

Risk Factors and Mortality for Atypical Presentation of COVID-19 Infection in Hospitalized Patients – Lessons From the Early Pandemic

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ABSTRACT

Objective: To assess the clinical epidemiology and outcomes of patients hospitalized with COVID-19 who did not experience fever and cough during the early pandemic.

Methods: Retrospective cohort of all patients admitted during March 13, 2020 through May 13, 2020 with laboratory-confirmed COVID-19 to 3 tertiary-care hospitals. Patient-level data (demographic, clinical manifestations, comorbid illnesses, inpatient treatment) were analyzed. The main outcome variable was atypical presentation, defined as any hospitalized patient with COVID-19 infection who did not experience both fever and cough. We identified risk factors for atypical presentation on univariate and multivariate analyses and assessed 30-day mortality differences via survival analysis.

Results: Of 163 patients in the study, 39 (24%) were atypical. On univariate analysis, atypical cases were significantly more likely to be older, reside in a long-term-care facility (LTCF), and have underlying diabetes mellitus, stroke, or cardiac disease; present without dyspnea or myalgia, have lower C-reactive proteins (CRP) and higher beta-natriuretic peptides. They were less likely to receive intensive care unit care or specific COVID-19 treatments ($P < .05$). The incidence of acute respiratory failure was not significantly different between the groups. On logistic regression, atypical cases were significantly more likely to be LTCF residents ($P = 0.003$) and have a lower average CRP ($P = 0.01$). Atypical cases had significantly higher 30-day mortality (hazard ratio 3.4 [95% CI, 1.6 – 7.2], $P = 0.002$).

Conclusion: During the first pandemic surge, COVID-19 patients without inflammatory signs and symptoms were more likely to be LTCF residents and had higher mortality. Timely recognition of these atypical presentations may have prevented spread and improved clinical outcomes.

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INTRODUCTION

The COVID-19 pandemic caused by the novel SARS-CoV-2 coronavirus has affected almost 144 million people globally, with more than 3 million deaths so far.¹ The virus continues to spread in multiple regions of the world, including the United States. Prompt diagnosis and management of all infected individuals with SARS-CoV-2 is crucial to contain further spread.

COVID-19 infection has a wide disease spectrum, ranging from asymptomatic infection to severe clinical conditions such as acute respiratory distress syndrome with multiorgan dysfunction. During the first pandemic surge, persistent fever and cough were the most common symptoms, present in 78% and 57% of patients, respectively, as confirmed by a large systematic review of more than 24,410 adults with COVID-19 infection.² While several cohort studies³⁻⁵ have suggested that some hospitalized patients—particularly older adults—can present in an atypical fashion without fever and cough, this subgroup of patients is not

otherwise well defined clinically and infection could be difficult to recognize promptly. Delays in diagnosis can prove fatal, given the much higher risk of death associated with older age.⁶ Therefore, our main objectives for this study were to characterize the clinical manifestations, epidemiology, and outcomes of patients diagnosed and admitted to the hospital with COVID-19 infection during the first pandemic surge who did not experience fever and cough (atypical presentations). We aimed to (1) compare clinical

manifestations and disease outcomes in patients admitted to the hospital with typical versus atypical COVID-19 presentations, (2) identify risk factors associated with atypical presentation in hospitalized patients, and (3) describe illustrative COVID-19 cases with atypical presentations in an effort to increase clinicians' awareness and ultimately improve care.

METHODS

Study Design and Setting

We performed a retrospective cohort study of all consecutive inpatients with COVID-19 infection admitted to 3 tertiary-care hospitals (1 university and 2 community hospitals, with 1,108 total beds) within our academic medical center in the Midwest over a 60-day period (March 13, 2020 - May 13, 2020). All patients with positive nasopharyngeal swab specimens for SARS-CoV-2 by reverse transcriptase-polymerase chain reaction were included. The Institutional Review Board deemed the study exempt.

