

## Incidentally Detected SARS-CoV-2 Among Hospitalized Patients in Los Angeles County, August to October 2020

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We aimed to determine the percentage of COVID-19–associated hospitalizations reported to Los Angeles County (LAC) Public Health that might have been misclassified because of incidentally detected SARS-CoV-2. We retrospectively reviewed medical records from a randomly selected set of hospital discharges reported to LAC Public Health from August to October 2020 for a clinical diagnosis of COVID-19 or a positive SARS-CoV-2 test result. Among the 13,813 discharges from 85 hospitals reported to LAC Public Health as COVID-19–associated

hospitalizations from August to October 2020, 346 were randomly selected and reviewed. SARS-CoV-2 detection was incidental to the reason for hospitalization in 12% (95% confidence limit, 9%-16%) of COVID-19 classified hospital discharges. Adjusting COVID-19–associated hospitalization rates to account for incidental SARS-CoV-2 detection could help public health policymakers and emergency preparedness personnel improve resource planning. *Journal of Hospital Medicine* 2021;16:480-483. © 2021 Society of Hospital Medicine

Many of the 85 hospitals in Los Angeles County (LAC) routinely test patients for SARS-CoV-2, the virus that causes COVID-19, upon admission to the hospital.<sup>1</sup> However, not all SARS-CoV-2 detections represent acute COVID-19 for at least two reasons. First, the SARS-CoV-2 real-time polymerase chain reaction (RT-PCR) assay can report a false-positive result.<sup>2</sup> Second, approximately 40% to 45% of persons with SARS-CoV-2 infection are asymptomatic, and RT-PCR tests can remain positive more than 2 months after an individual recovers from COVID-19; thus, SARS-CoV-2 detected on admission might represent shedding of nonviable virus from a prior unrecognized or undiagnosed infection.<sup>1,3</sup>

Public health policymakers closely monitor the rate of COVID-19 hospitalizations because it informs decisions to impose or relax COVID-19 control measures. However, the percentage of hospitalizations misclassified as COVID-19–associated because of incidentally detected SARS-CoV-2 (ie, COVID-19 was not a primary or contributing cause of hospitalization) is unknown. Therefore, we sought to determine the percentage of hospitalizations in LAC classified as having COVID-19 that might have had incidental SARS-CoV-2 detection.

### METHODS

The state of California requires healthcare providers to report all COVID-19 cases and clinical laboratories to report all SARS-

CoV-2 diagnostic test results. Hospitals in LAC are mandated to report daily lists of all persons hospitalized with suspected or confirmed COVID-19 to the LAC Department of Public Health (DPH) COVID-19 Hospital Electronic Surveillance System (CHESS).<sup>4</sup> Hospitals provide daily data to CHESS containing information about patients in their facilities with COVID-19. We conducted a cross-sectional retrospective study by selecting a random set of medical records from CHESS for review.

We began regularly and systematically reviewing medical records of patients in CHESS discharged after August 1, 2020, as part of LAC DPH surveillance to characterize persons experiencing severe COVID-19, defined as illness requiring hospitalization. For severe COVID-19 surveillance, we randomly selected 45 discharged patients per week from CHESS in August 2020 and 50 discharged patients per week between September and October 2020. To ensure that the sample represented the overall age distribution of patients in CHESS, we ordered patients by birth date and selected every  $k$  record, where  $k$  represented the interval between patients needed to meet the target for the week. Before random sample selection, several free text fields from the CHESS dataset were queried to identify and remove patients who were not LAC residents, were seen in the emergency department but not admitted, were hospitalized for <1 day, were discharged from a non-acute care hospital, or if the hospital-reported patient did not have a positive SARS-CoV-2 test. We then requested full medical records for these patients from the respective hospitals. After we received the medical records, a team of four nurses independently reviewed the medical charts and excluded patients who did not meet the above listed exclusion criteria; patients were excluded at two points—during the automated query and again by manual review.

