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# Characteristics of Hospitalized Children Positive for SARS-CoV-2: Experience of a Large Center

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Dr. Webb and Dr. Osburn conceptualized and designed the study, designed the data collection instrument, collected and analyzed all data, drafted the initial manuscript, reviewed and revised the manuscript, and approved the final manuscript as submitted.

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ABSTRACT

**Objective:** Define the spectrum of disease in pediatric inpatients with a positive SARS-CoV-2 test in a manner relevant to pediatric hospital medicine.

**Methods:** Retrospective case series of all patients < 22 years hospitalized at our institution with a positive SARS-CoV-2 PCR between 5/1/20 and 9/30/20. Demographic, clinical, and outcome data was collected and analyzed.

**Results:** Three distinct presentations were associated with acute SARS-CoV-2 positivity. Patients had incidental infection (40%), were potentially symptomatic (47%), or significantly symptomatic (14%). The average length of stay differed between the significantly symptomatic group and the incidental and potentially symptomatic groups ($p$ 0.002). Average age differed among these groups, with significantly symptomatic patients older by more than 2 years. Fifty-five percent of incidental and 47% of potentially symptomatic patients had at least one identified comorbidity while 90% of significantly symptomatic patients had at least one ($p$ 0.01). There was a significant relationship between obesity ($p$ 0.001) and asthma ($p$ 0.004) and severe disease. Additionally, there was a statistically significant difference between groups with respect to fever, hypoxia, supplemental oxygen use, duration of supplemental oxygen, and ICU admission, with a significantly higher percentage of patients in the significantly symptomatic group meeting each of these criteria ($p < 0.001$ for all categories).

**Conclusions:** Pediatric patients hospitalized with SARS-CoV-2 fall into distinct categories, which are critical to understanding the true pathology of SARS-Cov-2 as it relates to hospitalized pediatric patients. Most hospitalized patients who are positive for SARS-CoV-2 are asymptomatic or have a reason for hospitalization other than COVID-19.

## INTRODUCTION

During the COVID-19 pandemic, children have been relatively spared of severe respiratory compromise and concomitant morbidity and mortality.[1] Thus far, definitions of severe disease in pediatric patients are variable but generally reflect respiratory symptoms and define severe as a requirement for any respiratory support or oxygen saturations less than 92%. Most of these classification systems also define the COVID-19 illness as severe if the patient requires hospitalization. [2,3,4] Because of the novel nature of the virus and universal testing protocols in place at many US hospitals, these broad definitions do not adequately describe the disease spectrum in hospitalized children.

Children are often admitted to the hospital for reasons unrelated to SARS-CoV-2 and found to have incidental or mildly symptomatic infection. Asymptomatic infection, particularly in pediatric patients, has been well documented.[3,5,6] Because COVID-19 in pediatric patients has significant clinical overlap with many common conditions requiring admission in pediatric patients[7], it can be difficult to determine if a patient has symptomatic COVID-19 infection or incidental infection with SARS-CoV-2 in the presence of another disease process that has similar symptoms. We sought to accurately understand the COVID-19 disease burden in hospitalized pediatric patients at our center.

## METHODS

*Setting and Patient Population*

This study was conducted at a 358 bed tertiary care children's hospital with a catchment area encompassing 1.3 million children across 12 counties in California. The study site is a safety net hospital, with 75% of the patients being funded by a government payor. It is the second largest children's hospital in California and the 5th largest in the United States. The region was heavily impacted by COVID-19 in

adults during this time, resulting in hospitals transferring pediatric patients to our tertiary care site in order to accommodate larger volumes of adults.

This study is a retrospective case series of all patients hospitalized at our institution with SARS-CoV-2 positivity between 5/1/20 and 9/30/20. It was approved by our organizational Institutional Review Board (IRB). The time period reviewed was chosen based upon the dates our institution adopted universal testing of inpatients (mid-April 2020) and when our first SARS-CoV-2 positive patient was admitted (early May 2020), as well as a desire to avoid potential confounding from overlap with typical fall respiratory virus season.

