



Unexpected Viral Illness in an Urgent Care Setting: The Re-Emergence of Mumps, Measles, and Varicella

Urgent message: Urgent care providers often see acute public health emergencies due to easy patient accessibility. It is important to identify communicable disease rapidly to control any risk of a community outbreak. This article will focus on mumps, measles, and varicella (chickenpox).

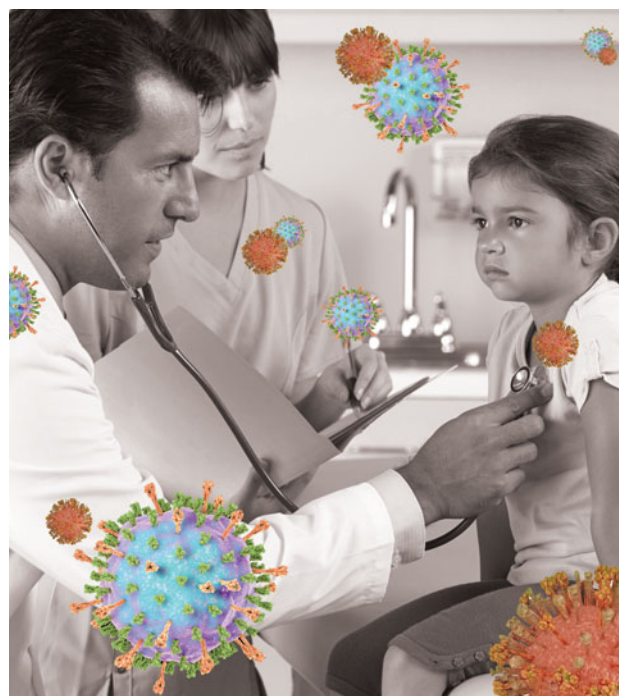
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In recent years, outbreaks of uncommon infectious diseases have occurred in schools and communities, due to increasing travel exposures, decreasing vaccination compliance, and varying effectiveness of vaccination response. In 2016, over 6,000 cases of mumps were reported to the Centers for Disease Control and Prevention.¹ The following year, 118 people were reported to have measles (rubeola), occurring even after the apparent elimination of measles was documented in the United States in 2000.² Rubella (German measles), is still declared eliminated in the U.S., citing less than 10 cases per year, while data on varicella outbreaks are limited.^{2,3}

A mild and nonspecific prodromal phase including fever, rhinorrhea, cough, sore throat, malaise, headache and decreased appetite occurs with many communicable infections, making diagnosis difficult, but within 1-2 days a rash or swelling may develop, which can help distinguish the diagnosis.

Outbreaks

Mumps outbreaks have become increasingly common, most recently occurring at Syracuse University in October 2017.⁴ From 2009 to 2010, there were 3,502 outbreaks between Canada and the East Coast. Interestingly, 90% of those individuals had received at least one dose



of the MMR vaccine.⁵ In the last 8 years, there have been a total of 1,597 cases. This suggests waning vaccination

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immunity, due to differences in antigens between the vaccine strain and outbreak strains. Inadequate vaccine coverage or use of the Rubini vaccine strain are also major leading causes of recent mumps outbreaks.⁶ Although the vaccination offers protection in most cases, during periods of an outbreak, a third vaccination is often recommended to close contacts and may offer increased protection.⁷

The CDC recommends the following measles immunization regimen for all patients planning international travel, before departing the United States:⁸

- Infants 6 months through 11 months of age should receive one dose of MMR vaccine; infants who get one dose of MMR vaccine before their first birthday should get two more doses (one dose at 12 through 15 months of age, and another dose at least 28 days later)
- Children 12 months of age and older should receive two doses of MMR vaccine, separated by at least 28 days
- Teenagers and adults who do not have evidence of immunity against measles should receive two doses of MMR vaccine separated by at least 28 days

Similar to measles and mumps, chickenpox outbreaks are most common in close contact settings, such as schools and childcare centers. However, since the introduction of two recommended doses for vaccination in 2006, outbreaks and hospitalizations have significantly decreased. Outbreaks were reported in six states between 2005 and 2012.⁹

Urgent care providers should also be aware of cultural differences, as some communities may resist immunization as seen in recent outbreaks.

