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BRIEF COMMUNICATION

Risk Factors for Hospitalization Among Patients with COVID-19 at a Community Ambulatory Clinic in Massachusetts During the Initial Pandemic Surge

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Abstract
Among patients with COVID-19 evaluated in outpatient settings, factors associated with hospitalization remain poorly understood. Multivariable regressions were used to assess sociodemographic and clinical factors associated with increased odds of hospitalization among patients with confirmed COVID-19 between March 18, 2020 through April 25, 2020 at a community-based outpatient clinic in Massachusetts. Older age, BMI ≥ 25, self-reported dizziness/lightheadedness, temperature ≥ 99.5°F, tachycardia, and oxygen saturation < 95% were associated with increased odds of hospitalization after adjustment for age, sex, and BMI. There was also an association between speaking Spanish as primary language and increased odds of hospitalization (compared to English, adjusted OR = 2.99 [95% CI 1.39, 6.39]). Speaking Portuguese as primary language was not associated with increased odds of hospitalization (compared to English, adjusted OR = 1.83 [0.78, 4.28]). In addition to several clinical risk factors established among inpatients, our study found that primarily speaking Spanish, but not Portuguese, was a marker of hospitalization risk among a diverse outpatient cohort of patients with COVID-19.

Keywords COVID-19 · Massachusetts · Risk factors · Health inequities · Immigrant health · Language · Ambulatory care

Introduction

Multiple studies have investigated the initial coronavirus disease (COVID-19) pandemic surge in eastern Massachusetts. Massachusetts' first documented case of COVID-19 was February 1, 2020 and cases increased throughout March with the initial wave of COVID-19 peaking during the third week of April 2020 [1]. Massachusetts' Governor Charlie Baker issued a "stay at home" advisory from March 23, 2020 to May 18, 2020.

Several studies have identified the disparate impact of COVID-19 among certain ethnic and racial groups in Massachusetts, in particular showing a disproportionate disease burden among Hispanic and Black patients [2–5]. One analysis of COVID-19 hospitalizations in Massachusetts found that Hispanic and Black individuals constituted a disproportionately higher proportions of COVID-19 hospitalizations compared to their representative proportions of the state's population [5]. Another study of Massachusetts census data found increased COVID-19 mortality in areas with higher household crowding, rates of poverty, and racialized economic segregation; with lower mortality in neighborhoods with higher percentages of non-Hispanic white residents [4].

The structural factors underlying this disparity require further study and more systematic assessment, particularly in outpatient settings designed to care for COVID-19 patients. In the current study, we investigated sociodemographic and clinical factors associated with increased odds of hospitalization among outpatients with COVID-19 evaluated at a community-based clinic during the initial surge in Massachusetts from March to April 2020 [6]. At the time of the study, the clinic served as the sole ambulatory care setting for our safety net health care system which cares

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for more than 140,000 patients in Eastern Massachusetts. Among adults in our safety net healthcare system, English is the most common primary language (59%). followed by Portuguese (13%) and Spanish (10%).

Methods

Patients 18 years of age or older who had an initial visit from March 18, 2020 through April 25, 2020 at our ambulatory clinic and had a positive result of a nasopharyngeal swab for SARS-CoV-2 using the CDC 2019-Novel Coronavirus RT-PCR Diagnostic Panel kit were included in the analytic sample. Patients who were initially evaluated in the emergency department were excluded. Patients were considered hospitalized if they were admitted to any hospital, not limited to our network. Patients evaluated and discharged by emergency departments and patients hospitalized for childbirth were considered non-hospitalized for the purposes of our study. Demographic and clinical factors were evaluated for independent associations with risk of hospitalization within 30 days of initial clinic evaluation. Bivariate analyses as well as multivariable logistic regression models adjusting for age, sex and body mass index (BMI) were used to assess the association between each potential risk factor and hospitalization. This was determined to be a quality improvement study by the Cambridge Health Alliance institutional review board and informed consent was not required.