Inclusion criteria were age less than 22 years (per our organizational age threshold for pediatric patients), positive SARS-CoV-2 by PCR either at our institution or documented positive PCR or antigen test at a referring facility for patients transferred in, and date of hospitalization between 5/1/20 and 9/30/20. Exclusion criteria were age 22 years or greater at the time of admission, negative or no documented SARS-CoV-2 PCR or antigen assay, including those with negative SARS-CoV-2 PCR or antigen and positive SARS-CoV-2 IgG, and documentation of false positive SARS-CoV-2 PCR or antigen.

*Data Collection*

We manually reviewed the electronic medical record for patients on this list for demographic, clinical, laboratory, radiographic, reason for admission and hospitalization outcome data from admission to discharge. The compiled data was maintained electronically on site adhering to IRB protocol. All chart review was conducted by the two principal study authors and a random selection of charts were reviewed

independently by each to ensure inter-rater reliability. There were no discrepancies between the two reviewers' independent assessments.

*Study Definitions*

Self-reported ethnicity was characterized consistent with our electronic health record as Hispanic and non-Hispanic. Patients were categorized as medically complex if they were technology dependent, considered medically fragile (i.e. oncologic diagnosis), had comorbidities requiring multiple specialists, or had a severe disability. [8,9] Obesity was defined as BMI (or weight for age if < 2 years), greater than or equal to the 95$^{th}$ percentile for age. [10]

Reason for admission was determined as the principal clinical diagnosis necessitating hospital admission. As a surrogate for socioeconomic status, payor status was determined as public, private, or uninsured.

**Incidental diagnosis** was defined as patients with no documentation of fever, respiratory symptoms (cough, shortness of breath, or difficulty breathing), or gastrointestinal symptoms (nausea, vomiting, or abdominal pain) prior to admission or during hospitalization. Patients admitted with these symptoms but who had a clearly documented alternative reason for them were also deemed to have incidental diagnosis. For example, a child presenting with abdominal pain and fever with positive SARS-CoV-2 PCR but found to have an intraabdominal abscess requiring drainage and antibiotic therapy would be classified as being incidentally diagnosed.

**Potentially Symptomatic** was defined as patients with fever, respiratory, or gastrointestinal symptoms who did not require respiratory support or intervention but also did not have a clearly documented

alternative explanation. Patients with diabetic ketoacidosis, appendicitis and neonatal "rule out serious bacterial infection" were classified in this group. COVID-19 was not the primary reason for admission for these patients, and COVID-19 alone did not directly require hospitalization without the concomitant condition.[1]

**Significantly symptomatic** was defined as patients with respiratory or cardiac symptoms consistent with COVID-19 requiring respiratory support or ICU-level care.[2]

**MIS-C:** Patients were identified as having MIS-C if that was the discharge diagnosis by the physician who provided the clinical care and if they met CDC criteria for MIS-C.[11]

*Data Analysis*

Descriptive statistics were used to summarize characteristics of patients overall and in each severity category. Chi-square or Fisher-Freeman-Halton Exact test was used to investigate the level of association among categorical variables. The Kruskal-Wallis test was used to analyze continuous variables (age, length of stay). A $p$ value of less than 0.05 was considered statistically significant.

Analyses were conducted using SPSS version 26 (Armonk, NY: IBM Corp).

[1] This group includes three patients with appendicitis who received supplemental oxygen in documented conjunction with narcotic administration.
[2] One child was SARS-Cov-2 PCR and IgG positive who presented with chest pain but only had one organ system involved and was characterized as having COVID myocarditis. He was classified as potentially symptomatic.

**RESULTS**

Our institutional Quality department provided a list of 184 patients admitted with a positive SARS-CoV-2 test during the study period. This included patients tested via PCR or IgG in our facility as well as patients admitted with a positive PCR or antigen test at an outside facility prior to transfer. Three duplicate names were identified, yielding 181 unique patients. Eleven patients on the list had a negative SARS-CoV-2 PCR and were thus excluded from analysis. During chart review, an additional 7 patients were determined to have had a false positive SARS-CoV-2 PCR. These patients were also excluded from analysis, resulting in inclusion of 163 unique patients. (Figure 1)

Patients were classified according to the categories defined above: those who appeared to have incidentally tested positive for SARS-CoV-2 after presenting without any of the described symptoms and being hospitalized for another reason, those who exhibited some of the described symptoms of COVID-19 but were hospitalized for other reasons and required no interventions related to their COVID-19 diagnosis during their hospitalization, those who appeared significantly symptomatic and for whom COVID-19 was either the reason for admission or the basis of some or all of the treatments or interventions performed, and those identified as having or likely having the Multisystem Inflammatory Syndrome in Children (MIS-C).

