

The Impact of the COVID-19 Pandemic on Plastic Surgery Consultations in the Emergency Department

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Background: Stay-at-Home (SAH) orders implemented in the United States to combat COVID-19 had a significant impact on health care delivery for patients with all conditions. In this study, we examined the effect SAH orders had on the Emergency Department (ED) consultation volume, injury patterns, and treatment of patients managed by our plastic surgery service.

Methods: In Rhode Island, SAH orders were instituted from March 28, 2020, to June 30, 2020. A retrospective chart review of patients presenting to our Level-1 academic medical center was performed. Patient demographics, types of injuries, and need for treatment in the ED or operating room (OR) were collected. Tests of significance were conducted using a comparison group spanning the same time period, in 2019.

Results: There was a 36% decrease in ED consultations to plastic surgery during SAH orders when compared with those in 2019. No observed differences were noted in patient demographics between time periods. There were significant increases in the proportions of hand injuries secondary to power tools and facial injuries secondary to falls. No observed differences were identified in injury severity and need for either operating-room interventions or ED interventions for patients seen in consultation during SAH orders.

Conclusions: SAH orders resulted in a decreased volume of plastic surgery consults in the ED but did not alter patient demographics, injury severity, or need for procedural interventions. There was a 2.9% positivity rate for COVID-19 for asymptomatic patients presenting in the ED with primary hand and facial injuries. (*Plast Reconstr Surg Glob Open* 2020;8:e3371; doi: [10.1097/GOX.0000000000003371](https://doi.org/10.1097/GOX.0000000000003371); Published online 21 December 2020.)

INTRODUCTION

The first suspected case of severe acute respiratory distress syndrome coronavirus 2 (SARS-CoV-2), commonly called COVID-19, in the United States reportedly occurred on January 20, 2020.^{1,2} Since then, the country has seen 7.6 million cases, with 35.3 million cases estimated worldwide as of October 4, 2020.³ The case fatality rates of COVID-19-related disease are currently reported between 0.1% and 28.5%, varying by country, with the greatest proportion of cases and deaths in the United States.⁴

These findings have had a devastating impact both on the everyday lives of Americans and on government, financial, and health care systems at large. To curtail the spread of COVID-19 and to maintain the solvency of its health care institutions, the US declared a National Emergency on March 13, 2020, leading to state-wide implementation of Stay-at-Home (SAH) orders for all non-essential workers and businesses.⁵

As a result, hospitals were faced with the difficult task of appropriately managing patients with all ailments, while balancing the safety of employees and patients with limited resources. Consulting services in health care systems throughout the world shifted policies to allow for better triaging of patients to encourage an efficient use of the Emergency Department (ED), hospital, and clinic environments whenever safely possible. By doing so, hospital systems were hoping to maintain social-distancing practices and conserve resources for those with the greatest need. These changes in policies inevitably affected the

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nature of injury patterns and the care provided by consultation services within the ED.^{6,7}

In this study, we describe the effects that SAH orders had on patients presenting to the ED who required plastic surgery consultation. Services provided by plastic surgeons in the ED encompass emergent and some elective care. To provide the most optimal and consistent quality of care for these patients, it is critical to best understand how SAH orders altered injuries seen and treated by plastic surgeons.

PATIENTS AND METHODS

A retrospective chart review was performed of all patients presenting to the Rhode Island Hospital ED for whom the plastic surgery department was consulted. Rhode Island Hospital is a level-1 trauma and academic medical center in Providence, Rhode Island. The hospital has a large catchment area, including Rhode Island, southern Massachusetts, and eastern Connecticut, which makes it one of busiest trauma centers in the country.⁸ Institutional Review Board approval was obtained for this study, and data were collected on patients presenting during the time of SAH orders in Rhode Island (March 28–June 30, 2020).

Inclusion criteria were all patients presenting during this time period for whom a plastic surgery consultation was requested. They included individuals with injuries involving the hand or upper extremity, facial trauma and infections, post-operative patients, and any general plastic-surgery-related conditions. Patients requiring plastic surgery consultation during this same time period (March 28–June 30, 2019) were used for comparison. By using the same time period in 2019, we sought to control for seasonal variations in consultation patterns. Patients who had significant primary injuries unrelated to plastic surgery were excluded.

Outcomes of interest included basic patient demographics (age, gender, ethnicity, and insurance status), injury etiology and mechanisms, need for intervention in the ED, need for intervention in the operating room (OR), acuity of OR intervention, need for hospital admission, rate of complications, and COVID-19 disease status. Acuity of OR intervention was subdivided into injuries

requiring emergent (<24 hours), urgent (24–48 hours), or subacute intervention (>48 hours).