Results

A total of 1377 adult patients with symptoms consistent with COVID-19 were evaluated, of whom 188 were excluded (87 for visiting an emergency department since onset of their symptoms prior to their clinic visit, 100 who did not get nasopharyngeal testing, and 1 due to lost nasopharyngeal sample en route to the laboratory). Of the remaining 1189 patients, 460 (38.7%) had a positive SARS-CoV-2 result. Sixty-four of the 460 patients were hospitalized within 30 days of respiratory clinic evaluation; two patients were hospitalized for childbirth and, therefore, considered non-hospitalized for the purposes of our study.

Demographic and clinical characteristics are provided in Table 1. Patients' primary languages were English (36%, 164/460), Spanish (27%, 122/460) and Portuguese (25%, 114/460). Among the 64 patients who were hospitalized, the outpatient clinic evaluation occurred an average of 2.85 days (± 3.77, range 0–18) prior to hospitalization. In multivariable analyses, older age (50–64 years compared to 18–49 years, adjusted OR (aOR) 3.73 [95% CI 1.94, 7.16]; ≥ 65 years compared to 18–49 years, aOR 10.99 [4.95, 24.41]), Spanish as primary language (compared to English, aOR 2.99 [1.39, 6.39]),

Table 1 Demographic and clinical characteristics of patients testing positive for SARS-CoV-2 presenting to an ambulatory clinic (n = 460)

Characteristic	n (%)
Demographic characteristics	
Age categories	
18–49	282 (61.3)
50–64	136 (29.6)
65 +	42 (9.1)
Sex	
Female	292 (63.5)
Male	168 (36.5)
Primary language	
English	164 (35.7)
Portuguese[a]	114 (24.8)
Spanish[b]	122 (26.5)
Other[c]	60 (13.0)
Health characteristics	
BMI status[d]	
Obese (BMI of 30 kg/m^2 or greater)	233 (50.7)
Overweight (BMI of 25–29.9 kg/m^2)	149 (32.4)
Normal weight (BMI of 18.5 to 24.9 kg/m^2)	75 (16.3)
Underweight (BMI below 18.5 kg/m^2)	3 (0.7)
Hypertension	125 (27.2)
Chronic lung disease	95 (20.7)
Coronary artery disease	23 (5.0)
Diabetes	77 (16.7)
Chronic kidney disease	14 (3.0)
Immunocompromised[e]	21 (4.6)
Chronic liver disease	25 (5.4)
Tobacco use (current or former smoker status)	89 (19.4)
Self-reported symptom history	
Fever, chills, or night sweats	304 (66.1)
Cough	350 (76.1)
Chest pain, discomfort or tightness	121 (26.3)
Dyspnea	274 (59.6)
GI symptoms (nausea, vomiting, diarrhea, abdominal pain)	172 (37.4)
Headache	150 (32.6)
Dizziness or lightheadedness	46 (10.0)
Loss of smell or taste (subjective)	186 (40.4)
Myalgias, back pain or joint pain	253 (55.0)
URI symptoms (rhinorrhea, sinus discomfort, nasal congestion, sore throat)	158 (34.4)
Vital signs taken at ambulatory clinic visit	
Temperature of 99.5 degrees Fahrenheit or greater[f]	44 (9.8)
Heart rate of 100 bpm or greater[g]	219 (48.6)
Oxygen saturation[h]	
95% or above	400 (87.7)
91–94%	42 (9.2)
90% or lower	14 (3.1)

Table 1 (continued)

SARS-CoV-2 severe acute respiratory syndrome coronavirus 2, *BMI* body mass index, *kg* kilograms, *m* meters, *GI* gastrointestinal, *URI* upper respiratory infection, *bpm* beats per minute

[a]The countries of origin for Portuguese-speaking patients were Brazil (n = 98) and Portugal (n = 2). Fourteen patients did not have country of origin documented

[b]The countries of origin for Spanish-speaking patients were El Salvador (n = 70), Honduras (n = 13), Guatemala (n = 11), Dominican Republic (n = 5), and seven other specified countries (n = 11). Twenty-three patients did not have country of origin documented

[c]Languages were Haitian Creole (n = 39), Arabic (n = 3), Bengali (n = 3), and ten other specified languages (n = 15)