Seventeen of 163 patients were diagnosed with MIS-C (see Table 1). These patients were excluded from subsequent analysis as our focus was acute SARS-CoV-2 positivity. Analysis of our complete MIS-C population is planned in a forthcoming manuscript.

Forty percent (58/146) of non-MIS-C patients were classified as having incidental infection. Forty-seven percent (68/146) of these were classified as potentially symptomatic, and 14% (20/146) were classified as significantly symptomatic. Average length of stay differed significantly among these groups, with incidental diagnosis (4.8 days) and potentially symptomatic (3.7 days) differing from significantly symptomatic (12.6 days, $p$ 0.002). The average age differed substantially among these groups (incidental diagnosis 8 years, potentially symptomatic 8.6 years), with the significantly symptomatic patients older (11.1 years), however this did not reach statistical significance ($p$ 0.11). See Table 2 for statistical analysis.

A majority of patients in all groups were Hispanic, with no significant difference among groups. 125/146 (86%) were Hispanic, compared to 66.2% of overall admissions (3831) during the same time period. Similarly, there was no significant difference among groups with respect to primary language spoken, with Spanish the most common after English (34%). This was also higher than the percentage of Spanish-speaking patients admitted to our institution during the same time period (17.8%). Eighty-eight percent of patients were publicly insured or uninsured, compared to 74.8% of overall admissions to our institution during the same time period.

Eighteen percent of (26/146) patients presented with acute appendicitis. All but one were categorized as potentially symptomatic due to their GI symptoms. One was categorized as significantly symptomatic due to supplemental oxygen use > 24 hours not clearly documented as being secondary to narcotics.

Eight percent of (11/146) patients presented with an isolated skeletal fracture, all of whom were classified as incidental diagnoses. Nine (6%) presented with seizure, of which 7 were classified as incidental diagnoses and 2 were classified as potentially symptomatic based upon definitions above. Six percent

presented with neonatal fever, all of whom were classified as potentially symptomatic and none of whom required intervention beyond monitoring of cultures and antibiotics. Eight (5%) patients presented with DKA, of which 7 were categorized as potentially symptomatic and one as significantly symptomatic due to need for PICU admission. See Table 3 for reason for admission breakdown.

COVID-19 was the reason for admission in 0/58 incidental diagnosis patients, compared to 11% of potentially symptomatic patients and 80% of significantly symptomatic patients ($p < 0$ .001). Forty-five percent of incidental and 47% of potentially symptomatic patients had no identified comorbidities while 10% of significantly symptomatic patients had none ($p$ 0.01). With specific comorbidities, there was a significant relationship for obesity, with 19% and 22% of incidental and potentially symptomatic patients obese vs 60% of significantly symptomatic patients ($p$ 0.001). The same relationship was seen with asthma, with 5% and 10% of incidental and potentially symptomatic patients with asthma vs 35% of significantly symptomatic patients ($p$ 0.004). There was no statistically significant relationship among groups for history of diabetes, seizure disorder, or medical complexity.

There were statistically significant relationships among groups with respect to history of fever, respiratory, and GI symptoms. Seventy-five percent of significantly symptomatic vs 51% and 7% of potentially symptomatic and incidental patients presented with history of fever ($p < 0.001$). Seventy-five percent of potentially symptomatic patients vs 33% and 45% of incidental and significantly symptomatic patients presented with GI symptoms ($p < 0.001$). Eighty-five percent of significantly symptomatic patients vs 24% of potentially symptomatic patients and none of the incidental diagnosis patients presented with respiratory symptoms ($p <0$ .001).

There was a statistically significant relationship among groups with respect to documented fever > 38°C, hypoxia < 90%, supplemental oxygen use, duration of supplemental oxygen therapy > 48 hours, and PICU admission, with a significantly higher percentage of patients in the significantly symptomatic group meeting each of these criteria ($p$ <0 .001 for all, see Table 2). Five patients in the incidental diagnosis group required supplemental oxygen; all were intubated. Two were multisystem organ trauma patients admitted for airway protection and 3 were deaths determined to have been unrelated to COVID. Apart from these 5, all patients who required more respiratory support than simple nasal cannula were categorized as significantly symptomatic.

