



Hantavirus: What Anaesthesiologists Should Know

Recent international outbreaks of hantavirus infection associated with cruise ship travel have highlighted the ongoing vulnerability of the global community to emerging infectious disease threats. Recently, it has been confirmed by the World Health Organization and South African authorities that passengers from multiple countries developed suspected or confirmed infections with the Andes strain of hantavirus after traveling aboard the same vessel. Several exposed individuals subsequently disembarked and returned to destinations across the world on commercial flights, before exposure or illness was recognized.¹

This pattern of international dissemination creates substantial challenges for public health surveillance, case identification, and contact tracing, particularly given the prolonged incubation period of hantavirus infection, the nonspecific nature of its early symptoms and the evolving understanding of how transmission occurs. These challenges are further compounded at a time when infectious disease preparedness, outbreak investigation capacity, and public health coordination have been weakened in some regions by reductions in funding, workforce limitations, and political disengagement from global health initiatives. In this environment, anaesthesiologists and critical care clinicians may encounter patients with suspected hantavirus infection unexpectedly and outside traditionally recognized endemic regions. Awareness of the clinical presentation, transmission characteristics, infection prevention considerations, and perioperative implications of hantavirus infection is therefore increasingly important for anaesthesia professionals worldwide.

What is Hantavirus?

Hantavirus is an RNA virus in the *Orthohantavirus* genus associated with rodent reservoirs capable of transmitting the virus to humans through aerosolization of rodent urine, feces, or saliva, or possibly through a bite or wound from an infected animal. While these viruses are found throughout the world, only the Andes virus strain, found in Argentina and Chile, is known to spread from person-to-person.² It has also been reported that the mortality rate of this variant can reach up to 50%.¹

The epidemiology of Hantavirus reveals a distinction between Old World variants found in Europe and Asia and New World variants found in the Americas. Old World viruses cause a clinical picture characterized by hemorrhagic fever with renal syndrome (HFRS) while New World viruses produce a cardiopulmonary syndrome (HCPS). The case fatality rate (CFR) of HFRS is roughly <1-12%, in contrast to the more lethal HCPS, which has a CFR between 12-45%.²

What is the Clinical Presentation of Hantavirus?

The clinical presentation of the two Hantavirus strains differs significantly but shares a common pathophysiology: endothelial dysfunction and increased vascular permeability. The renal medullary capillaries are the primary target in HFRS versus the pulmonary capillaries and myocardium in HCPS.² These differences result in two distinct clinical presentations.

In HFRS, the incubation period is between 2-6 weeks, then progresses through five possibly overlapping phases:²

1. **Febrile** (duration ~7 days)- High fevers, severe headache, nausea, myalgia, abdominal and back pain. Hypotension from vascular permeability begins.
2. **Hypotensive phase** (duration hours to days)- Increased vascular permeability producing hypotension and tachycardia with hemorrhagic manifestations developing, including petechiae, epistaxis, menorrhagia, and GI bleeding.
3. **Oliguric phase** (duration 3-7 days)- Acute kidney injury as evidenced by increasing creatinine and urea, progressing to oliguria and anuria, hypertension, and renal insufficiency complications such as pulmonary edema, which may progress to renal failure, shock, and multiorgan failure. Mortality is highest in this phase.
4. **Diuretic phase** (duration days to weeks)- Polyuria is seen with gradual improvement in renal function. Dehydration and electrolyte imbalances are possible.
5. **Convalescent phase** (duration weeks to months)- Gradual recovery with some patients exhibiting persistent renal impairment.

In HCPS, the incubation period is between 5-50 days (18 days on average) and is characterized by two clinical phases, often with an abrupt catastrophic transition.²

Febrile Prodrome (duration 2-7 days)- Flu-like illness characterized by myalgias, arthralgias, headache, malaise, chills, fever, abdominal pain, vomiting, diarrhea, conjunctival injection, and retro-ocular pain. Notably, in contrast to the flu, nasal congestion and sore throat are rare. Axillary and extremity petechiae can also be seen in the Andes virus variant.²

Cardiopulmonary phase (duration 2-4 days)- A biphasic pattern is noted with symptoms presenting early as cough, then with dyspnea, tachycardia, and hypotension, presenting late, often immediately prior to the need for intubation.³ This respiratory failure phase is characterized by pulmonary edema and hypovolemia due to capillary leakage, which may then progress to cardiac dysfunction exhibited by low cardiac index, low stroke volume, and high systemic vascular resistance.⁴

How is Hantavirus Diagnosed and Treated?

