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# Dyspnea in an Asthmatic Patient Following an Influenza Infection: A Case Report

**Urgent Message:** While patients with asthma will frequently experience exacerbations following viral respiratory infections, the urgent care clinician must be cautious when assuming dyspnea is due to asthma. As dyspnea can be caused by a wide variety of conditions, it is important to maintain a broad differential diagnoses, even in patients with underlying asthma.

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Key words: Influenza, Dyspnea, Asthma, Congestive Heart Failure, Myocarditis, Diagnosis Momentum

**Citation**: Davidoff TQ. Dyspnea in an Asthmatic Patient Following an Influenza Infection: A Case Report. *J Urgent Care Med.* 2025; 19(9): 25-29

# Abstract

**Introduction:** Patients commonly present to urgent care (UC) following respiratory infections. Co-morbidities and patient perceptions may complicate the evaluation and lead to cognitive bias.

**Case Presentation:** A 45-year-old woman with a history of asthma, hypertension, and anxiety presented to UC 1 month after a documented influenza A infection with a chief complaint of gradually worsening dyspnea, weakness, fatigue, and dizziness. She had been seen by 2 clinicians previously for her symptoms and received standard asthma treatment without improvement.

**Physical Exam:** Exam findings included tachypnea and tachycardia without wheezing.

Case Resolution: Based on the patient's severe dyspnea



despite adequate treatment for asthma, as well as symptoms of weakness and dizziness, the patient was sent to the emergency department (ED) after her third UC visit. Hospital evaluation revealed systolic heart failure with a left ventricular ejection fraction (LVEF) of <20%, likely due to viral myocarditis.

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**Conclusion:** It is critical for UC clinicians to be aware of serious complications of viral infections, including myocarditis, even though they may be uncommon. Early recognition of the complications of influenza may lead to better outcomes, less morbidity, and less mortality.

# Introduction

A lthough most cases of influenza are mild and selflimited, a small proportion of patients may have serious complications. Patients at the extremes of age and those with comorbidities are at increased risk for such complications.<sup>1</sup> Patients with asthma are susceptible to exacerbations due to acute respiratory infections, including influenza.<sup>2</sup> Cognitive bias, such as diagnosis momentum can cause delay in diagnosis. Failure to achieve a timely diagnosis as a result of these biases may expose patients to increased risk.

When patients present with a chief compliant worded as a diagnosis—especially after multiple visits—clinicians need to be extremely cautious, making sure that history elements, physical findings, and in some cases, response to treatment support that diagnosis. If they do not, a more careful evaluation for an alternate diagnosis should be sought.

#### **Case Presentation**

A 45-year-old woman with a past medical history of asthma, hypertension, and anxiety presented to UC with a chief complaint of asthma following an influenza A infection. After the resolution of her acute influenza symptoms, she began to feel progressively short of breath. Because of her history of asthma, she assumed this was related to an asthma exacerbation. However, after her dyspnea failed to improve with albuterol, she sought care with her primary care provider (PCP) who diagnosed her with an asthma exacerbation and prescribed a methylprednisolone dose pack as well as azithromycin in addition to her albuterol rescue inhaler.

The patient continued to feel worse despite the addition of systemic steroids, and she sought further care at a local UC center. At the second visit, she was again diagnosed with an asthma exacerbation and was given a second course of oral steroids and a course of azithromycin. Following that visit, she noted that her legs became very swollen after a long car trip and her dyspnea became worse. She elevated her legs, drank fluids, and avoided salt. The swelling improved, but the increased shortness of breath persisted. She was using her albuterol inhaler every 3 hours without effect.

Finally, 5 weeks after her initial influenza diagnosis,

she presented to a second UC facility with a chief complaint of asthma. She stated she was so dyspneic she could barely get dressed to come to the office. She had no complaints of chest pain, fever, or cough. She requested a chest x-ray (CXR), a longer course of steroids, and a nebulizer for home use.

The patient reported that her home medications included albuterol, ibuprofen as needed, escitalopram 10 mg daily, and trazodone. She admitted to non-adherence with her antihypertensive medication and denied smoking and illicit drug use.

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#### **Clinical Findings and Physical Exam**

On examination, the patient's vitals were: heart rate 121 beats per minute; respiratory rate 32 breaths per minute; and blood pressure 156/96 mmHg. Her oxygen saturation was 100% on room air, and she was afebrile.

She appeared moderately ill and dyspneic and was leaning forward in the chair.

Her head and neck exam revealed no rhinorrhea or pharyngeal erythema. Her heart rate was tachycardic but was thought to be regular. She had trace pedal edema bilaterally. Lung auscultation revealed no wheezing or rhonchi bilaterally; however, she was unable to speak in full sentences.

