

# Infectious Diseases in Clinical Practice

## Subacute disseminated histoplasmosis in a psoriatic arthritic patient with predominant hepatobiliary symptomatology: The vital role of outpatient labs

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<b>Abstract:</b>	Infection with <i>Histoplasma capsulatum</i> , a dimorphic fungus endemic to the Midwest, most commonly manifests as fever, cough, and fatigue. In immunocompetent individuals, histoplasmosis infection is often asymptomatic or mild and self-limited; however, infection can become disseminated and more severe in immunocompromised patients. Here, we present a case of a sixty-year-old female with a history of psoriatic arthritis on adalimumab and azathioprine with delayed diagnosis of disseminated histoplasmosis. The patient had an indolent presentation that consisted primarily of fatigue, mild respiratory symptoms, and gastrointestinal issues, including elevated liver enzymes and biliary inflammation. While previous reports have shown acute presentations of primary gastrointestinal histoplasmosis, here we illustrate the importance of outpatient labs and maintaining a broad differential in a patient with subacute disseminated histoplasmosis, with primarily hepatobiliary symptoms.
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<p><b>YES or NO: Indicate below if the submitted manuscript reports data derived from experimental or clinical observations in human or animal subjects</b></p> <p>--&gt;If you indicate <b>YES</b>, please provide the following information:</p> <ol style="list-style-type: none"> <li>1. The institutional affiliation of the Institutional Review Board (IRB) or Animal Use Committee that provided consent for the research, and</li> <li>2. The protocol or application number and Principal Investigator name submitted to the IRB or Animal Use Committee for review of your research.</li> </ol> <p>If this study was deemed exempt from IRB or Animal Use Committee review, please provide evidence of the report's exemption.</p> <p>Please add a statement regarding the approval or exemption in the Methods or other appropriate section of the manuscript. Papers without this statement will be returned to the authors to correct.</p>	<p>Patient consent was obtained to publish this case report per institution protocol. Our institution does not require Institutional Review Board or Human Research Protection Program approval for single patient case studies.</p>

**Subacute disseminated histoplasmosis in a psoriatic arthritic patient with predominant hepatobiliary symptomatology: The vital role of outpatient labs**

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**Abstract:**

Infection with *Histoplasma capsulatum*, a dimorphic fungus endemic to the Midwest, most commonly manifests as fever, cough, and fatigue. In immunocompetent individuals, histoplasmosis is often asymptomatic or mild and self-limited; however, infection can become disseminated and more severe in immunocompromised patients. Here, we present a case of a sixty-year-old female with a history of psoriatic arthritis on adalimumab and azathioprine with delayed diagnosis of disseminated histoplasmosis. The patient had an indolent presentation that consisted primarily of fatigue, mild respiratory symptoms, and gastrointestinal issues, including elevated liver enzymes and biliary inflammation. While previous reports have shown acute presentations of primary gastrointestinal histoplasmosis, here we illustrate the importance of outpatient labs and maintaining a broad differential in a patient with subacute disseminated histoplasmosis, with primarily hepatobiliary symptoms.

**Key Words:**

Histoplasmosis, *Histoplasma capsulatum*, Disseminated Histoplasmosis, Immunosuppression

**Abbreviations:**

Hc=*Histoplasma capsulatum*, INR=International Normalized Ratio, PsA=psoriatic arthritis, WBC=white blood cell, CMP=comprehensive metabolic panel, ED=emergency department, ALP=alkaline phosphatase, LFTs=liver function tests, CT=computed tomography, RUQ=right upper quadrant, IV=intravenous

**Learning Point:**

In immunosuppressed patients with prolonged, non-specific symptoms, physicians must utilize outpatient *Histoplasma* antigen labs in endemic areas and consider disseminated histoplasmosis as a diagnosis even in the absence of primary respiratory symptomatology.

1 **Background:**

2 *Histoplasma capsulatum* (*Hc*) is a dimorphic fungus, existing as mold and yeast. The  
3 mold form is found in the environment with enhanced growth in soil enriched by bird or bat  
4 feces. *Hc* produces spores that are aerosolized when soil containing the fungus is disturbed.  
5 These spores then enter the lungs of their hosts at which point they are introduced to warmer  
6 temperatures and morph into yeast.