Diagnostic evidence of Hantavirus infection includes thrombocytopenia (severity may be a prognostic sign), hemoconcentration, leukocytosis, and bilateral pulmonary infiltrates on chest radiograph.^{2,4} Confirmatory diagnosis is made using serology, with IgM often present at the onset of the febrile prodrome, with IgG usually detectable at the end of the prodrome.^{2,4} Reverse Transcription-quantitative Polymerase Chain Reaction (RT-qPCR) is both highly sensitive and specific in the diagnosis of Hantavirus. It can detect viral RNA particles two weeks prior to the development of either symptoms or antibodies.²

At present, there is no globally licensed treatment, approved antiviral drug, or vaccine for hantavirus infection; therefore, management is generally based on control of disease symptoms and supportive care, including invasive monitoring, careful fluid and electrolyte balancing, respiratory support, and vasoactive pressor support when needed, with hemofiltration and membrane oxygenation applied when indicated.¹ Ribavirin has demonstrated some efficacy during the early stages of HFRS but not for treatment of HCPS.¹ Platelet transfusion may be administered for acute thrombocytopenia.⁵ Some patients may require intermittent hemodialysis to manage renal failure. In severely ill patients, venoarterial extracorporeal membrane oxygenation (VA-ECMO) has been recommended and has been shown to reduce mortality in HCPS.⁶ Specific therapies that have been tried for treatment of HCPS but, to date, are not considered the standard of care include convalescent plasma, monoclonal antibodies, and antivirals such as favipiravir.⁴

How is Andes Hantavirus Transmitted?

Human to human transmission of the Andes virus is known to occur between close contacts, particularly household members and sexual partners.^{7,8} Secondary attack rates are thought to be low, estimated at approximately 18% for sexual partners and about 1% for other household contacts.² There have been case reports, however, of “super spreader events” with a median reproductive number (the number of secondary cases caused by an infected person during the infectious period) of 2.12 before control measures were implemented- in contrast to Covid-19 with an estimated $R_0 = 2.87$.^{9, 10} Transmission appears greatest during the prodromal and early

cardiopulmonary phases when viral loads are highest, although theoretical transmission could possibly occur in presymptomatic patients and therefore hantavirus should not be considered transmissible only after clear symptom onset.^{11, 12} In the UK, Andes virus is considered a “high consequence infectious disease” due to its acute infectious nature, high case-fatality rate, lack of effective prophylaxis or treatment, difficulty in recognizing and detecting rapidly, ability to spread in the community and within healthcare settings, and requirements of an enhanced individual, population and system response to ensure it is managed effectively, efficiently, and safely.¹³ Nosocomial transmission in healthcare settings have occurred both to patients as well as healthcare workers.¹⁴ For this reason, the UK Health Security Agency advises the application of enhanced infection prevention and control measures for both contact and airborne routes of transmission for all suspected and confirmed Andes virus patients.¹⁴ This includes respiratory isolation, ideally in a negative pressure room, and enhanced personal protective equipment (e.g., N95 or above masks, eye protection, gown, and gloves).¹⁴

Key Takeaways for Anaesthesiologists:

1. Although person-to-person transmission of Andes virus is thought to be low, due to the high viral load of critically ill hospitalized patients and the potential for presymptomatic and the possibility of “super spreader” events, enhanced contact and airborne precautions should be taken, including enhanced use of PPE. This is especially true during aerosol-generating procedures such as bronchoscopy, intubation, suctioning, and non-invasive ventilation.
2. Similar precautions to protect the anaesthesia machine during the Covid-19 pandemic should be taken as recommended by the *Anesthesia Patient Safety Foundation*.¹⁵ These include:
 - a. Place a “high quality” viral filter between the breathing circuit and the patient’s airway with the capability to sample gas from the machine side of the filter.
 - i. HMEF is preferred to preserve humidification.
 - ii. If filter only is used, reducing fresh gas flow is an important strategy for preserving humidity. (1-2 L/min or less)
 - b. Place a second filter at the end of the expiratory limb at the connection to the anaesthesia machine.
 - c. Local conditions of filter availability will determine what devices can be employed.
 - d. Breathing circuits should be discarded after every patient.
3. Because patients with HCPS may rapidly progress from the febrile prodromal phase to the cardiopulmonary phase, ready access to critical care services including ECMO is ideal. Patients in respiratory distress may also quickly progress to cardiac collapse, therefore prophylactic placement of vascular sheaths for expedited cannulation for VA-ECMO may

also be warranted. Anaesthesiologists may be called upon to intubate such patients at the time of cannulation.⁶

4. Anaesthesiologists may be called upon for placement of invasive monitors, including peripheral arterial lines, pulmonary artery catheters, and vascular access catheters.
5. Because ventilatory management of critically ill Andes virus patients may require standard ARDS ventilatory strategies, anaesthesiologists may be called upon to assist with proning, which has been shown to be effective in HCPS patients.⁴
6. Due to the increased permeability of the pulmonary vasculature in HCPS patients, use of intravenous fluids for vascular repletion must be done judiciously.⁴ Norepinephrine has been recommended as the first-line vasopressor of choice, with the addition of dobutamine when supplemental inotropic support is needed.⁴

As with all rapidly evolving infectious disease events, the epidemiology, transmission dynamics, clinical manifestations, and recommended infection prevention and management strategies associated with the current hantavirus outbreak may continue to evolve as additional data become available. Guidance provided in this advisory reflects the best available evidence and expert interpretation at the time of writing, but should be considered provisional and subject to revision through the normal iterative process of scientific investigation, public health surveillance, and clinical experience. Anaesthesiology clinicians are encouraged to remain attentive to updated recommendations from their local and national public health authorities, hospital infection prevention and occupational health programs, and other authoritative professional and governmental sources as the situation develops.

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