There were 4 deaths in our population (see Table 4). One, in a medically complex 16-year-old admitted for respiratory failure, was attributed to COVID-19. The other 3 were determined by our organization and local public health officials as not related to COVID-19 and were thus categorized as incidental diagnoses.

Seven patients received Remdesivir. All of these patients also received Dexamethasone, required PICU admission, and substantial respiratory support. Eight patients required intubation, including the 5 discussed above, an extremely premature infant who developed apnea and desaturations and had a positive SARS-CoV-2 PCR midway through a prolonged NICU course, and a medically complex 10-year-old with holoprosencephaly, refractory epilepsy, severe malnutrition, and severe chronic lung disease with home oxygen dependence. There was only 1 patient who had a respiratory co-infection: the medically complex 16-year-old who died had co-infection with adenovirus.

**DISCUSSION**

Currently available disease classification schemes[2,3,4] which would categorize a patient on substantial positive pressure support in the same/minimally different category as a patient admitted for appendicitis not requiring oxygen, are neither clinically helpful nor likely meaningful to the patients and families with whom we discuss disease severity.

We offer an alternative classification scheme that would recognize the significance of hospitalization all or in part due to COVID-19 and requiring intervention specifically for that, but also acknowledge that there is a substantial portion of patients for whom COVID was either incidental or minimally related to hospitalization. In our large population, that percentage was a majority of patients (126/146, 86%). As such, we sought to provide a classification that more accurately represents the disease burden for hospitalized pediatric patients.

Similar to prior studies, [12, 13] we had a substantial proportion of patients who were classified as having incidental diagnosis (40%). Furthermore, the 47% of patients in the potentially symptomatic category did not manifest COVID-19 disease that would otherwise require hospitalization. There was notable similarity between these two categories with respect to age, length of stay, comorbidities, historical symptoms, and lack of interventions related to COVID-19. This serves to further highlight the lower degree of morbidity that pediatric patients experience from SARS-CoV-2.

During this time, our institution was the only facility caring for hospitalized pediatric patients positive for SARS-CoV-2 within our very large catchment area and thus our population of these patients represents a comprehensive and accurate assessment of the disease burden of COVID-19 in children requiring hospitalization during the time period of interest.

The patient population with significantly symptomatic disease fit the description of adults [14] and children [15] who are also at higher risk of more severe disease, with significantly longer length of stay, greater proportion of obesity and asthma, and older age (the latter clinically if not statistically significant). With inclusion of children in vaccine trials as well as evaluation of high risk populations for monoclonal antibody therapy, this delineation of patients at higher risk for significantly symptomatic disease is critical.[13]

In our potentially symptomatic category, 37% of patients had appendicitis. It has been hypothesized that SARS-CoV-2 can make patients more susceptible to developing appendicitis, [16,17,18] however, no mechanism for this has been described. Given the fact that patients with appendicitis universally have abdominal pain it seems likely that a positive SARS-CoV-2 test in this instance is coincidental rather than causative.

Our region has a high number of frontline workers, particularly those working in agriculture, which likely contributed to the local impact of COVID-19 in adults. We found similar trends in socioeconomic status and ethnicity to previously published studies. [19,20] Specifically, even accounting for a high percentage of admissions of Hispanic, Spanish-speaking, and publicly insured children during the same time period, these populations were substantially overrepresented in our SARS-CoV-2 patients (86% vs 66.2% Hispanic, 34% vs 17.8% Spanish-speaking, and 88% vs 74.8% publicly insured or uninsured). Current available data show that vaccination rates among Hispanic/Latinx individuals lag substantially behind non-Hispanic whites, despite this population being heavily represented in essential industries.[21] This further highlights the need to focus education and mitigation efforts on these groups, as well as effectively prioritize them for vaccination.

As decisions regarding school reopening continue to be linked largely to community transmission rates[12,22] an accurate understanding of the true disease burden of COVID-19 in children is crucial. The same ethnic and socioeconomic disparities seen in those testing positive for SARS-CoV-2 are seen in the industries deemed essential, leading to a population of parents simultaneously most vulnerable to COVID-19 and to the potentially devastating economic and safety consequences of lack of childcare.[23] While our study does not directly address these, it does highlight that the burden of physiologically significant COVID-19 disease in an ethnically and socioeconomically vulnerable pediatric population during a time of high community transmission was overall low, and this is an important consideration in the broader context of public health and policy making.