History and Physical Examination

Historical clues to the diagnosis should include questions to identify sick contacts, a possible immunocompromised state, any recent travel, and vaccination status. Historical questions should explore timing and duration of prodromal symptoms such as fever, rhinorrhea, cough, sore throat, malaise, headache, and decreased appetite as well as presence and duration of rash and neck or testicular swelling. More serious symptoms such as altered level of consciousness, hearing loss, respiratory distress, or abdominal pain should also be defined. With presence of rash, inquire as to noninfectious etiologies such as exposure to new soaps, medicines, clothes, detergents, or foods.

Vital signs and the general appearance of the patient should be assessed, including any signs of pallor,

diaphoresis, respiratory distress, or confusion. Tachycardia, arrhythmias, increased respirations, wheezing, rales, and rhonchi would all indicate a worsening patient status. Upon HEENT exam, the conjunctiva should be examined for any injection or discharge, as conjunctivitis is a common symptom of measles but may also be present in other serious diagnoses such as Kawasaki disease. The mucosa membranes should be assessed for hydration status and lesions, and the oropharynx for erythema and exudates. Any glandular swelling, as can occur with mumps, should be noted. With a measles infection, the identifying feature is Koplik spots, clustered white lesions on the buccal mucosa, accompanied by a maculopapular rash progressing from the face to the body. This is distinguished from the rash in chickenpox, which has a teardrop vesicular appearance (umbilicated center) that originates on the trunk. The hallmark of mumps is swelling and tenderness of the parotid glands but can also involve testicular swelling.

Example Case: Mumps

H&P: A 59-year-old woman presented to the urgent care with 4 days of night sweats and chills, rhinorrhea and postnasal drainage, a dry cough, and sneezing which then progressed to swelling and pain of her left face and around her left ear. Patient noted that her left-sided jaw pain was exacerbated with chewing and swallowing. She was using symptomatic medications including a nasal spray and an antihistamine. Her past history revealed that her immunizations were up to date, and she denied any recent travel or known sick contacts. Upon physical examination, vitals were normal and she was afebrile. Soft tissue swelling was present over the left parotid gland with associated tenderness. No discrete mass or bony tenderness was noted, and no rashes were present on her exposed skin. Her ENT exam revealed serous fluid behind the left tympanic membrane and a mildly erythematous oropharynx with postnasal drainage. Lymphadenopathy was present on the left anterior cervical chain.

Differential diagnosis

The differential diagnoses included inflammatory and infectious causes of parotitis, including sialadenitis, Epstein-Barr virus (EBV), cytomegalovirus (CMV), influenza, human immunodeficiency virus (HIV), paramyxovirus mumps, and a bacterial etiology. While measles, mumps, and varicella have similar prodromal phases, there are distinguishing characteristics; the most notable symptom is parotid gland swelling, which is

caused by mumps. Chickenpox and measles each have distinctive rashes that begin 1-3 days after initial prodromal symptoms.⁵

Testing and results

Laboratory tests included serum mumps IGM and IGG antibodies, CBC with differential, EBV serology, CMV IGM antibodies, and serum HIV testing. The results returned with a positive serum mumps IgM antibody. Her mumps IgG antibody was also positive, indicating past exposure or vaccination. Additional testing was negative.

Patient outcome

The patient was instructed to use sialogogues and hydration, and to avoid close contact with others until complete resolution. The local health department was notified of the positive testing. On follow-up 5 days after the urgent care visit, her symptoms were almost completely resolved.

Testing

Mumps

The recommended test for mumps is a buccal and oral swab for RT-PCR.^{10,11} If positive with a suggestive clinical picture, a diagnosis of mumps can be made unless the patient has been vaccinated within the last 45 days. A negative test does not exclude mumps, however.¹¹ Serum laboratory tests often fail to confirm if a previously vaccinated patient has an active infection. Elevated Ig-M results can be false positives in vaccinated individuals, and these tests are often negative in persons with acute mumps infections.¹⁰ Acute phase reactants may take up to 5 days to test positive, during which a patient should be isolated. Urine samples may also be collected for diagnosis of mumps; however, viral levels are often too low to detect an active infection successfully.¹⁰

Measles

Laboratory recommendations for measles are often guided by the local health departments, although the World Health Organization advocates serum IgM antibody as the standard test for confirmation. As with mumps, many false positive and false negatives can occur with IgM testing. In general, the diagnosis can be made by one of the following tests: serum measles IgM antibody, noting a significant rise in IgG antibody between acute and convalescent titers; isolation of measles by culture; or detection of measles virus RNA by RT-PCR.¹²