Variables

We reviewed the electronic medical record (EMR) for each patient, including outpatient records within 2 weeks prior to admission and daily inpatient records, to assess factors relevant to COVID-19 infection and to verify accuracy of subjectively reported fever or lack of fever. We also reviewed outpatient records within 30 days post-discharge to assess clinical outcomes. Utilizing a standardized data collection tool, we collected data on the following characteristics:

- **Demographic variables:** age, sex, race, body mass index, smoking status (current, former, never), and place of residence (home vs long-term care facility [LTCF]). We defined LTCF as any skilled nursing home, assisted living facility, or group home for individuals with disabilities.
- **Comorbid illnesses:** diabetes mellitus, hypertension, cardiac disease, stroke, respiratory disease, chronic kidney disease, chronic liver disease, active malignancy, autoimmune disease, use of immune suppressive therapies, transplant recipient, or HIV infection.
- **Clinical manifestations:**
 - 1) **Signs and symptoms:** presence of fever, cough, dyspnea, myalgia, fatigue, sore throat, nasal congestion, headache, altered taste, altered smell, nausea, vomiting, diarrhea, chest pain as reported by the patient and/or recorded by a health care provider during hospitalization or during any outpatient health care encounter within 2 weeks prior to admission. We also recorded presence of hypoxia (oxygen saturation < 94% on pulse oximetry⁷) and acute lung infiltrates on chest x-rays or computed tomography on admission.
 - 2) **Laboratory data:** white blood cell count (WBC), platelets, creatinine, transaminases, creatinine kinase, troponin, beta-natriuretic peptide (BNP), ferritin, C-reactive protein (CRP), fibrinogen, lactic acid, D-dimers, lactate dehydro-

genase (LDH) on admission; and highest creatinine, CRP, ferritin and D-dimers values during the hospital stay.

- 3) **Treatments:** hydroxychloroquine or chloroquine, azithromycin, doxycycline, corticosteroids, remdesivir, tocilizumab, and/or convalescent plasma therapy for COVID-19 infection.

- **Clinical outcomes:** intensive care unit (ICU) admission, mechanical ventilation, pressor therapy, new hemodialysis requirement, length of hospital stay, and mortality (defined as death during hospital stay or within 30 days of admission to inpatient hospice).

Definitions

We defined atypical cases as patients who did not experience fever (temperature $\geq 100.4^{\circ}$ F or 38° C) and cough and typical cases as patients who experienced both symptoms during hospitalization or within 2 weeks prior to admission.

Statistical Analysis

We conducted univariate analyses to compare clinical characteristics and outcomes of atypical vs typical cases and multivariate analyses to identify independent risk factors for atypical presentation. We analyzed categorical variables by chi-square tests or Fisher exact tests and continuous variables by *t* test of means for normally distributed data and Mann-Whitney U tests for nonparametric distributions. Risk factors identified on univariate analysis to be statistically significant and have at least 10 patients on each cell of the 2-by-2 tables were entered into logistic regression. The logistic regression model's discrimination ability was assessed by the area under the receiver operating characteristic (ROC) curve. Survival analysis was conducted using Cox-proportional hazard models and Kaplan-Meier curves. A 2-tailed *P* value of ≤ 0.05 was considered statistically significant, and all statistical analyses were performed in STATA SE 15.

RESULTS

Clinical Manifestations, Treatment, and Risk Factors for Atypical Presentation

There were 163 patients hospitalized with confirmed COVID-19 infection during the 60-day study period. Fever and cough were not reported in 39 (24%) of these patients, and these were considered atypical cases. Table 1 shows the risk factors associated with atypical cases, with demographic, comorbid illness, clinical manifestations, and treatment incidence data for atypical and typical cases shown in the Appendix. On univariate analysis, atypical cases were more likely to be older, reside in a LTCF, and have underlying diabetes mellitus, stroke, and/or cardiac disease. In addition to not manifesting both fever and cough, they were also less likely to experience myalgia or dyspnea. The presence of gastrointestinal symptoms did not differ significantly between the 2 groups. On laboratory analysis, atypical cases had a significantly lower CRP than typical cases, whereas other inflammatory markers and bio-

Table 1. Risk Factors for Atypical COVID-19 Presentations in Patients Requiring Hospitalization (Univariate and Multivariate Analysis)