Data were analyzed using descriptive statistics. A Student’s *t*-test was conducted to determine the difference in means for pertinent variables. Pearson’s chi-squared tests were used to assess differences in proportion for categorical variables between the 2 time-periods. Bonferroni correction was used to detect the origin of the difference. Analyses were conducted in “R” (The R Foundation for Statistical Computing, Vienna, Austria) and “Stata SE 13.0” (StataCorp LLC, College Station, Tex.).^{9,10}

RESULTS

Demographics of Patients Requiring Plastic Surgery Consults during SAH Orders

During the 2020 SAH order period, there were 287 plastic surgery consultations, compared with 448 over the same 3-month time period in 2019. This amounts to a 36% decrease in plastic surgery consults in the ED during SAH orders. Demographics of patients evaluated by plastic surgery during 2020 SAH orders were compared with those in 2019 (Table 1). The average age of patients presenting during both time periods was 37 years. There was a significant decrease in the proportion of female patients presenting with hand injuries during SAH orders in 2020 when compared with that in 2019 (21% versus 33%, *P* = 0.01). Conversely, there was a significant increase in the proportion of female patients presenting with traumatic facial injuries during SAH orders (40% versus 28%, *P* = 0.02). Ethnicity and proportion of insured versus uninsured patients did not differ significantly. The overall rates of pediatric injuries were not significantly different between time periods.

Injury Mechanisms and Patterns during SAH Orders

Injury mechanisms for both hand and facial injuries were studied (Tables 2 and 3). During SAH orders, there was an overall significantly greater proportion of hand and facial consults because of traumatic mechanisms. Among hand consults, there was a significantly greater proportion of power tool injuries during SAH orders when compared with those in 2019 (30% versus 20%, *P* < 0.01). Among facial trauma consults, there was a significant difference in

Table 1. Demographics of Patients Needing Plastic Surgery Consults during COVID-19 Stay-at-Home Orders versus 2019

	Face			Hand/Upper Extremity			Total		
	2020	2019	<i>P</i>	2020	2019	<i>P</i>	2020	2019	<i>P</i>
No. consults	117	212		170	236		287	447	
Age, average	41.8	38.8	0.29	33.6	37.6	0.05	36.99	38.26	0.45
Pediatric (<18 y) (%)	22 (19%)	50 (24%)	0.38	39 (23%)	48 (20%)	0.61	61 (21%)	97 (22%)	0.96
Women (%)	47 (40%)	58 (28%)	0.02*	35 (21%)	78 (33%)	0.01*	82 (29%)	136 (30%)	0.65
Ethnicity (%)			0.62			0.46			0.26
White	87 (74%)	151 (71%)		106 (62%)	141 (60%)		193 (67%)	291 (65%)	
Black or African American	11 (9%)	21 (9%)		27 (16%)	31 (13%)		38 (13%)	52 (12%)	
Asian/Pacific Islander	2 (2%)	3 (1%)		2 (1%)	4 (2%)		4 (1%)	7 (2%)	
Native American/American Indian	1 (1%)	0 (0%)		1 (1%)	0 (0%)		2 (1%)	0 (0%)	
Other	16 (14%)	37 (18%)		34 (20%)	60 (25%)		50 (17%)	97 (22%)	
Hispanic (%)	12 (10%)	43 (20%)	1.00	36 (21%)	66 (28%)	1.00	48 (17%)	109 (24%)	1.00
Insured (%)	106 (91%)	193 (91%)	1.00	152 (89%)	211 (89%)	1.00	258 (90%)	403 (90%)	1.00

Percentages may not sum to 100% due to rounding.

*Significant at 95% confidence level.

Table 2. Hand and Upper Extremity Injury Mechanisms and Types during COVID-19 Stay-at-Home Orders versus 2019