Our study has several limitations. Our data was obtained from a single center. The time frame was limited to avoid overlap with respiratory virus season, which ultimately has had minimal impact this year. We intentionally excluded MIS-C patients from our final analysis given the fact that our inclusion criteria would have missed some of them, however it is certainly important to include MIS-C in the consideration of COVID-19 disease burden in children. We had 4 incidental diagnosis patients for whom review of systems data was lacking, however the likelihood of missing clinically significant COVID-19 disease in these patients is low given lack of intervention required while hospitalized.

Our study adds meaningfully to what is currently known about COVID-19 in children by highlighting that, while a positive SARS-CoV-2 test may be relatively common in hospitalized children during the COVID-19 pandemic, true need of hospital-level intervention for COVID-19 disease itself occurs in a minority of hospitalized patients. Despite a minority of SARS-CoV-2 positive patients having COVID-19 illness, our study underscores patients with asthma and obesity are at highest risk for severe disease.

Our classification scheme offers a clinically as well as epidemiologically useful tool for clinicians and particularly pediatric hospitalists to conceptualize pediatric SARS-CoV-2 hospitalizations and COVID-19 risk. Despite our utilizing a very conservative threshold in defining "potentially symptomatic", there was virtually no statistically or clinically meaningful difference between "incidental diagnosis" and this group. Given the similarity between incidentally and potentially or minimally symptomatic patients, prospective application of our classification criteria would provide a practical, safe means of identifying and prioritizing hospitalized pediatric patients at risk of severe disease.

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| Characteristic | All (n=163) | Incidental (n=58) | Potentially (n=68) | Significantly (n=20) | MIS-C (n=17) |
|---|---|---|---|---|---|
| Age in years (mean/median) | 8.7/9 | 8.0/8.5 | 8.6/9 | 11.1/15 | 8.3/7 |
| Female | 69 (42%) | 28 (48%) | 26 (38%) | 10 (50%) | 5 (29%) |
| LOS in days (mean/median) | 5.7/3 | 4.5/2 | 3.7/2.5 | 12.6/6 | 8.9/8 |
| Ethnicity | | | | | |
| *Hispanic* | 138 (85%) | 51 (88%) | 56 (82%) | 18 (90%) | 13 (77%) |
| *Non-hispanic* | 25 (9%) | 7 (12%) | 12 (18%) | 2(10%) | 4(24%) |
| Insurance Type | | | | | |
| *Public/Uninsured* | 143 (88%) | 55 (95%) | 58 (85%) | 15 (75%) | 15 (88%) |
| *Private* | 20 (12%) | 3 (5%) | 10 (15%) | 5 (25%) | 2 (12%) |
| Language | | | | | |
| *English* | 104 (64%) | 35 (60%) | 45 (66%) | 13 (65%) | 11 (65%) |
| *Spanish* | 54 (33%) | 21 (36%) | 21 (31%) | 7 (35%) | 5 (29%) |
| *Other* | 5 (3%) | 2 (3%) | 2 (3%) | 0 (0%) | 1 (6%) |
| Comorbidities | | | | | |
| *Any* | 95(58%) | 32 (55%) | 36 (53%) | 18 (90%) | 9 (53%) |
| *Obesity* | 44 (27%) | 11 (19%) | 15 (22%) | 12 (60%) | 6 (35%) |
| *Asthma* | 20 (12%) | 3 (5%) | 7 (10%) | 7 (35%) | 3 (18%) |
| *Diabetes* | 13 (8%) | 4 (7%) | 8 (12%) | 1 (5%) | 0 (0%) |
| *Seizures* | 10 (6%) | 7(12%) | 3 (4%) | 2 (10%) | 0 (0%) |
| Medically Complex | 25 (15%) | 11 (19%) | 7 (10%) | 6 (30%) | 1 (6%) |
| COVID-19 reason for admission * | | | | | |
| *Yes* | 31 (19%) | 0 (0%) | 7 (11%) | 16 (80%) | 8 (47%) |
| *No* | 126 (77%) | 58 (100%) | 59 (87%) | 4 (20%) | 5 (29%) |
| *Unclear* | 6 (4%) | 0 (0%) | 2 (3%) | 0 (0%) | 4 (24%) |
| Required ICU care | 38 (23%) | 7 (12%) | 6 (9%) | 12 (60%) | 13 (76%) |
| History**** | | | | | |
| *Fever* | 71 (44%) | 4 (7%) | 35 (52%) | 15 (75%) | 17 (100%) |
| *Respiratory symptoms* | 36 (22%) | 4 (7%) | 16 (24%) | 17 (85%) | 3 (18%) |
| *GI symptoms* | 91 (56%) | 0 (0%) | 51 (75%) | 9 (45%) | 13 (77%) |
| Documented | | | | | |
| *Fever* | 56 (34%) | 4 (7%) | 26 (38%) | 13 (65%) | 13 (77%) |
| *Hypoxia* | 18 (11%) | 3 (5%)** | 1 (2%)*** | 11 (55%) | 3 (18%) |
| *Supplemental Oxygen* | 27 (19%) | 5 (9%) | 3 (4%) | 19 (95%) | 9 (53%) |