7 While *Hc* is classically endemic to the Ohio and Mississippi River Valley regions, it can  
8 also be found in southern parts of Canada, as well as warm regions of Asia, South America, and  
9 Africa (Figure 1). Two strains of *Histoplasma* exist in Africa. *H. capsulatum* var. *capsulatum* is  
10 the same as in the US. Another strain, *H. capsulatum* var. *duboisii* is also present in Africa, but  
11 can be differentiated due to its more frequent skin, subcutaneous, and bone manifestations. In  
12 recent years, *Hc* has been found in the northern and western states. It is hypothesized that global  
13 warming may be influencing the changing distribution of this fungus (1,2). Given climate change  
14 and increased international travel, cases of histoplasmosis in traditionally non-endemic areas are  
15 becoming more common. For instance, case reports from Trinidad and Greece, both of which are  
16 traditionally non-endemic areas, have shown the need for a heightened awareness of this  
17 infection (3,4).

18 In areas endemic to *Hc*, it is estimated that 90% of individuals have been infected with  
19 *Hc* at one point in their lifetime (6). Symptomatology of histoplasmosis can vary largely;  
20 however, most symptomatic cases include cough or non-specific symptoms such as headache,  
21 chills, and myalgias. As seen in other infections, the underlying health of the host affects the  
22 course of histoplasmosis. In healthy, immunocompetent individuals, histoplasmosis is often self-  
23 limited. In individuals with altered immune function, whether from an underlying medical

24 condition or immunosuppressant medications, symptoms can range from mild respiratory  
25 symptoms to severe systemic illness. Disseminated disease may start with respiratory symptoms  
26 but typically then disseminates to organs including liver, bone marrow and central nervous  
27 system. Although the primary manifestation is pulmonary disease, it can affect multiple organs,  
28 including the larynx and spinal cord (7,8). Pertinent physical exam findings include  
29 hepatosplenomegaly, lymphadenopathy, skin ulceration, and erythema nodosum (Table 1). Less  
30 commonly, disseminated histoplasmosis can present with hepatobiliary symptoms and altered  
31 liver function tests in the absence of or with minimal pulmonary involvement (9-11).

32 Delayed diagnosis of disseminated histoplasmosis may lead to multiorgan failure,  
33 including liver failure (12-14). The purpose of this paper is to present the case of a patient with a  
34 delay in diagnosis of disseminated histoplasmosis in which outpatient *Histoplasma* antigen  
35 studies were key to properly diagnosing and preventing the patient from progressing into liver  
36 failure. This paper proposes incorporating serial *Histoplasma* antigen testing into the standard of  
37 care for immunosuppressed patients, especially those with subacute, non-specific symptoms.

38

### 39 **Case Report:**

40 A sixty-year-old Caucasian woman with a long-standing history of psoriatic arthritis  
41 (PsA) presented to our regional academic health center with a two-month history of mild cough,  
42 fatigue, intermittent low-grade fever, and headache. Her PsA had been treated with etanercept for  
43 years but due to insurance reasons, she was switched to adalimumab in early 2023. While on  
44 adalimumab, our patient's WBC count ranged from 3 k/cumm to 4 k/cumm, she was not anemic,  
45 and her CMP values were within reference range. During early 2024 (about one year prior to her

46 presentation at our hospital), azathioprine was added to the regimen to control scleritis. Her  
47 azathioprine dosage was slowly increased to ameliorate symptoms until late 2024 when the  
48 patient began experiencing intermittent low-grade fevers, mild cough, and fatigue. Due to these  
49 symptoms, an elective surgery slotted for late December was cancelled, and adalimumab was  
50 held but azathioprine was continued. No hepatic function testing was obtained in December. In  
51 late January 2025, adalimumab was then resumed after her low-grade fevers subsided but  
52 ultimately discontinued due to lower extremity swelling.

53 In late January 2025 our patient presented to the ED due to low-grade fever, mild cough,  
54 headache, fatigue, and abnormal outpatient labs (Table 2). Vitals revealed low-grade fever,  
55 tachycardia, and 96% oxygen saturation on room air. Physical exam was notable for mild  
56 scleritis and bilateral lower extremity edema. Lungs were clear on exam. Laboratory studies in  
57 the ED were notable for a drop in her WBC to 1.5 k/cumm, mild anemia with Hgb of 10.3  
58 gm/dL, mild hyponatremia at 131 mEq/L, ALP of 943 U/L, ALT 59 U/L, and AST 64 U/L.  
59 Albumin was decreased at 2 g/dL, and bilirubin was elevated at 1.6 mg/dL. Calcium was  
60 elevated at 10.6 mg/dL with an ionized calcium of 1.62 mg/dL (Table 2). Autoimmune antibody  
61 panel yielded a low-positive result for anti-smooth muscle antibody. Our patient was admitted to  
62 hospital for further evaluation of elevated liver enzymes and fever.