#### **Differential Diagnosis**

The differential diagnosis considered included asthma exacerbation, heart failure due to viral myocarditis or post-myocardial infarction related to influenza, arrhythmia (such as atrial fibrillation), deep venous thrombosis with pulmonary embolus, hypertensive emergency with pulmonary edema, and post-influenza bacterial pneumonia. Due to the absence of wheezing or prolongation of the expiratory phase, as well as normal oxygen saturation despite severe symptoms, asthma was thought to be unlikely. Her failure to improve despite adequate asthma treatment made reactive airway disease unlikely. Although she was tachycardic, her rhythm was regular, making arrhythmia less likely. Her blood pressure was elevated, but it was not thought to be high enough to cause a hypertensive emergency. Pneumonia was also thought to be less likely with this history. Ultimately, the UC clinician thought the patient required ED evaluation in lieu of pursuing further work-up in UC. Against the advice of the UC clinician, the patient declined ambulance transport and drove herself to the ED, which was only a few minutes from the UC center.

# **Case Continuation and Outcome**

In the ED, an electrocardiogram (ECG) showed sinus tachycardia, left atrial enlargement, and non-specific T-wave changes. A CXR was interpreted as normal. Laboratory studies included a normal complete blood count (CBC), and comprehensive metabolic panel (CMP). The B-type natriuretic peptide (BNP) returned elevated at 1754.8 pg/mL (0-100) and high-sensitivity troponin (hsTn) was also abnormal at 63 pg/mL (0-14). A d-dimer was significantly elevated, prompting a computed tomography-angiogram (CT-A) of the chest. While the CT-A was negative for pulmonary emboli, cardiomegaly was identified.

The patient was admitted and subsequently underwent a transthoracic echocardiogram (TTE) that showed no valvular or focal wall motion abnormalities, however there was notable dilation of the left ventricle with an ejection fraction (LVEF) estimated between 20-30%. The patient was treated with furosemide and improved with diuresis.

Ultimately, cardiac magnetic resonance imaging (MRI) was consistent with viral myocarditis and confirmed a severely depressed LVEF of <20%. After several days of diuresis, the patient's symptoms had improved, and she was discharged home with a temporary external defibrillator vest and prescriptions for lisinopril, furosemide, potassium supplement, and compression stockings. She remains on medical management while awaiting a heart transplant.

### Discussion

Although most patients recover from influenza uneventfully, complications do occur and can be seen in UC. The most common complications occur in the respiratory tract<sup>3</sup> and include pneumonia, bronchitis, sinusitis, and otitis media. In patients with asthma, exacerbations are also quite common following influenza infection and may result in significant morbidity and even mortality.<sup>4</sup> Patients with underlying coronary disease are at an increased risk for myocardial infarction, and patients with heart failure are at increased risk of decompensation. Myocarditis and pericarditis can occur after many viral infections, including influenza.<sup>5,6</sup> In a 2020 study published in *Annals of Internal Medicine*, the authors found that 11.7% of hospitalized patients with influenza experienced an acute cardiac event. The most common of these being heart failure and ischemic events.<sup>7</sup>

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# **Epidemiology**

Older patients and those with co-morbidities such as tobacco use, cardiovascular disease, diabetes, and renal disease are at increased risk for cardiac complications due to influenza.<sup>7</sup> A study that included more than 1 million patients with COVID-19 and more than 600,000 with influenza found the overall risk of myocarditis due to COVID-19 was 0.06%, whereas the risk associated with influenza was 0.02%.8 In COVID-19, the risk in younger males was disproportionally higher. In influenza, however, the incidence in males and females was equal, and older patients were more likely to be affected with the highest incidence being among patients >70 years. Patients with prior cardiac disease were also found to be at an increased risk of influenza-related myocarditis. The median time from onset of infection to the diagnosis of myocarditis in COVID-19 was 30 days versus 20 days in cases associated with influenza. There was a decreased risk of myocarditis in vaccinated patients for both COVID-19 and influenza.8

# Testing

Diagnostic testing for viral myocarditis may be challenging as ECG findings are nonspecific and may include sinus tachycardia, low amplitude QRS complexes, AV nodal or bundle branch blocks, ST-segment changes, and Q waves. ECG results are also often dynamic and change through the course of the illness.<sup>8</sup> Troponin levels are often elevated, however, a normal troponin does not exclude the diagnosis. Echocardiographic findings are also variable and can range from normal to focal or global hypokinesis. Echocardiography may also detect pericardial effusion, septal thickening, and left, right, or global ventricular disfunction with low ejection fraction; these are also nonsensitive and nonspecific.<sup>8</sup>