For patients with a concerning rash or possible Koplik

spots, seen in 50%-70% of measles cases, measles IGM antibody or measles RNA by RT-PCR must be performed to rule out the communicable disease. A throat or nasopharyngeal swab and urine sample can also detect the virus.²

Varicella

In varicella, the most sensitive method for confirming diagnosis is the use of PCR to identify the virus in skin lesions. IgM antibody testing is considered less sensitive.¹³ IgG antibodies can also be followed for a rise between the acute and convalescent periods, which has good specificity but less sensitivity than PCR testing.¹⁴

Complications of Infection

Complications from mumps are especially prevalent in adults. Of these, epididymo-orchitis is the most common in 15%-30% of cases.¹⁵ Oophoritis (5%) and mastitis ($\leq 1\%$) can also occur in women.^{1,15} On the other hand, complications of measles are most prevalent in children under 5-years-old, adults over 20-years-old, pregnant women, and immunocompromised individuals and include otitis media sometimes progressing to permanent hearing loss, and subacute sclerosing panencephalitis (measles encephalitis).^{1,15}

Discussion and Differentiation of Mumps, Measles, and Varicella

Overview

Mumps is a viral illness caused by a paramyxovirus, with an average incubation period of 16-18 days. Common features of the presenting illness include pain, tenderness, and swelling of the parotid glands. Additional salivary glands may also have associated swelling. Prodromal symptoms are typically present for several days prior, and may include fever, myalgia, fatigue, loss of appetite, malaise and headache, which may be difficult to distinguish from other viral illnesses.¹ Similarly, the virus may also only present with respiratory symptoms, making the diagnosis more challenging. The mumps virus is asymptomatic in nearly 33% of affected individuals, proposing yet another challenge in diagnosis.¹

Measles, another highly contagious paramyxovirus, spreads through contact with infectious droplets or by air with an incubation period of 7-14 days.² It is particularly challenging since the virus can live up to 120 minutes in the air after an infected person breathes, coughs, or sneezes.² Similar to mumps, measles often starts with prodromal symptoms such as a high fever and malaise, in addition to cough, coryza, and conjunctivitis (known as the three Cs). In contrast to mumps, measles will

often cause Koplik spots to develop within 2 to 3 days after initial symptoms. Within 3 to 5 days of initial symptoms and 14 days from initial exposure, a maculopapular rash starts on the individual's face or hairline and spreads to their body. The rash quickly subsides, making it imperative to form a quick diagnosis. Individuals are infectious from 4 days prior to development of the rash, until 4 days after the rash appears.²

Chickenpox is a herpesvirus¹³ spread by touch or airborne virus particles from an infected individual with an incubation period of 10-21 days.³ Similar to measles and mumps, chickenpox starts with prodromal symptoms of fatigue, malaise, loss of appetite, headache, and fever. However, the most notable symptom of chickenpox is the rash, which develops 1-2 days after onset of the prodromal phase and causes 250-500 pruritic blisters to develop on the individual's face, torso, and extremities.³ Chickenpox poses a challenge as the individual is infectious 1-2 days before the rash starts, but it presents similarly to many other common viruses seen in urgent care settings. Once the rash develops, individuals are infectious until the blisters scab, which usually takes 5-7 days. Many children will miss over a week of school due to chickenpox infections.³ Most healthy individuals who get infected with chickenpox do not experience complications. However, chickenpox is most concerning in babies, adults, pregnant women, and those with weakened immune systems; hospitalizations were common prior to vaccination.¹

Pregnancy complications

Illnesses with pregnancy present their own complications for both the mother and child. Measles, mumps, and varicella infections can all lead to birth defects and possible fetal demise. When a varicella infection occurs close to delivery, the infant can develop congenital varicella, which can have lasting effects on the infant.¹⁵ With any of these complications, close follow-up would be necessary. Treatment for viral illnesses is supportive to help alleviate discomfort or to address complications that may develop. In severe cases of hospitalized pediatric patients with measles, vitamin A is administered.² In high-risk pediatric patients with chickenpox, acyclovir can be administered.¹⁶

Public Health Considerations

Isolation and prevention

Patients should be isolated until the risk of transmission is low. With all three of these viral processes, airborne and droplet precautions must be exercised. Healthcare

staff with close contact should use appropriate respiratory precautions available in case of vaccine failure, and an airborne isolation room is preferred when available. With a mumps infection, the individual must be isolated for at least 5 days following onset of symptoms. Measles patients must be isolated 4 days after developing a rash, and anyone without immunity should avoid possible contact for 21 days after the rash onset.² Concern for chickenpox transmission lasts until the rash is completely scabbed over, usually up to 7 days.^{1,3}