63 CT chest during admission showed two small pulmonary nodules of the right lung  
64 (Figures 2a, 2b) and a 1.1 cm pleural-based opacity in the lingula (Figure 2c). CT  
65 Abdomen/Pelvis demonstrated a hyperemic gallbladder and multiple small, hypodense liver  
66 lesions which were too small to characterize. Ultrasound imaging of the  
67 RUQ/Liver/Gallbladder/Pancreas demonstrated a hyperemic gallbladder with thickening (Figure  
68 2d) and better illustrated the hypodense liver lesions (Figure 2e).

69 Over the course of this hospital stay, HIDA scan ruled out acute cholecystitis. Elevated  
70 liver enzymes were attributed to azathioprine usage, as hepatotoxicity with a cholestatic pattern  
71 of injury is a well-known side effect of this medication. Therefore, azathioprine was held, and  
72 the patient was scheduled for outpatient follow-up with Rheumatology. Ultimately, the patient  
73 was discharged a few days after the initial presentation and blood culture remained negative for  
74 growth.

75 In mid-February 2025, our patient returned to the ED due to a positive outpatient  
76 *Histoplasma* antigen test obtained at an outpatient Rheumatology visit. She continued to have  
77 vague constitutional symptoms. The patient was febrile, tachycardic, and mildly hypotensive  
78 with 100% oxygen saturation on room air. Exam was notable for minimal crackles in the left  
79 lower lung field and pedal edema extending to the knees bilaterally. Our patient remained  
80 pancytopenic, and now had hypokalemia along with hyponatremia and hypocalcemia. ALP,  
81 LFTs, and Bilirubin remained elevated, and albumin and total protein remained low. The patient  
82 was found to have elevated venous lactate at this point. Please see Table 3 for lab values during  
83 this presentation. No notable imaging changes were found from the previous visit.

84 During this February hospital stay, IV Liposomal Amphotericin B was induced at 4  
85 mg/kg daily. This continued for two weeks followed by step-down treatment with itraconazole  
86 for 12 months. Due to potential side effects of Amphotericin B, careful monitoring of potassium,  
87 magnesium, and renal function was critical while on the medication. Prior to discharge, LFTs  
88 were down trending while the patient's hyponatremia and hypokalemia resolved. Renal function  
89 remained intact. Ultimately, the patient was discharged a few days after her presentation and  
90 growth on blood culture remained negative.

91           At time of re-evaluation, our patient is now on her eleventh week of treatment and on  
92 itraconazole exclusively. Much of her hematologic, metabolic, and hepatobiliary lab  
93 abnormalities have normalized. Figures 3a and 3b illustrate trends of her liver labs and liver  
94 synthetic function over the course of her presentation. One can see a significant decrease in ALP  
95 since presentation, along with decreases in AST, ALT, and Bilirubin. Synthetic labs have  
96 increased to normal range. The patient's next visit is scheduled for July, with a plan to repeat  
97 labs.

98

99   **Conclusion:**

100           *Histoplasma capsulatum* is a dimorphic fungus endemic to the midwestern United States,  
101 which has or will infect a large portion of this population. Clinically, histoplasmosis is often  
102 asymptomatic and self-limiting. However, as demonstrated in this patient, infection in  
103 immunocompromised individuals can progress to disseminated histoplasmosis. This report  
104 presents a case of delayed diagnosis for disseminated histoplasmosis that manifests primarily  
105 with GI symptoms.