Risk Factor ^a	Odds Ratio	95% CI	P value	Adjusted Odds Ratio	95% CI	P value
Demographics						
Age (mean, years)	1.05	1.03–1.08	<0.001	1.01	0.98–1.05	0.50
Sex (female)	1.7	0.8–3.6	0.13			
Body mass index (mean)	1.0	0.9–1.0	0.12			
Current smoker	1.0	0.3–3.2	0.97			
Long-term care facility resident	6.7	3.0–14.9	<0.001	5.1	1.72–15.0	0.003
Comorbid illnesses						
Hypertension	1.8	0.8–4.0	0.13			
Diabetes mellitus	2.2	1.05–4.7	0.04	2.25	0.86–5.9	0.10
Previous stroke	4.3	1.4–12.8	0.009			
Cardiac disease	3.4	1.6–7.3	0.002	1.34	0.48–3.7	0.57
Respiratory disease	1.0	0.46–2.2	0.99			
Renal disease	2.2	0.95–5.0	0.06			
Clinical manifestations						
No myalgia	5.8	2.1–15.8	<0.001			
No dyspnea	9.9	4.4–22.3	<0.001			
Hypoxia	0.6	0.3–1.3	0.23			
Abnormal chest x-ray	0.5	0.17–1.38	0.18			
Gastrointestinal symptoms	1.1	0.5–2.3	0.75			
Chest pain	0.3	0.08–1.0	0.05			
Abnormal troponin ^b	1.1	0.4–2.8	0.82			
Serum WBC count (mean)	0.98	0.92–1.0	0.56			
Platelet count (mean)	1.0	0.99–1.0	0.25			
Serum creatinine at admission (mean)	1.36	0.95–1.95	0.09			
ALT (mean)	0.99	1.0–1.0	0.19			
BNP (mean)	1.0	1.0–1.0	0.02			
CRP at admission (mean)	0.91	0.84–0.98	0.02			
Highest CRP (mean)	0.92	0.87–0.97	0.002	0.91	0.85–0.98	0.01
Highest ferritin (mean)	0.99	1.0–1.0	0.47			
Highest D-dimer (mean)	0.99	0.94–1.0	0.78			
Highest LDH (mean)	0.99	1.0–1.0	0.45			
Treatment						
Hydroxychloroquine	0.4	0.17–0.9	0.03			
Azithromycin	0.5	0.2–1.0	0.07			
Other systemic antibiotics	0.8	0.34–2.1	0.70			
Steroids	0.3	0.12–0.95	0.04			
Remdesivir	4.6	0.98–21.6	0.05			
Tocilizumab	c	c	0.13			
Convalescent plasma	1.1	0.36–3.1	0.90			

Abbreviations and normal ranges: WBC, white blood cell, 4.5–11x10⁹/L, values in the table are multiples of 10⁹/L; platelet count, 150–400x10⁹/L; serum creatinine, 0.84–1.21 mg/dL; ALT, alanine transaminase, 7–56 units/L; BNP, beta-natriuretic peptide, ≤ 450 pg/mL for age ≥ 75 and ≤ 125 pg/mL for age < 75; CRP, C-reactive protein, ≤ 1.0 mg/dL (normal value); ferritin, 12–300 ng/mL for males, 12–150 ng/mL for females; D-dimer, < 0.4 mcg/mL; LDH, lactate dehydrogenase 140–280 U/L.

^a Other variables (race/ethnicity, chronic liver disease, active malignancy, autoimmune disease, treatment with immune-suppressant agents, transplant recipient, presence of sore throat, fatigue, nasal congestion, headache, altered taste, altered smell, values for fibrinogen, lactic acid, and receipt of doxycycline) did not have significant differences between the 2 groups, and are not shown. There were no HIV-positive patients in our study sample.

^b Percentages calculated out of total patients with troponin labs checked (26 cases and 87 controls).

^c Could not be calculated due to zero observations for atypical cases.

ate analysis, patients presenting atypically were significantly more likely to reside in a LTCF, and significantly less likely to have a very elevated CRP. The area under the ROC curve for this model was 0.82.