[d]Those without a documented BMI measure were designated as normal weight (n = 13)

[e]Patients were considered immunocompromised if they were currently taking an immunosuppressive medication or had: functional or anatomic asplenia, previous diagnosis of HIV, previous diagnosis of autoimmune rheumatologic disease, or a diagnosis of cancer since January 2019

[f]Among those with temperature taken at respiratory clinic visit, n = 448

[g]Among those with heart rate taken at respiratory clinic visit, n = 451

[h]Among those with oxygen saturation measured at respiratory clinic, n = 456

and higher BMI (BMI 25–29.9: 5.90 [1.31, 26.65]; BMI ≥ 30: aOR 7.32 [1.68, 31.97]) were associated with increased odds of hospitalization (Table 2). Multivariable analyses also showed that during the clinic visit, temperature ≥ 99.5° F (aOR 4.71 [2.22, 10.01]), tachycardia (aOR 2.20 [1.19, 4.05]), and oxygen saturation < 95% (aOR 11.87 [5.88, 23.96]) were associated with increased odds of hospitalization (Table 2). In self-reported symptom histories, report of dizziness/lightheadedness (aOR 2.70 [1.20, 6.09]) was also associated with increased odds of hospitalization (Table 2). Although men had a slightly higher prevalence of hospitalization, sex was not associated with increased odds of hospitalization. Of note, several comorbidities including hypertension, chronic kidney disease, and diabetes were associated with increased odds of hospitalization but these associations were attenuated after adjustment for age, sex, and BMI of 25 or above.

Discussion

We found that several clinical factors along with Spanish as primary language increased the odds of hospitalization among patients diagnosed with COVID-19 in our urban, ambulatory setting. As was the case in our cohort, increased age has consistently been found to be associated with worse prognosis in COVID-19 [7]. Prior evidence suggests that obesity, fever, tachycardia and hypoxia are more common among critically ill patients, aligning with our findings in our ambulatory setting [7, 8]. Our study also supports preliminary evidence from hospital settings that being overweight (BMI of 25–29.9 kg/m^2) and experiencing dizziness may also be associated with severe disease [9, 10].

Research in Massachusetts has begun to explore the disproportionate impact of COVID-19 among Hispanic and Black communities, highlighting profound health inequities [2–4]. Our analysis identifies this disparity along another axis—primary language spoken. This finding is in line with a study of another large safety net hospital system in Boston that found that among 2729 patients with SARS-CoV-2 in Massachusetts' first wave, a higher proportion of Hispanic patients were hospitalized than were Black or non-Hispanic white [2].

In Massachusetts, 24% of residents speak a language other than English at home, with Spanish being the most common non-English language (approximately 9% of overall residents) followed by Portuguese (approximately 3% of overall residents) [11]. In our clinic, all patients had access to a clinician fluent in their language or professional interpreter services. Our findings raise concerns regarding the utility of using the category "Hispanic" to identify patient populations that may be at higher risk of hospitalization due to COVID-19. The majority of Spanish-speaking patients in our cohort were born in Central America whereas the majority of our Portuguese-speaking patients were born in Brazil. In our patient population, some, but not all, Portuguese-speaking patients may identify as Hispanic. As such, language may be a useful marker to help investigate external factors and systemic inequities that contribute to increased disease risk among Massachusetts residents.

A more nuanced and clinically relevant understanding of risk for severe COVID-19 will require moving beyond our current use of general category terms such as "Hispanic" to explicitly assess specific social determinants of health in care of individual patients. Economic segregation, housing, and barriers to healthcare access among other social determinants of health likely contribute to the disparity between primary Spanish-, Portuguese- and English-speaking patients and require further study. Of note, our study data were collected during the first wave of the coronavirus pandemic in Massachusetts, during which a stay-at-home advisory was in effect beginning on March 23, 2020. While most employees were required to remain at home, essential employees including those working in healthcare, food and agriculture were excluded from the stay-at-home order. The differences we found in hospitalization between Spanish-, Portuguese- and English-speaking persons may have been impacted, in part, by differences in occupational risk of infection associated with these initial orders.