106           This case illustrates the importance of maintaining a broad differential for vague and  
107 subacute symptomatology, especially in the case of immunocompromised patients. Seemingly  
108 benign conditions can quickly take a turn for the worse in patients on immunosuppressants. An  
109 understandable reason for the delay in diagnosis for this case is the high prevalence of incidental  
110 pulmonary nodules on Lung CT in the patient population served in our area. Such pulmonary  
111 nodules are commonly reminiscent of prior infection with histoplasmosis and are treated as  
112 incidental findings in those without obvious symptoms. Additionally, the relatively low dose of

113 immunosuppressants in this patient was assumed not to contribute significantly to an  
114 immunocompromised state; thus, suspicion was low for disseminated histoplasmosis on finding  
115 pulmonary nodules on initial presentation. Notably, however, in the recently published  
116 “Infectious Disease Society of America’s Clinical Practice Guideline for Histoplasmosis”,  
117 patients on the biologic adalimumab have been found to be frequent victims of disseminated  
118 disease (15). This highlights the importance of how maintaining a broad differential and avoiding  
119 common mental heuristics, such as familiarity bias and confirmation bias, are essential for  
120 efficacy in the treatment of histoplasmosis in immunocompromised individuals in endemic areas.

121         When testing for disease, one must note the methodology utilized. Antigen testing has  
122 been shown to have high sensitivity (92%) when testing for disseminated disease, which makes it  
123 the preferred method of testing. Often, urine and serum antigen testing are combined to increase  
124 yield. Other methods, such as serology, lack specificity in highly endemic areas while other  
125 methods such as culture and pathology have a high specificity but are more invasive and are less  
126 sensitive compared to antigen testing (16). If a patient has previous negative testing, it is  
127 important to maintain a high level of suspicion and consider repeat testing if a patient’s  
128 symptoms are progressing without explanation. If the proper diagnosis was not eventually made  
129 in this patient, it is possible that the patient’s condition could have deteriorated into liver failure,  
130 as she was beginning to show signs of poor synthetic liver function. We recommend having a  
131 low threshold for testing for histoplasmosis in highly endemic areas in immunosuppressed  
132 patients with non-traditional symptoms.

133         Moreover, this case highlights the utility and importance of appropriate and specific  
134 outpatient follow-up after patient discharge from the hospital. Due to clinical intuition and  
135 suspicion for atypical presentation of indolent disease, the discharging physician from initial

136 hospital visit ensured rheumatologic follow-up in this patient. Low threshold for referral to  
137 Rheumatology and consultation from Infectious Disease were instrumental in ensuring high  
138 quality and timely care for this patient. Due to the astute clinical reasoning of the outpatient  
139 Rheumatology team, this patient underwent high sensitivity testing that was critical to timely  
140 treatment.

141         Fortunately, while the diagnosis was delayed due to the indolent and characteristic nature  
142 of the patient's presentation, this patient was treated before irreversible damage had occurred.  
143 This report therefore illustrates the importance of keeping a broad differential in patients who  
144 may not show clear symptoms of histoplasmosis. Additionally, intentional post-hospitalization  
145 follow-up was key to providing context and crucial information during subsequent  
146 hospitalization. Lastly, we observe how outpatient lab surveillance for immunocompromised  
147 individuals leads to decrease time from presentation to diagnosis, and consequently time to  
148 treatment and resolution of infection.

149

150 **Tables, Figures, Legends:** please see attached

151

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153         For many medical students, the only interaction they will have with Histoplasmosis is  
154 through *Sketchy*, an online learning tool that utilizes cartoon drawings with extensive backstories  
155 as a memory aid. Getting the opportunity to work with a fellow medical student and a team of  
156 wonderful physicians in treating this patient was a rewarding experience. We wish continued  
157 health for our patient along with a speedy and full recovery. The medical student authors thank

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159 mentorship.

160

### 161 **Conflict of Interest**

162 There are no financial interests or conflicts of interest to disclose.

163

### 164 **Patient Consent Statement**

165 Patient consent was obtained to publish and is available upon request. Our institution does not  
166 require Institutional Review Board or Human Research Protection Program approval for single  
167 patient case studies.