Clinical Outcomes for Atypical Cases

As seen in Table 2, atypical cases were significantly less likely to be admitted to the ICU, receive pressor or ventilatory support, and be treated with hydroxychloroquine and/or corticosteroids. The odds of 30-day mortality were 3 times higher for atypical cases. The Kaplan-Meier survival curve for hospitalized patients presenting atypically versus those with typical symptoms of COVID-19 infections is shown in the Figure. Of the 12 atypical patients who died, 11 (92%) declined aggressive therapy and transitioned to comfort care measures during inpatient stay versus 4 (25%) of the 16 typical cases ($P < .001$). Among the subset of hospitalized patients with hypoxia (Table 3), atypical patients were less likely to have received corticosteroids ($P = 0.059$) and more likely to have received remdesivir ($P = 0.07$), although this trend did not reach statistical significance. None of the hypoxic patients from this subset analysis who received remdesivir died. As seen with the atypical patients from the entire cohort, the subset of hypoxic atypical patients was also significantly less likely to be admitted to the ICU and receive aggressive medical therapies and remained 3 times more likely to die compared with typical patients.

Illustrative Atypical Cases

Case 1. An 82-year-old man with underlying hypertension, atrial fibrillation, and coronary artery disease presented to his primary care physician with several weeks of gradually worsening fatigue, a sensation of loss of balance without falls, and

chemical parameters (ferritin, D-dimers, lactate dehydrogenase [LDH]) did not differ significantly. WBC counts, platelets, serum creatinine, transaminases, and troponins were similar on average between the 2 groups. Prevalence of hypoxia, abnormal lung infiltrates on chest x-rays, and chest pain did not differ significantly between the 2 groups, although atypical cases were more likely to have a significantly higher average BNP level. On multivari-

profound anorexia. He described that “nothing tastes good” and he had lost his desire to eat, especially after a close friend who used to cook for him had died 2 weeks earlier. The patient was thought to experience grief and bereavement and was prescribed an appetite stimulant. He was admitted to the hospital the next day when his wife reported that he was no longer able to get up from the floor after multiple episodes of diarrhea through-

out the night. On admission, his temperature was 99.3° F, with other vital signs, including oxygen saturation, normal. His labs were remarkable for a WBC count of 5.4 K/ μ L with lymphopenia, sodium 129 mmol/L, baseline creatinine 1.06 mg/dL, and alanine aminotransferase 86 U/L. His chest x-ray showed new patchy infiltrates in the left upper and lower lobes, and his SARS-CoV-2 polymerase chain reaction (PCR) nasopharyngeal swab was positive. His symptoms improved with intravenous fluids and supportive therapy, and he was discharged home after 3 days. He gradually regained his strength and appetite at home, and by 5 weeks post-discharge reported that he was able to ambulate without assistance, complete his usual daily exercise regimen on the stationary bike, and felt back to his normal self. His wife had remained asymptomatic throughout, and her SARS-CoV-2 PCR test was negative.

Case 2. An 86-year-old widow residing in an assisted-living facility with underlying diabetes mellitus, hypertension, obesity, and hypothyroidism was brought to the emergency department (ED) by her granddaughter due to worsening fatigue and decreased oral intake over a few days. She denied fevers, chills, nausea, vomiting, abdominal pain, cough, or chest pain. On admission, her temperature was 99.5° F and her oxygen saturation was 90% on room air. The chest x-ray showed diffuse bilateral airspace disease. Her SARS-CoV-2 PCR test was positive, and admission labs showed normal complete blood cell counts and electrolytes, with slightly elevated inflammatory markers (ferritin 276 ng/mL, CRP 2.6 mg/dL) and elevated LDH (324 U/L) and BNP (2,194 pg/mL). She became more hypoxic subsequently, requiring 3L of oxygen for most of her inpatient stay. She was treated for acute congestive heart failure and pneumonia and completed a 5-day course of hydroxychloroquine despite slight prolongation in QTc interval. She was discharged back to her assisted living facility with no further need for oxygen after 18 days of being in the hospital. At her 2-day telemedicine follow-up, she reported feeling back to baseline and expressed sadness at not being allowed to go on her usual nature walks with her relatives due to the facility's newly implemented social distancing restrictions.