Postexposure vaccinations

The MMR vaccine can be offered to anyone without previous immunity within 72 hours of measles exposure, or immunoglobulin administered within 6 days of exposure may provide some protection. Postexposure prophylaxis with IVIG should be administered to immunocompromised patients, including patients with HIV infection and CD4 percentage <15% and pregnant women without evidence of immunity.¹⁷ There is some evidence to support that due to possible waning immunity, an additional MMR booster vaccination can aid with improving immunity in the setting of a current outbreak. Although there is no current postexposure recommendation for mumps, one study found that the attack rate of mumps was lower when receiving three doses of MMR compared with two, and there was increased risk if the second MMR dose was received 13 years or more before the outbreak.⁷ An additional study found a third dose of MMR reduced the risk by 78.1% when compared to two doses.⁷ Similar recommendations apply to chickenpox exposure. For individuals exposed to varicella who cannot receive the vaccine, immune globulin is recommended within 10 days of exposure.¹⁸

Vaccinations

The measles, mumps, and rubella (MMR) vaccination provides protection from the diseases and further complications of the illnesses. The vaccination is a mixture of live attenuated viruses that became available in 1967, and has decreased the occurrence of mumps and measles cases by 99% in the United States.¹ The current recommendation for the pediatric vaccination is two doses: one between 12-15 months of age and the second between 4-6 years of age.¹ Two doses of the MMR vaccine are, on average, 88% effective against the mumps virus, with a range of 66% to 95% efficacy.¹ With regard to measles, two doses of the MMR vaccine are 97% effective and one dose is 93% effective.² Anyone who has received the vaccination should be at lower risk for transmission; this

could influence the provider's decision making to overlook any less prevalent disease process.

To prevent chickenpox, the varicella vaccination was developed in 1995 and decreased the occurrence of chickenpox by 97% between 1995 and 2010.⁹ As with the MMR vaccine, individuals are recommended two doses: one between 12 and 15 months of age and the second between 4 and 6 years of age. In addition, a combination vaccine with MMR and varicella, known as MMRV, has been created and is available to select children 12 months to 12 years of age.⁹ It has been shown that two doses of the chickenpox vaccine are 94% effective at preventing the disease.⁹ In addition, the varicella vaccine has a range of 70%-90% efficacy against any varicella infection, and 90%-100% efficacy against severe disease. In 2001-2005, populations with high frequency of individuals with only one dose of the varicella vaccine led to many outbreaks which proved that one dose was not efficient in prevention of chickenpox. This led to the recommendation of two doses starting in 2006. Fortunately, chickenpox immunity has since been shown to be long-lasting, and breakthroughs tend to be much less severe and without presence of a fever.⁹

Since both vaccinations are live attenuated viruses, the vaccination may be contraindicated in severely immunocompromised individuals. HIV-infected patients without severe immunosuppression may receive the single antigen varicella vaccine, while patients with CD4 counts >15% may still receive MMR.¹⁹

Treatment

Supportive care is recommended including antipyretics, analgesics, and application of cold packs.

Conclusion

Mumps, measles, and chickenpox often present with vague, prodromal symptoms which may make a diagnosis difficult. However, with an increase in recent outbreaks, these diagnoses should be considered, as a timely diagnosis may prevent spread. ■

References

- Centers for Disease Control and Prevention. Mumps. 2017. Available at: <https://www.cdc.gov/mumps/index.html>. Accessed November 27, 2017.
- Centers for Disease Control and Prevention. Measles cases and outbreaks. 2018. Available at: <https://www.cdc.gov/measles/cases-outbreaks.html>. Accessed March 16, 2018.
- Centers for Disease Control and Prevention. Chickenpox (Varicella). 2016. Available at: <https://www.cdc.gov/chickenpox/outbreaks.html>. Accessed March 16, 2018.
- Syracuse University Health Services. Mumps and vaccinations. Available at: <http://health.syr.edu/health-tips/mumps-vaccinations.html>. Accessed November 27, 2017.
- White SJ, Boldt KL, Holditch SJ, et al. Measles, mumps, and rubella. *Clin Obstet Gynecol*. 2012;55(2):550-559.
- Dayan GH, Rubin S, Plotkin S. Mumps outbreaks in vaccinated populations: Are available mumps vaccines effective enough to prevent outbreaks? *Clin Infect Dis*. 2008;47(11):1458-1467.