168

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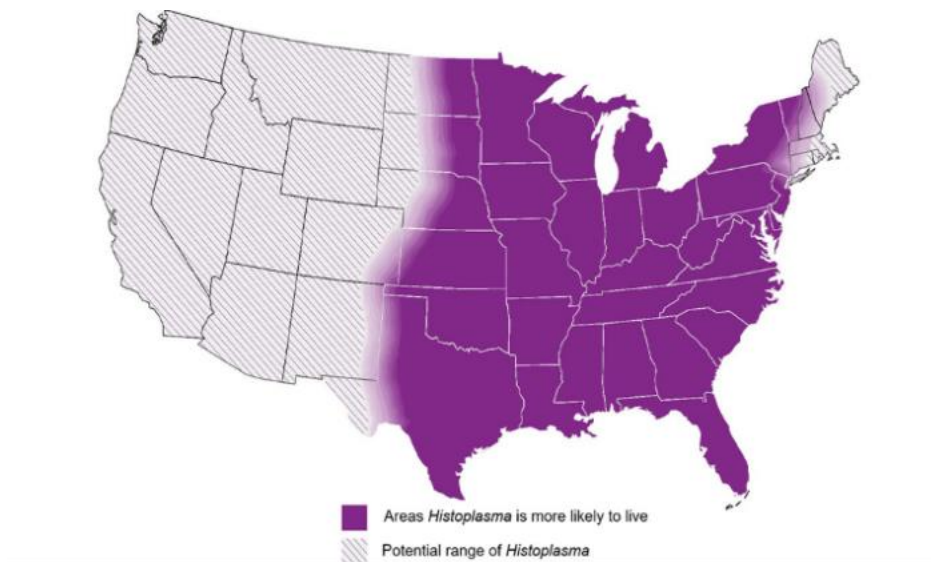
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**Figure 1.** Endemic distribution of *Histoplasma* and its potential spread in the United States (5).



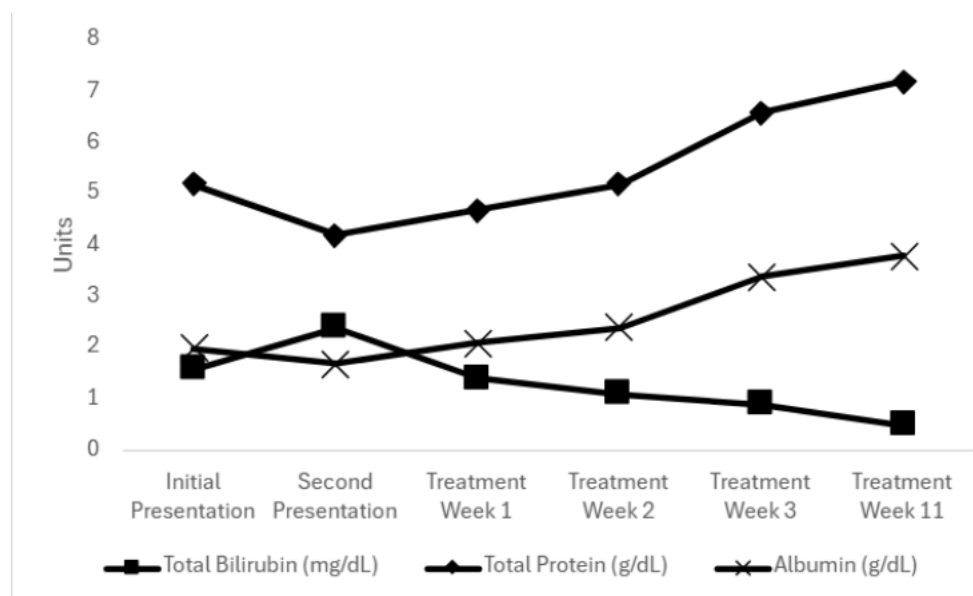
Geographic distribution illustrating endemic areas of *Histoplasma*, along with potential range of the fungus.