**For patients with MIS-C as reason for admission , COVID-19 as reason for admission was "yes" answer*

***3 deaths not attributed to COVID-19*

****Patient with congenital heart disease with documented baseline sats less than 90%*

*****There were 4 patients, all categorized as incidental diagnosis, admitted for multisystem trauma where there was no documented review of systems and thus historical symptoms were categorized as "unclear". The total of the "yes" and "no" fields for historical symptoms is thus 54.*

Table 1. Demographics and clinical characteristics of the four distinct groups

| Variable | Diagnosis Group | | | | | | p-value |
|---|---|---|---|---|---|---|---|
| | Incidental Diagnosis (n = 58) | | Potentially Symptomatic (n = 68) | | Significantly Symptomatic (n = 20 ) | | |
| | n | (%) | n | (%) | n | (%) | |
| **Age, mean (sd)** | 8.0 | (6.1) | 8.6 | (6.0) | 11.1 | (6.6) | 0.11 |
| **Length of stay, mean (sd)** | 4.8 | (9.7) | 3.7 | (3.5) | 12.6 | (24.1) | **0.002** |
| **Gender** | | | | | | | |
| Female | 28 | (48) | 26 | (38) | 10 | (50) | |
| Male | 30 | (52) | 42 | (62) | 10 | (50) | |
| **Ethnicity** | | | | | | | |
| Hispanic | 51 | (88) | 56 | (82) | 18 | (90) | 0.61 |
| Non-Hispanic | 7 | (12) | 12 | (18) | 2 | (10) | |
| **Primary Language** | | | | | | | |
| English | 35 | (60) | 45 | (66) | 13 | (65) | 0.96 |
| Spanish | 21 | (36) | 21 | (31) | 7 | (35) | |
| Other | 2 | (3) | 2 | (3) | 0 | (0) | |
| **Insurance Type** | | | | | | | |
| Private | 3 | (5) | 10 | (15) | 5 | (25) | **0.03** |
| Public | 55 | (95) | 55 | (81) | 15 | (75) | |
| Uninsured | 0 | (0.0) | 3 | (4) | 0 | (0) | |
| **COVID-19 Reason for Admission** | | | | | | | |
| No | 58 | (100) | 59 | (89) | 4 | (20) | **<0.001** |
| Yes | 0 | (0) | 7 | (11) | 16 | (80) | |
| **Comorbidity - Any** | | | | | | | |
| No | 26 | (45) | 32 | (47) | 2 | (10) | **0.01** |
| Yes | 32 | (55) | 36 | (53) | 18 | (90) | |
| **Comorbidity - Obesity** | | | | | | | |
| No | 47 | (81) | 53 | (78) | 8 | (40) | **0.001** |
| Yes | 11 | (19) | 15 | (22) | 12 | (60) | |
| **Comorbidity – Asthma** | | | | | | | |
| No | 55 | (95) | 61 | (90) | 13 | (65) | **0.004** |
| Yes | 3 | (5) | 7 | (10) | 7 | (35) | |
| **Medically Complex** | | | | | | | |
| No | 47 | (81) | 61 | (90) | 14 | (70) | 0.09 |
| Yes | 11 | (19) | 7 | (10) | 6 | (30) | |
| **History of Resp Symptoms*** | | | | | | | |
| No | 54 | (100) | 52 | (76) | 3 | (15) | **<0.001** |
| Yes | 0 | (0) | 16 | (24) | 17 | (85) | |
| **History of Fever*** | | | | | | | |
| No | 50 | (93) | 33 | (49) | 5 | (25) | **<0.001** |
| Yes | 4 | (7) | 35 | (51) | 15 | (75) | |
| **History of GI Symptoms*** | | | | | | | |
| No | 36 | (67) | 17 | (25) | 11 | (55) | **<0.001** |
| Yes | 18 | (33) | 51 | (75) | 9 | (45) | |
| **Max Temperature** | | | | | | | |
| > 38 | 4 | (7) | 26 | (38) | 13 | (65) | **<0.001** |
| ≤ 38 | 54 | (93) | 42 | (62) | 7 | (35) | |
| **Lowest O2 Sat** | | | | | | | |
| <90% | 3 | (5) | 1 | (1) | 11 | (55) | **<0.001** |
| 90-92% | 1 | (2) | 2 | (3) | 3 | (15) | |
| >92% | 54 | (93) | 65 | (96) | 6 | (30) | |
| **Supplemental O2**** | | | | | | | |
| No | 53 | (91) | 65 | (96) | 1 | (5) | **<0.001** |
| Yes | 5 | (9) | 3 | (4) | 19 | (95) | |
| **Respiratory Support** | | | | | | | |
| CPAP-BiPAP | 0 | (0) | 0 | (0) | 2 | (10) | **<0.001** |
| High-flow nasal cannula | 0 | (0) | 0 | (0) | 7 | (35) | |
| Intubated | 5 | (9) | 0 | (0) | 3 | (15) | |
| Simple nasal cannula | 0 | (0) | 3 | (4) | 7 | (35) | |
| None | 53 | (91) | 65 | (96) | 1 | (5) | |
| **Duration of O2 use** | | | | | | | |
| ≤ 24 hours | 1 | (2) | 2 | (3) | 2 | (10) | **<0.001** |
| 24-48 hours | 0 | (0) | 0 | (0) | 6 | (30) | |
| > 48 hours | 4 | (7) | 1 | (1) | 11 | (55) | |
| None | 53 | (91) | 65 | (96) | 1 | (5) | |
| **PICU***** | | | | | | | |
| No | 51 | (88) | 62 | (91) | 8 | (40) | **<0.001** |
| Yes | 7 | (12) | 6 | (9) | 12 | (60) | |