	2020	2019	P
Etiology			0.11
Trauma	143 (83%)	177 (73%)	
Infection	25 (15%)	57 (24%)	
Surgical complication	1 (1%)	2 (1%)	
Other	3 (2%)	7 (3%)	
Trauma mechanisms (%)			0.03*
Fall	20 (12%)	18 (8%)	
Motor vehicle	6 (4%)	15 (6%)	
Assault	9 (5%)	16 (7%)	
Ballistic	1 (1%)	0 (0%)	
Sharp/penetrating	68 (40%)	60 (25%)	
Power tools	21 (30%)	12 (20%)	0.01*
Bite	6 (4%)	16 (7%)	
Other blunt/crush	35 (21%)	61 (26%)	
Sports-related (% of total)	3 (2%)	12 (5%)	0.08
Fractures			
Radius	2 (1%)	3 (1%)	1.00
Ulna	1 (1%)	3 (1%)	0.86
Carpal bone	6 (4%)	10 (4%)	0.92
Metacarpal	13 (8%)	29 (12%)	0.18
Phalangeal			
Proximal	12 (7%)	17 (7%)	1.00
Middle	11 (7%)	21 (9%)	0.48
Distal	34 (20%)	34 (14%)	0.16
Tissue types injured			
Bone	66 (39%)	112 (48%)	0.10
Joint injury	12 (7%)	17 (7%)	1.00
Neurovascular—digits only	10 (6%)	10 (4%)	0.60
Neurovascular—other	12 (7%)	3 (1%)	0.01*
Tendon	23 (14%)	25 (11%)	0.45
Soft tissue	70 (41%)	133 (56%)	0.01*
Finger tip	36 (22%)	33 (14%)	0.08

Percentages may not sum to 100% due to rounding.
*Significant at 95% confidence level.

the proportion of traumatic mechanisms ($P < 0.01$), with an observed increase in fall-related injuries during SAH orders (45% versus 31%). Alcohol-related injuries were also studied by collecting blood alcohol concentration (BAC). For facial injuries related to falls, 14% were associated with intoxication in 2020 and 16% in 2019 ($P > 0.05$). Injuries due to sports also changed during SAH orders. There was a significantly smaller proportion of sports-related facial injuries (1% versus 9%, $P < 0.01$) and a decrease in the proportion of sports-related hand injuries (2% versus 5%, $P = 0.08$). The proportion of facial injuries from animal bites during SAH orders was also increased.

Patterns of injury were also studied (Tables 2 and 3). Among hand consultations, significantly fewer patients during SAH orders had soft tissue injuries alone (41% versus 56%, $P < 0.01$), and a significantly greater proportion of patients during SAH orders presented with neurovascular injuries (13% versus 5%, $P < 0.01$). Hand fractures, joint injuries, and tendon injuries were similar across time periods. Facial fracture patterns and facial lacerations were also similar during SAH orders when compared with those in 2019.

Acuity and Interventions Performed during SAH Orders

Patient acuity and their subsequent need for intervention were summarized (Table 4). The need for intervention in the ED or OR for hand and facial consultations was similar across time periods. For hand consults that required operative intervention, there was no difference in the acuity. There was, however, a greater percentage

Table 3. Facial Injury Etiology Mechanisms and Types during COVID-19 Stay-at-Home Orders versus 2019

	2020	2019	P
Etiology			0.49
Infection	4 (3%)	12 (6%)	
Trauma	115 (97%)	201 (94%)	
Surgical complication	0 (0%)	0 (0%)	
Other	0 (0%)	1 (1%)	
Trauma mechanisms (%)			<0.01*
Fall	53 (45%)	66 (31%)	
Motor vehicle	14 (11%)	24 (11%)	
Assault	23 (20%)	61 (29%)	
Ballistic	1 (1%)	1 (1%)	
Sharp/penetrating	9 (8%)	3 (1%)	
Bite	12 (10%)	13 (6%)	
Other blunt/crush	3 (3%)	30 (14%)	
Sports-related (% of total)	1 (1%)	19 (9%)	0.00*
Types (%)			
Fractures			
Nasal fracture	39 (33%)	66 (31%)	0.77
Orbital fracture	19 (16%)	46 (22%)	0.30
Midface fracture	14 (12%)	41 (19%)	0.12
Mandible fracture	15 (13%)	31 (15%)	0.78
Dental/alveolar fracture	2 (2%)	8 (4%)	0.48
Frontal bone fracture	4 (3%)	8 (4%)	1.00
Skull fracture	0 (0%)	3 (1%)	0.49
Lacerations (%)			
Scalp	4 (3%)	3 (1%)	0.42
Eye	10 (9%)	4 (2%)	0.01*
Ear	10 (9%)	8 (4%)	0.12
Nose	14 (12%)	17 (8%)	0.33
Lip	19 (16%)	27 (13%)	0.48
Other lacerations†	16 (14%)	22 (10%)	0.45

Percentages may not sum to 100% due to rounding.
*Significant at 95% confidence level.
†“Other Lacerations” include injuries to other facial structures not explicitly mentioned (the forehead, eyebrow, cheek, etc).