**Figure 2a-e.** Radiological Imaging at Initial Hospital Presentation

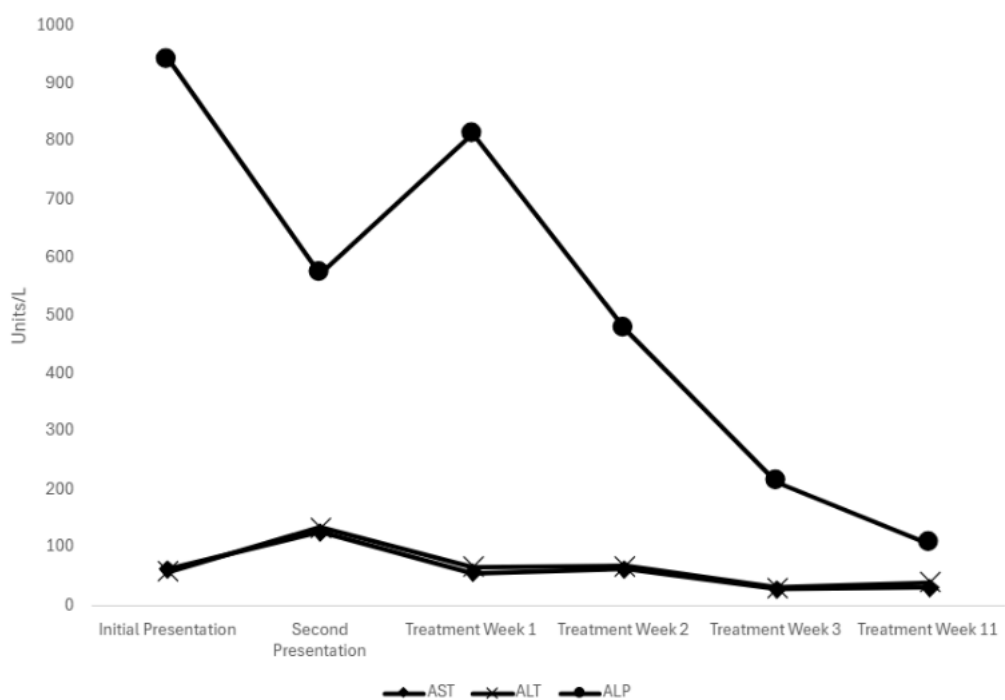


Fig 2a-e: a through c showing pulmonary nodules; d illustrating hyperemic gallbladder; e illustrating hypodense lesions of the liver.

**Figure 3a-b: Graphical illustration of patient's labs over time**



a)



b)

Fig 3a-b: a illustrates change in Total Bilirubin, Total Protein, and Albumin over time while b illustrates change in AST, ALT, and ALP over time.

**Table 1.** Associated Symptoms in Disseminated and Non-Disseminated Histoplasmosis

<b>Non-disseminated</b>	Disseminated
<ul style="list-style-type: none"><li>• Cough</li><li>• Chills</li><li>• Malaise</li><li>• Muscle aches</li></ul>	See non-disseminated plus: <ul style="list-style-type: none"><li>• Fever</li><li>• Hepatosplenomegaly</li><li>• Lymphadenopathy</li><li>• Pedal edema</li><li>• Oral ulcers</li><li>• Erythema nodosum</li></ul>

Left column illustrating symptoms associated with non-disseminated histoplasmosis. The right column illustrating symptoms associated with disseminated histoplasmosis.

**Table 2.** Pertinent Outpatient Labs and Initial Labs during January 2025 presentation to Emergency Department

<b>Component</b>	<b>Initial Presentation to ED in Jan 2025</b>	<b>Standard Range</b>	<b>Units</b>
WBC	1.5	3.6 - 10.6	k/cumm
Hgb	10.3	12.0 - 15.0	gm/dL
Sodium	131	136 - 144	mEq/L
ALP	943	20 - 130	U/L
GGT	416	9 - 43	U/L
AST	64	8 - 33	U/L
ALT	59	4 - 36	U/L
Albumin	2	3.4 - 5.4	g/dL
Total Bilirubin	1.6	0.1 - 1.2	mg/dL
Direct Bilirubin	0.8	0 - 0.2	mg/dL
Calcium	10.6	8.5 - 10.2	mg/dL
Ionized Calcium	1.62	1.12 – 1.33	mmol/L

Outpatient and presentation labs, illustrating value, standard range, and units.

**Table 3.** Labs during February 2025 hospitalization

<b>Component</b>	<b>Outpatient Labs Feb 2025</b>	<b>Second Presentation to ED in Feb 2025</b>	<b>Standard Range</b>	<b>Units</b>
<i>Hc Ag</i>	Positive, above the limit of quantification			
WBC		2.2	3.6 - 10.6	k/cumm
Hgb		9.5	12 - 15	g/dL
MCV		88	80 - 95	fL
Platelets		84,000	150,000 - 400,000	/uL
Sodium		126	136 - 144	mEq/L
Potassium		3.0	3.6 - 5.1	mEq/L
ALP		573	20 - 130	U/L
AST		127	8 - 33	U/L
ALT		135	4 - 36	U/L
Total Protein		4.2	6.5 - 8.1	g/dL
Albumin		1.7	3.4 - 5.4	g/dL
Bilirubin		2.4	0.1 - 1.2	mg/dL
Calcium		7.5	8.5 - 10.2	mg/dL
Venous Lactate		2.3	0.5 - 2.2	mmol/L

Antigen lab result on outpatient testing, along with labs on repeat presentation.