*4 patients in the incidental diagnosis group had no documented review of systems and were excluded from analysis of historical symptoms.
**Includes 3 deaths deemed not related to COVID by VCH and Public Health, and 2 multisystem trauma patients intubated for airway protection.
***Includes 5 patients above plus another multisystem trauma and a patient with ingestion and altered mental status.

Table 2. Characteristics and statistical analysis of 3 subgroups

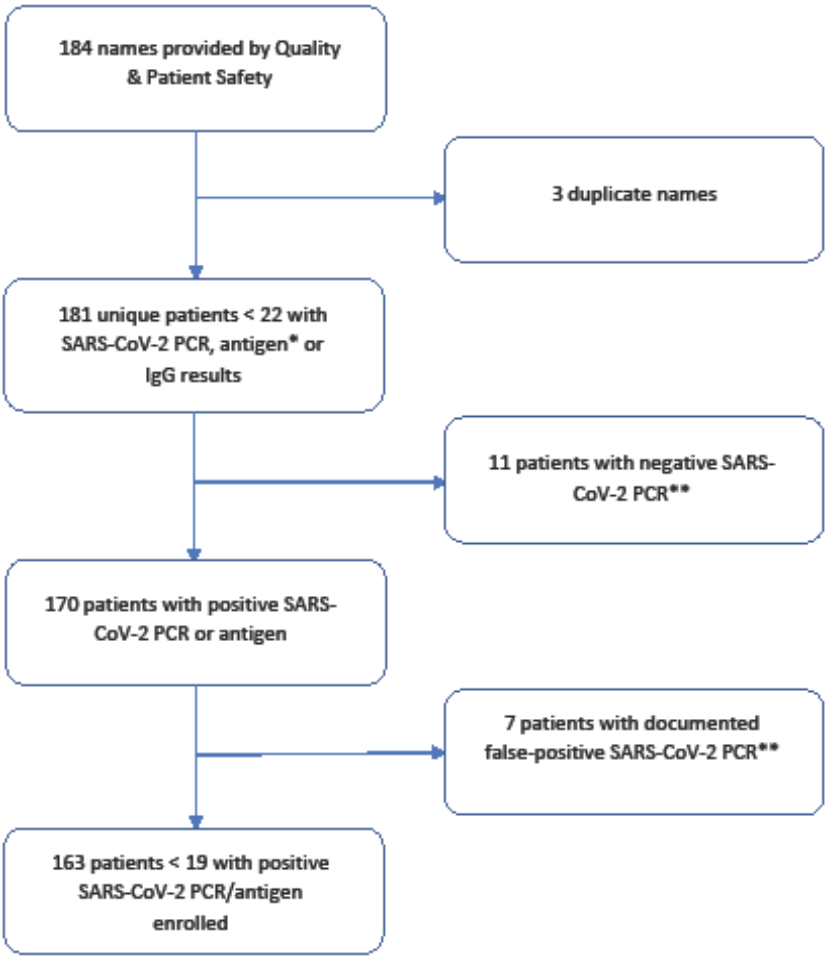
| Reason for Admission | Incidental (n=58) | Potentially (n=68) | Significantly (n=20) |
|---|---|---|---|
| Respiratory distress | 0 (0%) | 2 (3%) | 10 (50%) |
| Appendicitis | 0 (0%) | 25 (37%) | 1 (5%) |
| LRTI/Pneumonia | 0 (0%) | 0 (0%) | 5 (25%) |
| Fracture | 11 (19%) | 0 (0%) | 0 (0%) |
| Neonatal fever/ROS | 0 (0%) | 9 (13%) | 0 (0%) |
| Seizure | 7 (12%) | 2 (3%) | 0 (0%) |
| Diabetic Ketoacidosis | 0 (0%) | 7 (10%) | 0 (0%) |
| Trauma | 5 (9%) | 0 (0%) | 0 (0%) |
| Dehydration | 0 (0%) | 5 (7%) | 0 (0%) |
| Skin/soft tissue infection | 3 (5%) | 2 (3%) | 0 (0%) |
| Scheduled admission | 3 (5%) | 0 (0%) | 0 (0%) |
| Abdominal pain | 2 (3%) | 1 (2%) | 1 (5%) |
| Asthma | 0 (0%) | 0 (0%) | 1 (5%) |
| Ingestion | 2 (3%) | 0 (0%) | 0 (0%) |
| Intussusception | 2 (3%) | 0 (0%) | 0 (0%) |
| Feeding intolerance/poor feeding | 1 (2%) | 1 (2%) | 0 (0%) |
| GI bleed | 1 (2%) | 1 (2%) | 0 (0%) |
| Other | 22 (38%) | 13 (19%) | 2 (10%) |

Table 3. Reason for admission by subgroup