Our study had several limitations. It had a relatively small sample size and involved a single, safety net institution. Findings were also ultimately limited to patients who accessed care at the clinic, limiting generalizability. Several clinical variables including respiratory rate, blood

Table 2 Odds ratios of future hospitalization by demographic and clinical characteristics of patients infected with SARS-CoV-2 (n=460)

Characteristic	n	Hospitalized n (%)	Unadjusted OR (95% CI)[a]	Adjusted OR (95% CI)[b]
Demographic characteristics				
Age categories				
18–49	282	17 (6.0)	Ref	Ref
50–64	136	27 (19.9)	3.86 (2.02, 7.37)*	3.73 (1.94, 7.16)*
65 +	42	18 (42.9)	11.69 (5.34, 25.59)*	10.99 (4.95, 24.41)*
Sex				
Female	292	34 (11.6)	Ref	Ref
Male	168	28 (16.7)	1.52 (0.88, 2.61)	1.46 (0.81, 2.60)
Primary language				
English	164	13 (7.9)	Ref	Ref
Portuguese	114	14 (12.3)	1.63 (0.73, 3.61)	1.83 (0.78, 4.28)
Spanish	122	27 (22.1)	3.30 (1.62, 6.71)*	2.99 (1.39, 6.39)*
Other	60	8 (13.3)	1.79 (0.70, 4.55)	1.31 (0.48, 3.62)
Health characteristics				
BMI status				
Obese (BMI of 30 kg/m^2 or greater)	233	39 (16.7)	7.64 (1.80, 32.40)*	7.32 (1.68, 31.97)*
Overweight (BMI of 25–29.9 kg/m^2)	149	21 (14.1)	6.23 (1.42, 27.31)*	5.90 (1.31, 26.65)*
Normal and underweight (BMI of 24.9 kg/m^2 or less)[c]	78	2 (2.6)	Ref	Ref
Hypertension				
Yes	125	26 (20.8)	2.18 (1.25, 3.79)*	0.98 (0.52, 1.88)
No	335	36 (10.8)	Ref	Ref
Chronic lung disease				
Yes	95	10 (10.5)	0.71 (0.35, 1.45)	0.70 (0.33, 1.51)
No	365	52 (14.3)	Ref	Ref
Coronary artery disease				
Yes	23	8 (34.8)	3.78 (1.53, 9.34)*	1.37 (0.48, 3.89)
No	437	54 (12.4)	Ref	Ref
Diabetes				
Yes	77	20 (26.0)	2.85 (1.56, 5.20)*	1.39 (0.70, 2.76)
No	383	42 (11.0)	Ref	Ref
Chronic kidney disease				
Yes	14	7 (50.0)	7.11 (2.40, 21.04)*	2.49 (0.70, 8.91)
No	446	55 (12.3)	Ref	Ref
Immunocompromised[d]				
Yes	21	3 (14.3)	1.07 (0.31, 3.76)	0.92 (0.24, 3.47)
No	439	59 (13.4)	Ref	Ref
Chronic liver disease				
Yes	25	6 (24.0)	2.14 (0.82, 5.58)	1.76 (0.63, 4.91)
No	435	56 (12.9)	Ref	Ref
Tobacco use (current or former smoker status)				
Yes	89	13 (14.6)	1.12 (0.58, 2.18)	0.71 (0.34, 1.47)
No	371	49 (13.2)	Ref	Ref
Self-reported symptom history				
Fever, chills or night sweats				
Yes	304	47 (15.5)	1.72 (0.93, 3.18)	1.83 (0.94, 3.57)
No	156	15 (9.6)	Ref	Ref
Cough				
Yes	350	48 (13.7)	1.09 (0.58, 2.06)	1.10 (0.55, 2.18)
No	110	14 (12.7)	Ref	Ref

Table 2 (continued)