Summary: Complications and Isolation

- **Complications**
 - Mumps: Especially prevalent in adults; epididymo-orchitis is the most common in 15%-30% of cases; oophoritis (5%) and mastitis (\leq 1%) can also occur in women.
 - Measles: Most prevalent in children under 5-years-old, adults over 20-years-old, pregnant women, and immunocompromised individuals and include otitis media sometimes progressing to permanent hearing loss and subacute sclerosing panencephalitis.
 - Chickenpox: Most healthy individuals who get infected with chickenpox do not experience complications. However, chickenpox is most concerning in babies, adults, pregnant women, and those with weakened immune systems.
- **Isolation**
 - Patients with a mumps infection must be isolated for at least 5 days following onset of symptoms.
 - Measles patients must be isolated 4 days after developing a rash; anyone without immunity should avoid possible contact for 21 days after rash onset.
 - Concern for chickenpox transmission lasts until the rash is completely scabbed over, usually up to 7 days.

- Cardemil CV, Dahl RM, James L, et al. Effectiveness of a third dose of MMR vaccine for mumps outbreak control. *N Engl J Med*. 2017;377(10):947-956.
- Centers for Disease Control and Prevention. Measles (Rubeola). For travelers. Available at: <https://www.cdc.gov/measles/travelers.html>. Accessed December 13, 2018.
- Centers for Disease Control and Prevention. Pinkbook. Epidemiology and prevention of vaccine-preventable diseases. 2015;22:353-374.
- Trotz-Williams LA, Mercer NJ, Paphitis K, et al. Challenges in interpretation of diagnostic test results in a mumps outbreak in a highly vaccinated population. *Clin Vaccine Immunol*. 2017;24(2):e00542-16.
- Centers for Disease Control and Prevention. Questions and answers about lab testing. Available at: <https://www.cdc.gov/mumps/lab/qa-lab-test-infect.html#collection-serum>. Accessed December 14, 2018.
- Gans H, Maldonado YA. Measles: clinical manifestations, diagnosis, treatment, and prevention. UpToDate. Available at: https://www.uptodate.com/contents/measles-clinical-manifestations-diagnosis-treatment-and-prevention?search=measles%20testing§ionRank=1&usage_type=default&anchor=H8&source=machineLearning&selectedTitle=1-150&display_rank=1#H8. Accessed December 13, 2018.
- Albrecht MA. Clinical features of varicella-zoster virus infection: chickenpox. UpToDate. Available at: https://www.uptodate.com/contents/clinical-features-of-varicella-zoster-virus-infection-chickenpox?search=chicken%20pox§ionRank=1&usage_type=default&anchor=H7&source=machineLearning&selectedTitle=1-150&display_rank=1#H7. Accessed March 16, 2018.
- Centers for Disease Control and Prevention. Chickenpox (Varicella). Interpreting laboratory tests. Available at: <https://www.cdc.gov/chickenpox/hcp/lab-tests.html>. Accessed December 13, 2018.
- Centers for Disease Control and Prevention. People at high risk for complications: chickenpox (varicella). 2016. Available at: <https://www.cdc.gov/chickenpox/hcp/high-risk.html>. Accessed March 28, 2018.
- Centers for Disease Control and Prevention. Managing people at severe risk for varicella. 2016. Available at: <https://www.cdc.gov/chickenpox/hcp/persons-risk.html>. Accessed March 28, 2018.
- Hibberd PL. Measles, mumps, and rubella immunization in adults. UpToDate. Available at: https://www.uptodate.com/contents/measles-mumps-and-rubella-immunization-in-adults?search=mmr%20vaccine&source=search_result&selectedTitle=2-104&usage_type=default&display_rank=1#H12518363. Accessed December 13, 2018.
- Centers for Disease Control and Prevention. Updated recommendations for use of VarizIG—United States, 2013. *MMWR*. 2013;62(28):574-576.
- Albrecht MA. Vaccination for the prevention of chickenpox (primary varicella infection). UpToDate. Available at: https://www.uptodate.com/contents/vaccination-for-the-prevention-of-chickenpox-primary-varicella-infection?search=chicken%20pox%20vaccine§ionRank=2&usage_type=default&anchor=H195935066&source=machineLearning&selectedTitle=2-144&display_rank=1#H195935066. Accessed December 13, 2018.