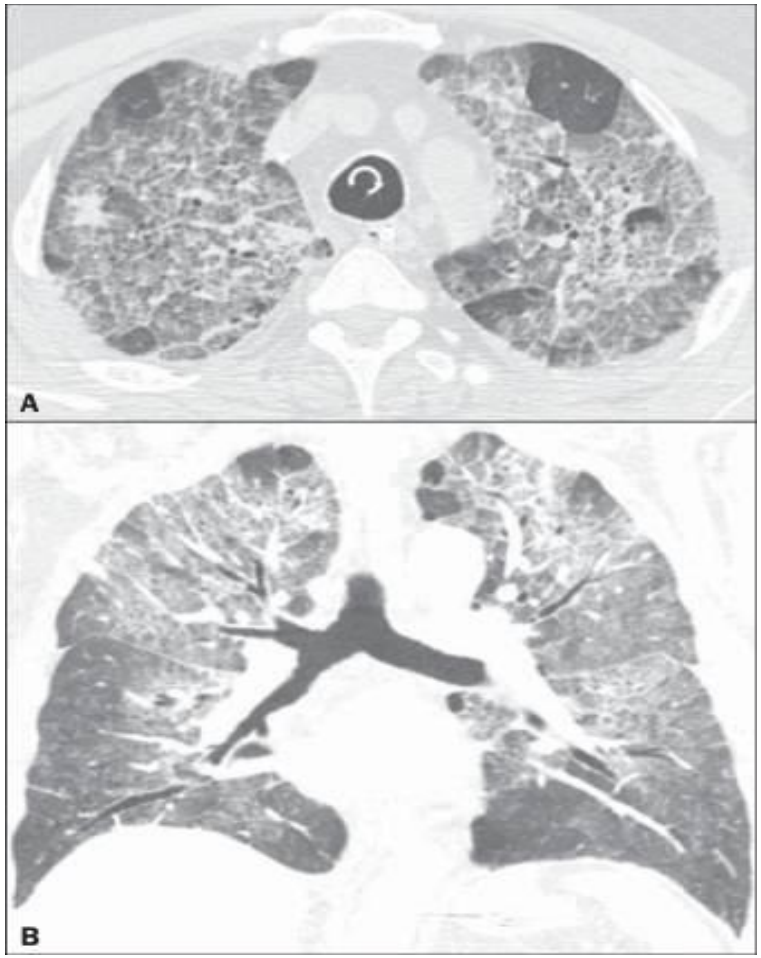
extensive perihilar and upper lung zone consolidation with associated air bronchograms.

diffuse alveolar air-space pattern that is more predominant centrally and in mid and lower lung zones.

interstitial edema, Kerley B lines, pulmonary vascular congestion, and mild consolidation of perihilium and lower lung area.



bilateral ground-glass opacities.
Note also bilateral pleural effusion.



High-resolution computed tomography with axial (A) and coronal (B) reconstructions shows bilateral areas of ground-glass opacities associated with inter- and intralobular septal thickening ("crazy-paving" pattern).

CLINICAL CHALLENGES IN THIS CASE

- **Vital Signs and Monitoring Parameters Indicating Progression to the Critical Phase .**

3.Hemodynamic Instability

Respiratory Rate

- One of the earliest warning signs:
  - **RR >24–28 breaths/min**
  - **Progressive increase over time**

Oxygen Saturation

- **SpO_2 <94% on room air**
- **Progressive decline in oxygen saturation**
- **Increasing oxygen requirement**

Heart Rate

- **Tachycardia >100–120 bpm**
- **Reflects capillary leak and reduced effective circulating volume**

Blood Pressure

- **Systolic BP <90 mmHg**
- **Mean arterial pressure (MAP) <65 mmHg**

CLINICAL CHALLENGES IN THIS CASE

4. Lack of Specific Antiviral Therapy

- **There is no definitive antiviral treatment for HPS. Management mainly depends on:**

- **Intensive supportive care**
- **Mechanical ventilation**
- **Hemodynamic monitoring**
- **Careful fluid balance**
- **Hemodynamic monitoring**
- **Vasopressor support when indicated**

TREATMENT AND ORGAN SUPPORT

GENERAL PRINCIPLES

- No specific antiviral treatment proven effective.
- Management is supportive and based on early recognition, intensive care and prevention of complications.
- Early transfer to a center with ICU capability is recommended for severe cases.