Endomyocardial biopsy and cardiac MRI are the diagnostic tests of choice for myocarditis.<sup>5</sup> Endomyocardial biopsy findings are helpful if positive but may miss the involved endomyocardial site producing a false negative result. Clinical correlation is important in making the diagnosis.<sup>6</sup> Additionally, positron emission tomography (PET) scanning has been shown increasingly to have promise in the diagnosis of viral myocarditis. PET scanning, however, can also be difficult to obtain and can identify active inflammation but cannot confirm the specific cause.<sup>8</sup>

#### Presentation

Myocarditis frequently results in dilated cardiomyopathy with outcomes ranging from complete recovery to severe heart failure and death. Some 50-70% of cases of myocarditis are due to viral infections. Pathogenesis is believed to be related to a maladaptive post-viral response causing myocardial cell dysfunction and compromised contractility.<sup>5</sup> Other causes of myocarditis include bacterial and protozoal infections, toxins, autoimmune disorders, and hypersensitivity reactions.<sup>6</sup>

Fulminant myocarditis (FMC) is a rare complication of viral myocarditis with an acute, rapid onset of hemodynamic compromise and extensive myocardial inflammation over a few days that is treatment resistant and requires ventilatory and mechanical circulatory support. Arrhythmias are common. Despite the severity, there is a high likelihood of complete recovery of ventricular function if the patient survives the acute episode.<sup>6</sup>

The patient presented in this case was repeatedly presumed to be suffering from an asthma exacerbation. This was due to cognitive bias. Diagnosis momentum refers to situations in which clinicians assume a previous diagnosis from another healthcare provider—as was relayed by the patient in this case—is responsible for the current constellation of symptoms, thereby foregoing development of an appropriate differential diagnosis.<sup>9,10</sup> With subsequent visits and reinforcement, the initial diagnostic label becomes increasingly "sticky."<sup>9,11</sup> Each successive clinician is more vulnerable to adopting the initial impression, often despite increasing evidence to the contrary. This can lead to a possibility of diagnostic error as symptoms, physical findings, or test results that do not fit with the erroneous diagnosis are dismissed when they do not align with that diagnosis.<sup>9,11</sup> It is important that clinicians be aware of this human tendency to prematurely arrive upon the most convenient explanation for a patient's presentation. Awareness of these biases is critical to keeping an open-minded approach allowing thorough evaluation of all information before deciding whether a prior diagnosis is accurate.

In this case, the patient failed to improve with standard asthma treatment, which may be a red flag that an alternate condition may be at play. Physical findings did not support the diagnosis of asthma. Although some patients with severe bronchospasm or significant hyperinflation may have little air movement resulting in clear lung sounds, it would be unusual to have no wheezing and no prolonged expiratory phase in a patient experiencing asthma even after treatment. This is also an indication that an alternate diagnosis may exist.

Diagnosis momentum is a cognitive bias increasingly recognized in both acute care and primary care settings.<sup>9</sup> Diagnosis momentum may be exacerbated further by the modern phenomenon of patient's ability to research their symptoms online. Use of internet medical references leads many patients to arrive upon a presumed diagnosis before ever seeking a clinician's opinion.<sup>12</sup> It is particularly important for clinicians to remain vigilant in history taking and data gathering to ensure their ultimate conclusion to accept or refute the patient's self-diagnosis is substantiated appropriately.

#### Conclusion

Viral respiratory infections are among the most common illnesses encountered in UC medicine. Although the overwhelming majority of patients will recover uneventfully, some will suffer complications, which rarely may be serious or even life-threatening. UC clinicians should be aware of these rare but potentially serious complications and ensure that presumptive diagnoses are re-examined when patients fail to follow the expected clinical course. Awareness of diagnosis momentum and other cognitive biases that predispose to diagnostic errors is the first step to mitigating their harmful effects. Furthermore, UC clinicians should "trust but verify" when confronted with a patient with a presumed diagnosis, especially when the patient's presentation does not conform to expected patterns for that condition.

#### **Ethics Statement**

The patient was unable to be reached for consent to publish this case report. Some details irrelevant to the educational content were changed to protect patient privacy.

# **Takeaway Points for Urgent Care Clinicians**

- Patients commonly present with ongoing symptoms related to influenza infection and, while rare, serious sequelae should be considered if a patient's condition worsens during a period when recovery is expected.
- Abnormal vital signs are a red flag for more serious disease. These abnormalities should be fully explained and may require emergency department evaluation.
- Cognitive biases such as diagnosis momentum are natural tendencies that predispose clinicians to diagnostic error. Awareness of situations that are prone to bias and undertaking caution during such visits are crucial for reducing the risk of potentially hazardous errors.

Manuscript submitted February 21, 2025; accepted April 25, 2025.

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