Characteristic	n	Hospitalized n (%)	Unadjusted OR (95% CI)[a]	Adjusted OR (95% CI)[b]
Chest pain, discomfort, tightness or pleuritic chest pain				
Yes	121	8 (6.6)	0.37 (0.17, 0.81)*	0.48 (0.21, 1.08)
No	339	54 (15.9)	Ref	Ref
Dyspnea				
Yes	274	39 (14.2)	1.18 (0.68, 2.04)	1.48 (0.80, 2.71)
No	186	23 (12.4)	Ref	Ref
GI symptoms (nausea, vomiting, diarrhea, abdominal pain)				
Yes	172	23 (13.4)	0.99 (0.57, 1.72)	1.09 (0.60, 1.98)
No	288	39 (13.5)	Ref	Ref
Headache				
Yes	150	20 (13.3)	0.98 (0.55, 1.74)	1.48 (0.79, 2.78)
No	310	42 (13.6)	Ref	Ref
Dizziness or lightheadedness				
Yes	46	11 (23.9)	2.24 (1.07, 4.68)*	2.70 (1.20, 6.09)*
No	414	51 (12.3)	Ref	Ref
Loss of smell or taste (subjective)				
Yes	186	16 (8.6)	0.47 (0.26, 0.85)*	0.68 (0.36, 1.31)
No	274	46 (16.8)	Ref	Ref
Myalgias, back pain or joint pain				
Yes	253	29 (11.5)	0.68 (0.40, 1.17)	0.69 (0.38, 1.22)
No	207	33 (15.9)	Ref	Ref
URI symptoms (rhinorrhea, sinus discomfort, nasal congestion, sore throat)				
Yes	158	16 (10.1)	0.63 (0.34, 1.15)	0.85 (0.44, 1.64)
No	302	46 (15.2)	Ref	Ref
Vital signs taken at ambulatory clinic visit				
Temperature of 99.5 degrees Fahrenheit or greater[e]				
Yes	44	17 (38.6)	5.43 (2.73, 10.77)*	4.71 (2.22, 10.01)*
No	404	42 (10.4)	Ref	Ref
Tachycardia (Heart rate of 100 bpm or greater)[f]				
Yes	219	38 (17.4)	2.11 (1.19, 3.73)*	2.20 (1.19, 4.05)*
No	232	21 (9.1)	Ref	Ref
Oxygen saturation below 95%[g]				
Yes	56	32 (57.1)	16.44 (8.61, 31.40)*	11.87 (5.88, 23.96)*
No	400	30 (7.5)	Ref	Ref

SARS-CoV-2 severe acute respiratory syndrome coronavirus 2, *OR* odds ratio, *CI* confidence interval, *ref* referent category, *BMI* body mass index, *kg* kilograms, *m* meters, *GI* gastrointestinal, *URI* upper respiratory infection, *bpm* beats per minute

*p value < 0.05

[a]Separate logistic regression models were run for each risk factor, associations between the risk factor and odds of hospitalization are presented along with 95% confidence intervals

[b]Logistic regression models were adjusted for age category, sex, and BMI of 25 or above (combined overweight and obesity categories)

[c]Those without a documented BMI measure were designated as normal weight (n = 13)

[d]Patients were considered immunocompromised if they were currently taking an immunosuppressive medication or had: functional or anatomic asplenia, previous diagnosis of HIV, previous diagnosis of autoimmune rheumatologic disease, or a diagnosis of cancer since January 2019

[e]Among those with temperature taken at respiratory clinic visit, n = 448

[f]Among those with heart rate taken at respiratory clinic visit, n = 451

[g]Among those with oxygen saturation measured at respiratory clinic, n = 456

pressure, and serologic tests were not consistently collected at our clinic. We were also unable to evaluate which social determinants of health or other factors may underlie the increased risk of hospitalization. Additional socioeconomic variables such as income, employment status, household size, and education were not consistently available in the

electronic medical record for our cohort and not included in our study. Finally, we identified factors among outpatients with COVID-19 that were associated with increased odds of hospitalization, and risk factors for worse outcomes may differ among hospitalized patients.

