The impact of the state of Ohio stay-at-home order on non-COVID-19 intensive care unit admissions and outcomes

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Dear Editor,

Hospitals reported a decline in emergency room (ER) visits, hospitalisations, and elective procedures during the coronavirus disease 2019 (COVID-19) pandemic [1–4]. This raised concerns over delays in seeking care [5].

Cleveland Clinic, the largest healthcare system in northeast Ohio with its 10 hospitals witnessed a significant decline in ER visits and intensive care unit (ICU) admissions since the March 16 Ohio school closure order and the March 23 stay-at-home order by the Governor of Ohio. This study reviews non-COVID-19 patient ICU admissions and outcomes during the above social distancing measures.

We analysed the Cleveland Clinic health care system quality data registry for all non-COVID-19 ICU admissions from March 15 to April 30 2020. The Ohio stay-at-home order expired on May 1. This data was compared to the same period last year (2019). We collected demographics, ICU admission sources, hospital and ICU length of stay (LOS), hospital and ICU mortality, admission acute physiology score (APS), acute physiology and chronic health evaluation (APACHE III) score, and admission principal diagnosis to the ICU. Additionally, we collected Department of Health (DOH) in Ohio mortality data excluding COVID-19 for the months of March and April 2020 and compared those to the mortality counts and ratios for the same two months in 2019 for the seven counties in northeast Ohio where the 10 hospitals serve over 2.7 million population [6]. Two-sample t-test or Wilcoxon rank-sum test were used to compare continuous variables; the c^2 test was applied to compare categorical variables. The institutional review board at the Cleveland Clinic approved this study and waived patient informed consent.

The number of patients presenting at all 10 hospital ERs from March 15 to April 30 2020 was 39,970, a decrease of 40.5% from 67,217 during the same period last year, with incidence rate ratio (IRR): 0.5946 (95% CI: 0.5873–0.6020). With universal COVID-19 testing for all admissions, ICU admissions for non-COVID-19 cases decreased by 38.1% from 2573 to 1592, IRR: 0.6187 (95% CI: 0.5812–0.6586). During the above same period the total number of ICU admissions of COVID-19-confirmed cases was 274, and the total overall number of hospitalised COVID-19-confirmed patients was 656. Table 1 summarises demographic and characteristic data for 2019 compared to 2020 for non-COVID-19 ICU admissions. Only the principal diagnosis on admission to the ICU was reported. A decrease in patient counts for all admission diagnoses was noted except for cardiogenic shock and the acute respiratory

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TABLE 1. Demographics and characteristics of non-COVID-19 patients from March 15 to April 30, 2019 compared to same period in 2020

Parameter	Year 2019 (N = 2573)	Year 2020 (N = 1592)	P value
Age (years)			
Mean (SD)	63.8 (17.7)	63.5 (17.3)	0.4324
Median	65.0	65.0	
Gender			
Female	1285 (49.9%)	787 (49.9%)	0.9659
Male	1288 (50.1%)	791 (50.1%)	
Race/Ethnicity			
White	1606 (62.4%)	936 (59.2%)	0.2066
African American	876 (34.0%)	589 (37.3%)	
Asian Pacific	15 (0.6%)	9 (0.6%)	
Latinos	78 (3.0%)	46 (2.9%)	
ICU admission Source			
Emergency room	1406 (54.6%)	833 (52.7%)	0.2508
General medical ward	601 (23.3%)	364 (23.0%)	0.8526
Skilled nursing facility	19 (0.7%)	18 (1.1%)	0.2433
Post-surgery	149 (5.8%)	54 (3.4%)	0.0004
Transfer from another hospital	400 (15.5%)	311 (19.7%)	0.0003
Readmissions	169 (6.6%)	85 (5.4%)	0.1222
Invasive Mechanical Ventilation on admission	465/2573 (0.18)	390/1592 (0.24)	<0.001
Non-invasive ventilation on admission	456/2573 (0.18)	194/1592 (0.12)	< 0.001
Post-surgery (operative)	133 (5.2%)	48 (3.0%)	0.0011
Hospital Length of Stay (LOS)			
Mean	8.7 (11.0)	8.1 (8.9)	0.0462
Median	5.9	5.7	
ICU LOS			
Mean	3.0 (4.5)	2.7 (3.4)	< 0.0001
Median	1.8	1.6	
APS score			
Mean	42.2 (24.3)	45.1 (24.7)	< 0.0001
Median	36.0	40.0	
APACHE III Score			
Mean	56.5 (27.2)	59.5 (27.5)	< 0.0001
Median	52.0	55.0	
ICU mortality	5.9%	6.7%	0.3219
Hospital mortality	7.11%	7.98%	0.3306
Cirrhosis	202 (7.8%)	143 (9.1%)	0.1714
Acute immunodeficiency syndrome	11 (0.4%)	4 (0.3%)	0.3639
Chronic dialysis on admission	215 (8.3%)	163 (10.3%)	0.0323

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TABLE 1. Cont.