HEMODYNAMIC SUPPORT

- Manage hypotension with cautious fluid resuscitation.
- If hypotension persists, start vasopressors (norepinephrine preferred).
- Invasive hemodynamic monitoring may be needed in severe cases.

RESPIRATORY SUPPORT

- Monitor closely for signs of pulmonary edema and respiratory failure.
- Provide supplemental oxygen as needed.
- Use lung protective mechanical ventilation for ARDS (low tidal volume, adequate PEEP).
- Prone positioning may improve oxygenation.

FLUID AND ELECTROLYTE MANAGEMENT

- Carefully monitor fluid balance, electrolytes, renal function and urine output.
- Avoid fluid everload.
- Correct electrolyte disturbances as needed.

RENAL SUPPORT

- Monitor renal function and urine output.
- Provide renal replacement therapy (dialysis) if indicated.

ADDITIONAL SUPPORTIVE MEASURES

- Manage fever and pain.
- Provide nutritional support (enteral preferred).
- Monitor for and treat secondary infections.

EARLY RECOGNITION + INTENSIVE SUPPORTIVE CARE IMPROVES SURVIVAL.
Close monitoring and timely escalation of organ support are critical in the cardiopulmonary phase.

ROLE OF ECMO ??

???

- **Extracorporeal Membrane Oxygenation (ECMO) provides temporary cardiopulmonary support when conventional therapy fails.**

- **Does ECMO Improve Survival?**
- **Evidence suggests that ECMO can substantially improve survival in patients with severe HPS who develop refractory respiratory or cardiopulmonary failure.**

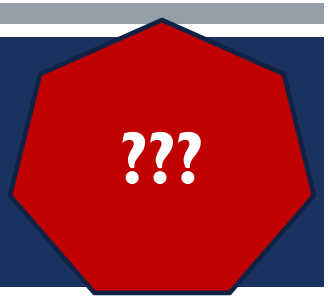
- **Reported outcomes from experienced centers have shown survival rates approaching 70–80% or higher in selected patients who receive timely ECMO support.**

WHEN SHOULD ECMO BE CONSIDERED?

- **Severe hypoxemia despite optimal ventilation**
- **Rapidly progressive pulmonary edema**
- **Cardiogenic or mixed shock**
- **Refractory respiratory failure**
- **Impending cardiovascular collapse**

Timing is critical. Early initiation before irreversible organ injury develops is associated with the best outcomes .

ROLE OF CORTICOSTEROID IN HPS?



- The only randomised controlled trial comparing high-dose intravenous methylprednisolone with a placebo in acute multiple organ failure syndrome (HCPS),showed a non-significant reduction in mortality in the treatment group, with an acceptable safety profile.

- Current consensus does not support routine corticosteroid use in HCPS; however, they may be considered in patients fulfilling criteria for ARDS ($PaO_2/FiO_2 \leq 300$), and should be administered early and in the context of concurrent clinical monitoring.

ROLE OF RIBAVIRIN ?

???

Ribavirin, an antiviral nucleoside analogue with demonstrated efficacy against Old World hantaviruses (Hantaan, Puumala) in haemorrhagic fever with renal syndrome when administered before day 6 of illness, has not shown benefit in the cardiopulmonary phase of HPS.

KEY CLINICAL MESSAGE

The transition from the prodromal phase to the cardiopulmonary phase of HPS can occur abruptly.

In a patient with fever, severe myalgia, gastrointestinal symptoms, rodent exposure, thrombocytopenia, and worsening oxygenation, clinicians should strongly suspect HPS and closely monitor for rapid deterioration.

Early ICU transfer and timely consideration of ECMO can be lifesaving in severe cases.

Any questions?