Case 3. A 74-year-old woman current smoker with body mass index of 48, underlying diabetes mellitus, hypertension, atrial fibrillation, chronic obstructive pulmonary disease on 2L of oxygen at baseline, obstructive sleep apnea, and dementia was brought to the hospital after she was found hypoxic with an oxygen saturation of 85% at her nursing home. On arrival, she was afebrile, with a systolic blood pressure of 90 mmHg, heart rate of 130, and an oxygen saturation of 93% on 10L of oxygen. She had been seen in the ED on 2 previous occasions. During the first visit 4 days prior to admission, she presented with delirium, was diagnosed with a urinary tract infection caused by an extended-spectrum beta-lactamase producing *E coli*, and was discharged back to her nursing home on intramuscular ertapenem. Her second visit 2

Table 2. Clinical Outcomes Associated With COVID-19 Infection in Hospitalized Patients Presenting With Atypical vs Typical Disease (Univariate Analysis)

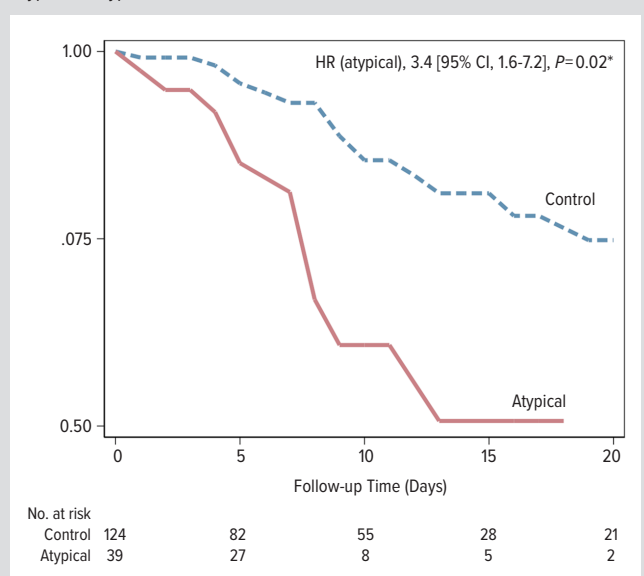
Outcome	Cases (N=39) N (%)	Controls (N=124) N (%)	Odds Ratio	95% CI	P value
Intensive care unit admission	3 (8)	44 (35)	0.15	0.04 – 0.5	0.003
Received pressor support	3 (8)	27 (22)	0.3	0.1–1.0	0.06
Received ventilator support	2 (5)	38 (31)	0.1	0.03–0.5	0.005
Length of hospital stay (mean, days)	7.8	10.4	0.95	0.90–1.0	0.09
30-day mortality ^a	12 (31)	16 (13)	3	1.3–7.1	0.01

^aIncludes patients who died in the hospital or within 30 days of admission to hospice.

Table 3. Treatments and Clinical Outcomes for Hospitalized Patients With Hypoxia and COVID-19 Infection, by Atypical vs Typical Presentation (Univariate Analysis)

Characteristic	Atypical N = 23 N (%)	Typical N = 86 N (%)	Odds Ratio	95% CI	P value
Treatments					
Remdesivir	3 (13)	3 (3)	4.2	0.5–32.7	0.07
Steroids	4 (17)	33 (38)	0.3	0.08–1.15	0.059
Convalescent plasma	5 (22)	12 (14)	1.7	0.4–6.1	0.36
Outcomes					
Intensive care unit admission	3 (13)	42 (49)	0.16	0.03–0.6	0.02
Need for pressors	3 (13)	25 (29)	0.36	0.06–1.41	0.12
Ventilator support	2 (9)	36 (42)	0.13	0.01–0.6	0.003
Length of hospital stay (mean, days)	9.7	12.0			0.22
30-day mortality	9 (39)	15 (17)	3.0	0.96–9.2	0.03

Figure. Kaplan-Meier Survival Curve for Hospitalized Patients Presenting With Atypical vs Typical COVID-19 Infections



*HR, hazards ratio of death; patients with typical COVID-19 presentation are labeled as "control."

days prior to admission was for dyspnea and hypoxia. Her chest x-ray showed bilateral interstitial opacities with small pleural effusions. A SARS-CoV-2 PCR test was obtained, but the probability of COVID-19 infection was considered “low” because she had been afebrile on both occasions and was not noted to be coughing. She was discharged back to her nursing home with a higher oxygen requirement (3L) before the test results were available. On her third ED visit, which resulted in hospitalization, her chest x-ray showed bilateral interstitial infiltrates that had progressed from the prior study. She was admitted to the ICU and started on pressors and high-flow oxygen. Given her multiple underlying medical illnesses and poor overall prognosis, the patient and her guardian declined mechanical intubation and opted for comfort care. She died in the hospital the next day.