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**TABLE 1. Demographic Characteristics and Clinical Outcomes Among All Patients Hospitalized for COVID-19 and Patients Selected for Study Population—Los Angeles County, August to October 2020**

	All hospitalized patients (N = 13,813)	Study population (n = 346)	
	No. (%)	No. (%)	95% confidence limit, %
<b>Sex</b>			
Male	7,190 (52)	187 (54)	49-59
Female	6,619 (48)	159 (46)	41-51
Other <sup>a</sup>	1 (0)	0	—
Unknown	1 (0)	0	—
<b>Age, y</b>			
<18	236 (2)	12 (3)	2-5
18-29	1,087 (8)	27 (8)	5-11
30-49	2,860 (21)	80 (23)	19-28
50-64	3,795 (27)	100 (29)	24-34
65-79	3,659 (26)	83 (24)	19-29
80+	2,164 (16)	44 (13)	9-16
Unknown	12 (0)	0	—
<b>Race/ethnicity</b>			
White	2,209 (16)	69 (20)	16-24
Latinx	8,203 (59)	209 (60)	55-66
Black/African American	1,197 (9)	28 (8)	5-111
Asian/Pacific Islander	1,058 (8)	20 (6)	3-8
American Indian or Alaska Native	14 (0)	0	—
Other <sup>a</sup>	678 (5)	8 (2)	1-4
Missing/unknown <sup>b</sup>	454 (3)	12 (3)	2-5
<b>Outcomes<sup>c</sup></b>			
Intensive care unit admission	3,511 (25)	73 (24)	19-29
Death	1,744 (13)	36 (12)	8-16

<sup>a</sup> Includes "Male-to-Female Transgender," "Female-to-Male Transgender," "Genderqueer (neither exclusively male/female)," and people whose response was "Other."  
<sup>b</sup> Includes persons of multiple race/ethnicity and persons whose response was "Other."  
<sup>c</sup> Outcome information only provided for "likely COVID" and "potentially COVID-associated" cases (n = 303).

In addition, severe COVID-19 surveillance was intended to characterize primary admissions for COVID-19, defined as having a documented positive SARS-CoV-2 result within 10 days of symptom onset or hospital admission and no prior hospitalization for COVID-19. The date of the first positive result was validated by locating the positive SARS-CoV-2 result in the patient's medical record and/or the LAC COVID surveillance database; the patient was excluded from analysis if a positive SARS-CoV-2 result could not be found. Excluded dis-

charges were not replaced by a new randomly selected patient. Instead, we oversampled the number of weekly charts to request with a goal of having 40 to 45 charts per week that met inclusion criteria for abstraction.

For this analysis, we examined medical records abstracted for discharges occurring between August 1 and October 31, 2020. We categorized hospitalizations into one of the following: (1) "likely COVID-19-associated" if the patient had a clinical or radiographic diagnosis of pneumonia or acute respiratory distress syndrome or measured fever ( $>100.4$  °F) with new cough or shortness of breath; (2) "not COVID-19-associated" if patient was admitted primarily for a traumatic or accidental injury, acute psychiatric illness, or full-term uncomplicated delivery, or was tested preoperatively for an elective procedure in the absence of other acute medical illnesses (other causes were considered on a case-by-case basis based on the consensus of the chart abstraction team); and (3) "potentially COVID-19-associated" for all other hospitalizations not meeting criteria for the other two categories. We considered the identification of SARS-CoV-2 in patients classified as "not COVID-19-associated" to be incidental to the reason for hospitalization. When the medical records reviewer classified a hospitalization as "not COVID-19-associated," the primary reason for hospitalization was entered into a tracking database and no further data were collected.

Descriptive statistics and all analyses were conducted using SAS version 9.4 (SAS Institute). Confidence limits (CL) were calculated using the proc freq CL option in SAS. Chi-square analysis was conducted to determine whether trends in hospitalization categories changed over time. Statistical significance was set at  $P < .05$ .