| Deaths | Age | Clinical Details | Attributed to COVID* |
|---|---|---|---|
| 1 | 16 years | Medically complex patient admitted for respiratory failure | Yes |
| 2 | 7 years | Previosly healthy patient admitted after a submersion in a local body of water. SARS-CoV-2 PCR was positive. The patient died within 48 hours of admission | No |
| 3 | 17 years | Medically complex patient who presented to the ED with a small bowel obstruction and died within 24 hours. The patient had GI symptoms but no other history consistent with or concerning for SARS-CoV-2 | No |
| 4 | 13 years | Oncology patient who had a prolonged hospitalization and ultimately died of sepsis. At admission, the patient was SARS-CoV-2 positive but asymptomatic. The patient died almost six weeks following the positive test. | No |

*COVID attribution was determined by our organization in conjunction the local public health department

Table 4. Deaths in our population




*Patients transferred in from referring centers with positive SARS-CoV-2 test did not have study repeated. Most of these were PCRs but some were antigen tests. None were antibody tests. All negative referrals had a confirmatory PCR sent at our institution.

**The 11 patients with negative SARS-CoV-2 PCR had positive IgG, hence inclusion on the list we received. All 11, as well as all 7 of the tests deemed false positive, were performed at our institution and were PCR tests.

Figure 1. Flow diagram of patients included in study

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