DISCUSSION

As the COVID-19 pandemic reached and expanded in the Midwestern US during March through May 2020 (first wave), approximately a quarter of our patients who were hospitalized with COVID-19 disease presented in an atypical fashion, without fever and cough. These patients were also less likely to experience myalgia and dyspnea, and their elevation in CRP was generally lower than that of patients with typical COVID-19 symptoms. Interestingly, hypoxia and radiological findings of multifocal airspace disease were as frequent in atypical patients as they were in patients hospitalized with typical clinical manifestations of COVID-19 pneumonia, suggesting that at least some of these patients experienced the “silent hypoxia” phenomenon previously described.⁸ Patients presenting with atypical COVID-19 infection in our study were less likely to receive corticosteroids or aggressive medical treatment in the ICU—even when hypoxic—and were approximately 3 times more likely to die. Most of this mortality was among patients with progressive respiratory failure who declined mechanical ventilation and opted for comfort measures in the context of advanced age with multiple underlying illnesses that indicated a poor prognosis for recovery. In addition, the undertreatment of hypoxic, atypical patients with corticosteroids—which have been shown to reduce 28-day mortality among critically ill patients⁹—combined with delays in diagnosis until the disease was very advanced, likely also contributed to this finding.

Our findings underscore the importance of maintaining a high index of suspicion for COVID-19 disease in frail, older individuals. The blunted fever response and paucity of typical inflammatory symptoms and signs in older individuals presenting with severe infections, likely due to immune senescence-related changes in cytokine production and alteration in thermoregulatory responses, are well-documented in geriatric literature.¹⁰ For example, older studies have shown that 20% to 50% of advanced age patients with pneumonia,¹¹ bacteremia,¹² influenza,¹³ or other life-threatening infections¹⁴ lack fever—a finding that has been associated with a poor prognosis on occasion.^{15,16} This tendency for atyp-

ical infection presentation in older individuals is now increasingly apparent worldwide in the context of the COVID-19 pandemic.¹⁷ In the study by Guo et al,⁴ in an elderly COVID-19 cohort from Hunan Province, China, fever and cough were absent at admission in 33% and 35% of the patients older than 65, respectively. In the retrospective inpatient cohort study conducted in the United Kingdom by Brill et al,⁵ COVID-19 patients older than 80 were significantly more likely to present without fever, cough, and dyspnea. Instead of these typical infectious disease symptoms, frail, elderly patients with COVID-19 disease may present with delirium, dehydration from gastrointestinal losses and decreased oral intake in the setting of ageusia or anosmia, falls, or exacerbation of underlying comorbid illnesses, as shown in our study and in several published case reports from Europe.^{18,19}

In our study, LTCF residence was an independent risk factor associated with COVID-19 atypical presentation. This finding has important clinical and public health implications. The COVID-19 disease burden has disproportionately affected residents and health care workers in the LTCF setting, which was associated with 33% of all US coronavirus deaths as of April 22, 2021.²⁰ While reasons for this excess mortality are multifactorial, unrecognized COVID-19 infection in residents because of the lack of typical signs and symptoms may have contributed to this situation, as diagnostic and treatment delays can prove fatal to individuals of advanced age with multiple comorbid illnesses. In this regard, the multi-nursing home outbreak investigation conducted by Graham et al²¹ showed that less than 40% of the infected LTCF residents reported either cough or fever, and many did not develop cough or fever even in the days leading up to death. In addition to the devastating clinical outcomes in this patient population, unrecognized disease undoubtedly increases the risk of viral transmission both within the facility and when these patients are cared for at other health care settings (ED, ambulatory care clinics, hospitals) if infection prevention protocols for COVID-19 are not appropriately activated. The study by Arons et al,²² which showed that after the first identified COVID-19 case in a Seattle nursing home, 64% of the residents contracted SARS-CoV-2 within 3 weeks and 26% died—highlighted the importance of early recognition and control of this disease in the LTCF setting. Isolation and visitor restriction policies, when stringently enforced, are effective at preventing community transmission. However, these efforts are not feasible indefinitely, considering their deleterious psychological effects on older adults.²³ As the pandemic eases and LTCFs reopen, prompt recognition of atypical COVID-19 through routine and widespread testing of all LTCFs is crucial in preventing further spread.