## RESULTS

Of the 13,813 hospital discharges reported to CHES from August to October 2020, 3,182 (23%) records were not eligible for inclusion in the random selection sample for the following reasons: 1,765 (13%) patients reported by hospitals did not have a positive COVID-19 test, 734 (5%) discharges were for non-LAC residents, 636 (5%) patients had a length of hospital stay  $<1$  day, and 47 ( $<1\%$ ) discharges were from a non-acute care hospital. From the 10,631 discharges in CHES meeting preliminary inclusion criteria from August 1 to October 31, 2020, we randomly selected 618 discharges for medical record review. Of the 618 discharges, 504 (85%) medical records were available for review as of November 30, 2020. After review of the 504 medical records, an additional 158 were excluded because 83 (13%) had a first documented positive SARS-CoV-2 test that was  $>10$  days from hospital admission or symptom onset, 34 (6%) were previously hospitalized for COVID-19, 29 (5%) had an emergency department visit only, 6 (1%) were discharged from a non-acute care hospital, and 6 (1%) were non-LAC residents. We reviewed medical records for 346 (56%) of the 618 hospitalizations that met our inclusion criteria.

The demographic characteristics of patients included in our sample were similar to those of the overall patient population

in CHES (Table 1). Most patients in our final study population were male (54%), older than 50 years (66%), and Hispanic (60%); the median length of hospital stay for survivors was 5 days (first quartile–third quartile: 3 to 8 days).

Our analysis indicates that 71% (95% CL, 66%–75%) of hospital discharges were “likely COVID-19-associated”; 12% (CL, 9%–16%) were “not COVID-19-associated” and, therefore, had incidentally detected SARS-CoV-2; and 17% were “potentially COVID-19-associated” (CL, 13%–21%). The percentage of hospitalizations classified as “likely,” “potentially,” and “not COVID-19-associated” did not change from month-to-month during the study period ( $P = .81$ ). Full-term delivery was the most common reason for hospitalization among patients with incidentally detected SARS-CoV-2 (Table 2).

## DISCUSSION

The primary public health objective of the COVID-19 pandemic response has been to prevent overwhelming the healthcare system by slowing disease transmission. LAC DPH closely monitors the daily number of hospitalized COVID-19 patients, defined as hospitalization of a person with an associated positive SARS-CoV-2 result. However, increasing community transmission of SARS-CoV-2 can complicate interpretation of hospitalization data because it is likely that some patients with incidentally detected, nonviable virus will be misclassified as having COVID-19. Overestimating the burden of COVID-19-associated hospitalizations may lead public health policymakers to impose more restrictive control measures or remove restrictions more slowly. Results from this study can inform policymakers about the potential magnitude of overestimating COVID-19-associated hospitalizations.

Our results indicate that SARS-CoV-2 detection might be incidental (ie, “not COVID-19-associated”) in approximately one of eight persons hospitalized with COVID-19 in LAC. We likely underestimated the percentage of hospitalizations with incidental SARS-CoV-2 detection because our definition of “not COVID-19-associated” hospitalizations was intended to be specific for identifying patients who had no clear reason for SARS-CoV-2 testing except a presumed hospital policy of testing on admission or preoperatively. In addition, several patients classified as having a “potentially COVID-19-associated” hospitalization also had a primary reason for admission that currently does not have a clear link to COVID-19 (eg, Bell’s palsy and pelvic inflammatory disease). Although our sample size was relatively small, it was representative of all potential COVID-19 hospitalizations in LAC over a 3-month period.

## CONCLUSION

Detection of SARS-CoV-2 in a person with a clinical presentation that is not compatible with COVID-19 can complicate initial clinical management because it is unclear if the result represents presymptomatic or asymptomatic infection, prolonged shedding of nonviable virus, or a false-positive result. Considering the consequences of missing a true infection, such as transmission to other staff or patients, healthcare

TABLE 2. Primary Reason for Hospitalization Among Patients Selected for Study Population—Los Angeles County, August–October 2020 (N = 346)