of patients presenting with facial trauma requiring emergent OR intervention during SAH orders. Emergent facial injury operative interventions consisted of patients presenting with multiple severe facial fractures, concern for facial nerve injury, severe penetrating trauma (including gunshot wounds), or severe pediatric facial soft tissue injuries. However, the absolute difference in the number of

Table 4. Need for Intervention and Acuity of Operating Room Intervention during COVID-19 Stay-at-Home Orders versus 2019

	2020	2019	P
Hand—ED intervention			0.11
No	19%	26%	
Yes	81%	74%	
Hand—OR intervention			0.82
No	78%	80%	
Yes	22%	20%	
Hand—OR acuity			0.17
Subacute	51%	69%	
Urgent	24%	10%	
Emergent	24%	21%	
Face—ED intervention			0.55
No	44%	49%	
Yes	56%	51%	
Face—OR intervention			0.25
No	87%	82%	
Yes	13%	18%	
Face—OR acuity			0.01*
Subacute	64%	65%	
Urgent	7%	30%	
Emergent	29%	5%	0.03*

Percentages may not sum to 100% due to rounding.
*Significant at 95% confidence level.

cases between years was small and was not deemed to be clinically significant.

Interventions performed in the ED are also described (Fig. 1). Overall, proportions of services provided (including laceration repairs, bony reductions, and abscess drainage) were similar during SAH orders and during 2019. One notable difference was a statistically significant increase in the proportion of hand laceration repairs performed by the plastic surgery service during SAH orders (49% versus 32%, $P < 0.01$).

Need for Admission, Complications, and COVID-19 Status of Patients during SAH Orders

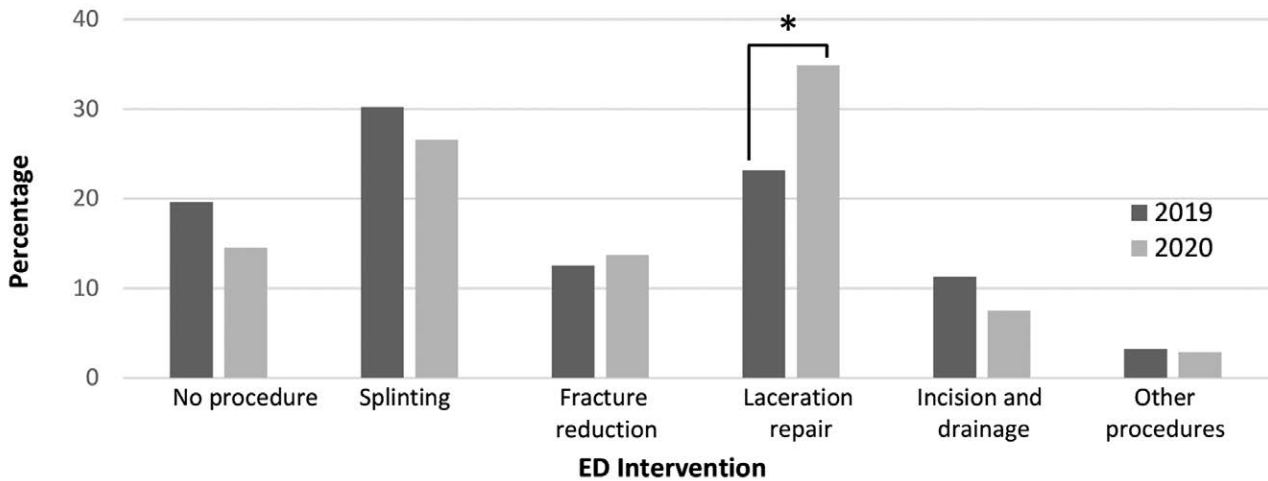
There were fewer patients evaluated by plastic surgery in the ED that required hospital admission for primary hand or facial injuries during SAH orders when compared with those in 2019 (15% versus 20%, $P = 0.05$). There were no observed differences for complications suffered by

patients with hand or facial injuries during SAH orders when compared with those in 2019 (3% versus 4%, $P = 0.65$). During SAH orders, patients were tested for COVID-19 at our institution if they were getting admitted to the hospital or if they required either acute or elective operative intervention. A total of 102 asymptomatic patients with hand or facial injuries were tested for COVID-19, and 3 patients were tested positive.