Conclusion

Our study provides additional information on the markers of severe disease risk among a diverse cohort of patients at a community clinic in Massachusetts during the initial surge of COVID-19. Notably, we found that speaking Spanish, but not Portuguese, as primary language was associated with increased odds of hospitalization after adjustment for age, sex, and BMI. Our results may help guide future research into the social determinants underlying COVID-19's disparate impact on communities in Massachusetts, inform policy identifying and addressing root causes of health inequities in Massachusetts, and help clinicians with more nuanced understanding of risk for hospitalization among outpatients with COVID-19.

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Authors contribution Study conceptualization: PC, YS; Development or design of methodology: PC, DN, YS, HS; Statistical analysis: LR; Data investigation: PK, CL, DN, HS; Writing - first draft preparation: PC; Writing - review and editing: PC, CL, DN, PK, LR, HS, YS; Supervision: PC, YS.

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Declarations

Conflict of interest Financial interests: Dr. Cohen reports receiving compensation from UptoDate. Non-financial interests: None.

Ethical Approval This quality improvement study met criteria for determination of non-human subject research by the Cambridge Health Alliance institutional review board.

References

1. Lemieux J, Siddle KJ, Shaw BM, et al. Phylogenetic analysis of SARS-CoV-2 in the Boston area highlights the role of recurrent importation and superspreading events. MedRxiv. 2020. https://doi.org/10.1101/2020.08.23.20178236.
2. Hsu HE, Ashe EM, Silverstein M, et al. Race/ethnicity, underlying medical conditions, homelessness, and hospitalization status of adult patients with COVID-19 at an urban safety-net medical center — Boston, Massachusetts, 2020. Morb Mortal Wkly Rep. 2020;69:864–9. https://doi.org/10.15585/mmwr.mm6927a3.
3. Goldfarb IT, Clapp MA, Soffer MD, et al. Prevalence and Severity of Coronavirus Disease 2019 (COVID-19) Illness in Symptomatic Pregnant and Postpartum Women Stratified by Hispanic Ethnicity. Obstetr Gynecol. 2020;136(2):300–2. https://doi.org/10.1097/AOG.0000000000004005.
4. Chen JT, Waterman PD, Krieger N. COVID-19 and the unequal surge in mortality rates in Massachusetts, by city/town and ZIP Code measures of poverty, household crowding, race/ethnicity, and racialized economic segregation. Harvard center for population and development studies. harvard center for population and development studies. Working Paper, 2020;19(2). https://cdn1.sph.harvard.edu/wp-content/uploads/sites/1266/2020/05/20_jtc_pdw_nk_COVID19_MA-excess-mortality_text_tables_figures_final_0509_with-cover-1.pdf
5. Karaca-Mandic P, Georgiou A, Sen S. Assessment of COVID-19 hospitalizations by race/ethnicity in 12 states. JAMA Intern Med. 2021;181(1):131–4. https://doi.org/10.1001/jamainternmed.2020.3857.
6. Cohen PA, Hall L, John JN, Rapoport AB. The early natural history of SARS-CoV-2 infection: clinical observations from an urban, ambulatory COVID-19 clinic. Mayo Clinic Proc. 2020;95(6):1124–6. https://doi.org/10.1016/j.mayocp.2020.04.010.
7. Liang W, Liang H, Ou L, et al. Development and validation of a clinical risk score to predict the occurrence of critical illness in hospitalized patients with COVID-19. JAMA Intern Med. 2020;180(8):1081–9. https://doi.org/10.1001/jamainternmed.2020.2033.
8. Richardson S, Hirsch JS, Narasimhan M, et al. Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. JAMA. 2020;323(20):2052–9. https://doi.org/10.1001/jama.2020.6775.
9. Cai Q, Chen F, Wang T, Luo F, Liu X, Wu Q, He Q, Wang Z, Liu Y, Liu L, Chen J. Obesity and COVID-19 severity in a designated hospital in Shenzhen, China. Diabetes Care. 2020;43(7):1392–8. https://doi.org/10.2337/dc20-0576.
10. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. JAMA. 2020;323:1061–9. https://doi.org/10.1001/jama.2020.1585.
11. Migration Policy Institute Data Hub, State Immigration Profiles: United States—Language and Education [Massachusetts, 2018]. https://www.migrationpolicy.org/data/state-profiles/state/language/MA