Primary reason for hospitalization	No. (%)
Likely COVID-19-associated <sup>a</sup>	244 (71)
Pneumonia only	201 (82)
Pneumonia + acute respiratory distress syndrome	38 (16)
Fever + shortness of breath /cough	3 (1)
Acute respiratory distress syndrome only	2 (1)
Potentially COVID-19-associated <sup>b</sup>	59 (17)
Renal (urinary tract infection, pelvic inflammatory disease, pyelonephritis, acute kidney injury)	11 (19)
Cardiopulmonary (chest pain, bronchitis versus pneumonia, myocarditis, chronic obstructive pulmonary disease exacerbation, management of immunosuppression status post heart transplant, unstable angina)	10 (17)
Gastrointestinal (diverticulitis, acute appendicitis, acute cholecystitis, acute gastrointestinal bleed, abdominal pain, Crohn’s disease, umbilical hernia pain)	9 (15)
Atypical COVID-19 symptoms (weight loss, PO [food] intolerance, syncope, dehydration, nausea and vomiting)	7 (12)
Neurologic (metabolic encephalopathy, questionable subdural hematoma, paresthesia, Bell’s palsy, transient ischemic attack)	5 (8)
Hyponatremia and sepsis (sepsis, neonatal sepsis evaluation)	3 (5)
Diabetes (diabetic ketoacidosis, uncontrolled diabetes)	9 (15)
Other (osteomyelitis, joint pain and swelling, <i>Escherichia coli</i> , hypertensive emergency, delivery of preterm infant, postoperative wound complication, L4-5 stenosis, vaginal bleeding)	
Not COVID-19-associated <sup>c</sup>	43 (12)
Delivery of full-term infant	22 (51)
Substance use/mental health (psychosis, depression/overdose, ethanol withdrawal/intoxication, suicide)	7 (16)
Violence-related injury (gunshot wound, stab wound)	6 (14)
Fall-related injury	2 (5)
Motor vehicle crash–related injury	2 (5)
Elective surgery	1 (2)
Other (hemodialysis, osteosarcoma, cancer metastasized to bone)	3 (7)

<sup>a</sup> “Likely COVID-19-associated” is defined as patients diagnosed with pneumonia and/or acute respiratory distress syndrome, or who presented to the hospital with measured fever (100.4 ° F or higher) and cough or shortness of breath.

<sup>b</sup> “Potentially COVID-19-associated” is defined as patients who reported other COVID-19 symptoms (eg, anosmia, malaise, altered mental status) or who had alternative diagnoses that may have been exacerbated by SARS-CoV-2 infection (eg, acute gastrointestinal bleeding, acute appendicitis).

<sup>c</sup> “Not COVID-19-associated” is defined as patients whose COVID-19 diagnosis was not the primary reason for admission but rather was incidental to the primary hospital diagnosis.

providers are obligated to treat the test result as a real infection. Therefore, our results are not applicable to patient-level clinical management decisions, but highlight the need for policymakers and emergency preparedness personnel to consider that hospital-reported data might overestimate the burden of COVID-19 hospitalizations when making decisions that rely on hospitalization data as a metric. Additional research is needed to develop methods for correcting hospitalization data to account for patients in whom incidentally detected SARS-CoV-2

was not a direct or contributing cause of hospitalization. Adjusting COVID-19–associated hospitalization rates to account for incidental SARS-CoV-2 detection could allow for optimal resource planning by public health policymakers.

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## References

1. Liotti, FM, Menchinelli, G, Marchetti, S, et al. Assessment of SARS-CoV-2 RNA test results among patients who recovered from COVID-19 with prior negative results. *JAMA Intern Med.* 2021;181(5):702-704. <https://doi.org/10.1001/jamainternmed.2020.7570>
2. Centers for Disease Control and Prevention and Infectious Disease Society of America. RT-PCR Testing. Accessed April 19, 2021. <https://www.idsociety.org/covid-19-real-time-learning-network/diagnostics/RT-pcr-testing>
3. Oran DP, Topol EJ. Prevalence of asymptomatic SARS-CoV-2 infection: a narrative review. *Ann Intern Med.* 2020;173(5):362-367. <https://doi.org/10.7326/M20-3012>
4. Los Angeles County Department of Public Health. Daily reporting of hospitalized COVID-19 positive inpatients: updated data submission requirements and guide for acute care facilities in Los Angeles County. Accessed on December 10, 2020. <http://publichealth.lacounty.gov/acd/docs/Hosp-COVIDReportingGuide.pdf>

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