Parameter	Year 2019 (N = 2573)	Year 2020 (N = 1592)	P value
Selected diagnosis on admission to the ICU			
ARDS	22 (0.9%)	29 (1.8%)	0.0041
COPD/airway obstructive disease exacerbation	121 (4.7%)	40 (2.5%)	0.0003
Pulmonary embolism	44 (1.7%)	30 (1.9%)	0.7424
Sepsis all sources	457 (17.8%)	322 (20.4%)	0.0193
Pneumonia all causes	187 (7.3%)	137 (8.7%)	0.1131
Hypertensive emergency	41 (1.6%)	39 (2.5%)	0.0603
Cardiac arrest	69 (2.7%)	59 (3.7%)	0.0692
Arrhythmias	77 (3.0%)	42 (2.7%)	0.5981
Congestive heart failure exacerbation	116 (4.5%)	85 (5.4%)	0.2296
Alcohol and/or drug overdose/abuse	87 (3.4%)	43 (2.7%)	0.276
Diabetic ketoacidosis	93 (3.6%)	61 (3.9%)	0.7429
Cerebrovascular accident	43 (1.7%)	25 (1.6%)	0.9282
Seizures	42 (1.6%)	22 (1.4%)	0.6336
Upper gastrointestinal bleeding	29 (1.1%)	18 (1.1%)	0.99
Acute kidney injury	30 (1.2%)	25 (1.6%)	0.3161
Trauma all causes	64 (2.5%)	38 (2.4%)	0.9527
Cardiogenic shock	9 (0.3%)	18 (1.1%)	0.002
Asthma exacerbation	25 (1.0%)	13 (0.8%)	0.7498
Chest pain	77 (3.0%)	29 (1.8%)	0.0142
Acute pancreatitis	13 (0.5%)	10 (0.6%)	0.7454
Lower gastrointestinal bleeding	11 (0.4%)	6 (0.4%)	0.99

distress syndrome (ARDS). Non CO-VID-19 ICU admissions had a statistically significant higher APS score and APACHE III score in 2020 compared to 2019 ($P < 0.0001$ for both). Proportionally more patients were admitted with acute respiratory distress syndrome ($P = 0.0041$), sepsis ($P = 0.0193$), cardiogenic shock ($P = 0.002$), respiratory failure on mechanical ventilation ($P < 0.0001$), and patients on chronic dialysis ($P = 0.0323$). On the other hand, there were proportionally fewer chronic obstructive lung disease (COPD) exacerbations ($P = 0.0003$), chest pain admissions ($P = 0.0142$), and post-operative surgical patients ($P = 0.0004$). Despite higher acuity at presentation, there were no statistical differences in ICU or hospital mortality within the Cleveland Clinic healthcare system. Also, no differences in mortality for non-COVID-19 patients at the county level in Northeast Ohio were seen (Table 2).

During the COVID-19 stay-at-home order in the state of Ohio, ER visits declined by 40.5% and ICU admissions by 38.1%. Sicker admissions of non-COVID-19 patients to the ICU with higher APS and APACHE score were noted. This could be due to the significantly higher proportion of

TABLE 2. Ohio Department of Health mortality data: non-COVID-19 death rates comparison (%) for March and April 2019 vs. the same two months in 2020

Counties	Population	Death 2019	Death 2020	Death rate 2019	Death rate 2020	P value (two-sided)
Cuyahoga	1253783	2346	2295	0.1871	0.1830	0.4626
Geauga	93961	144	148	0.1533	0.1575	0.8605
Lake	230052	415	409	0.1804	0.1778	0.8616
Lorain	306713	546	505	0.1780	0.1646	0.2169
Medina	177257	254	261	0.1433	0.1472	0.7913
Portage	162644	234	261	0.1439	0.1605	0.2422
Summit	541810	1038	1065	0.1916	0.1966	0.5704
Total	2766220	4977	4944	0.1799	0.1787	0.7578

higher acuity admission diagnoses in the 2020 cohort and lower proportion of the lower acuity presentations, with patients who are less sick probably being more reluctant to seek care and to present to the ER. However, the decline across all patient principal diagnoses and admission numbers, along with an increase in the APS and APACHE III score and the increase in the number of patients with ARDS and cardiogenic shock in the 2020 cohort are alarming. This confirms a trend where patients most often reached sicker health status, seeking care later, and avoiding hospitals due to fear of the COVID-19 infection. A Similar decline of 42% was reported by the Centres for Disease Control and Prevention (CDC) in emergency room visits as of June 3, 2020 because of the pandemic [7], a decline of 42% in Veterans Affairs hospitals admissions [4] and 33.7% in hospital admissions for eight other acute care hospitals [9], a decline of 38% to 40% in cardiac catheterisation laboratory ST-segment elevation myocardial infarction (STEMI) activations across the United States and Spain [1, 8], and finally a decline in the use of stroke imaging by 39% [10]. All are consistent with the above 38.1% decline seen in our non-COVID-19 ICU admissions during the pandemic compared to the same period last year.

The limitations of the study are mainly the retrospective nature and the single healthcare system data, which might not be generalisable. Another limitation was the use of the principal diagnosis on admission, which could have overlooked other comorbidities and critical care illnesses that were not reported. In a short-term follow-up and when the data was obtained from the Ohio DOH in June 2020, the ICU, hospital, and county mortalities were not statistically different, as mentioned above. However, the long-term impact of such delays in care remains unknown. Patient education and care planning will be needed especially if a second wave with new stay-at-home orders are to be expected.

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