Our study has several limitations. Being retrospective in nature, it is subject to the biases associated with observational study designs. Our hospitalized patient population is drawn from 2 US states in the Midwest (Wisconsin, Illinois) and may not be gener-

alizable to other geographical areas. Our data collection relied on retrospective EMR review of outpatient and inpatient records; it is possible that some patients experienced certain COVID-19 symptoms before admission that were not documented in the records, which could have led to inadvertent misclassification of atypical cases. However, we believe this is unlikely, since our pandemic preparedness protocols required health care providers to electronically fill out COVID-19 screening questionnaires that prompted symptom documentation at each point-of-entry for both telemedicine and in-person clinical assessments, resulting in multiple symptom screenings for each patient prior to admission. Our study adds new findings to previous retrospective cohort studies and case reports by comparing atypical and typical cases, identifying independent risk factors for atypical presentations of COVID-19 infections, and describing their epidemiology and outcomes in more detail.

CONCLUSION

Long-term care facility residents are more likely to present with atypical COVID-19 clinical manifestations that lack classic symptoms of fever and cough. Their caregivers and health care providers should maintain a high index of suspicion for the diagnosis in this high-risk group to prevent treatment delays and limit intra- and interfacility spread.

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Appendix: Available online at www.wmjonline.org.

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Appendix. Characteristics associated with atypical COVID-19 presentation (cases) versus typical COVID-19 presentation (controls) on admission to the hospital (univariate analysis)

Characteristic, N (%)	Cases (N = 39)	Controls (N = 124)
Demographics		
Age (mean, years)	72.2 (17.6)	57.1(18.2)
Gender (female)	23 (59)	56 (45)
BMI (mean)	30.1	32.7
Current smoker	4 (10)	13 (10)
LTCF resident	22 (56)	20 (16)
Comorbid illnesses		
Hypertension	28 (72)	72 (58)
Diabetes mellitus	17 (44)	32 (26)
Previous stroke	8 (20)	7 (6)
Cardiac disease	19 (49)	27 (22)
Respiratory disease	12 (31)	38 (31)
Renal disease	12 (31)	21 (17)
Clinical manifestations		
No myalgia	33 (87)	66 (53)
No dyspnea	25 (64)	19 (15)
Hypoxia	23 (59)	86 (69)
Abnormal chest X-ray	31 (82)	99 (90)
GI symptoms	17 (44)	50 (41)
Chest pain	3 (8)	28 (23)
Abnormal troponin	9 (23)	28 (23)
Serum WBC (mean)	7.0 (5.6)	7.9 (8.9)
Platelet count (mean)	189.3 (88.8)	207.7 (87.8)

Serum creatinine at admission (mean)	1.49 (1.16)	1.17 (0.85)
ALT (mean)	36.1 (36.6)	51.9 (67.3)
BNP (mean)	1,805.5	381.9
CRP at admission (mean)	5.6	9.3
Highest CRP (mean)	8.8	15.6
Highest ferritin (mean)	1,158.9 (1914)	1,570.8 (2981)
Highest D-Dimer (mean)	6.2 (9.1)	6.8 (9.0)
Highest LDH (mean)	380.9 (343)	423.9 (259.2)
Treatment		
Hydroxychloroquine	8 (21)	49 (40)
Azithromycin	18 (46)	78 (63)
Other systemic antibiotics	31 (75)	102 (82)
Steroids	5 (13)	37 (30)
Remdesivir	4 (11)	3 (2)
Tocilizumab	0 (0)	7 (6)
Convalescent plasma	5 (12)	15 (12)