DISCUSSION

The COVID-19 pandemic has required hospital institutions across the country to change the way health care is delivered. It became apparent that the only way to protect against the rapid spread of COVID-19 and the inevitable oversaturation of hospital resources was to mandate strict social-distancing orders. Based on this unique experience, it is important to study the effect of SAH orders on patients still

A Hand injuries



B Face injuries

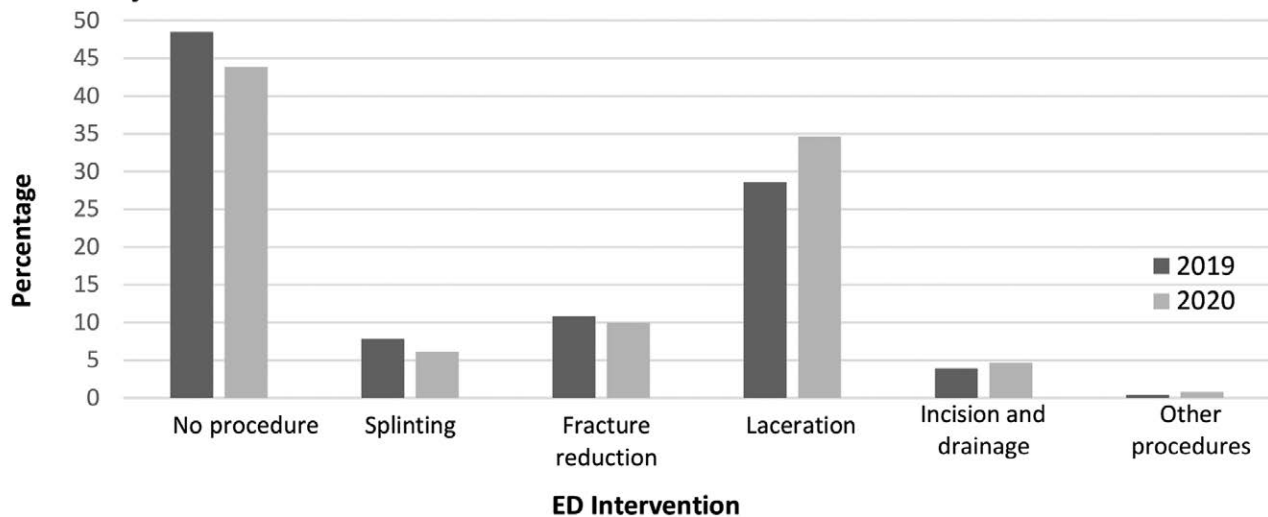


Fig. 1. Percentage of interventions performed at the Emergency Department, on (A) hand and (B) face injuries during COVID-19 Stay-at-Home orders versus 2019. “Other procedures” include revision amputations, pin or suture removals, and wound irrigation. *Significant at the 95% confidence level.

requiring ED visits and intervention. A better understanding of patient demographics, injury patterns, and need for treatment for patients presenting during these times will help inform best treatment practices to ensure optimal patient care should we experience a resurgence of the pandemic.

SAH orders led to a decreased number of consultations to the plastic surgery service. The total number of consults decreased by almost 36% during SAH orders when compared with those in 2019, with declines seen in both hand and facial plastic surgery consultations. The relative decrease seen in plastic surgery consultations was similar to the numbers reported by Hassan et al. 2020,¹¹ which was 30% over 3 weeks. Compared with the data published for other subspecialties, decrease in plastic surgery consults during SAH orders was also similar, with a 45% decrease in consults reported in orthopedics,⁷ and 45% decrease in inpatient admissions seen in neurosurgery.¹²

The reduction in consultations seen at our institution likely stem from a decrease in overall patient visits to the ED during SAH orders and from ED providers triaging and managing patients more aggressively without consulting plastic surgery to streamline care. Hartnett et al reported a 42% decrease in patient ED visits in the United States during March 29–April 25, 2020 when compared with those in March 31–April 27, 2019.¹³ This trend has been consistently seen around the world, with decreases in ED visits being reported in Australia,¹⁴ Hong Kong,¹⁵ and Italy.¹⁶ In our data, we found that plastic surgery was consulted on a smaller proportion of patients that required no procedures in the ED. During SAH orders, patients are more likely to manage non-urgent issues at home and present to the hospital when suffering more severe injuries. These observations could also contribute to the decrease in plastic surgery consultations seen in the ED.

There were no observed differences in patient demographics, including average age, ethnicity, and percent insured across time periods. These data suggest that patients particularly vulnerable to injuries requiring plastic surgery evaluation and intervention may still be at risk despite SAH orders. It is well documented that pandemics disproportionately affect vulnerable populations, namely patients from low socioeconomic backgrounds, those who work in casual employment, and patients from racial and ethnic minorities.^{17–19} Many of these patients make up essential worker communities and are under financial pressure, which may have prevented strict SAH order adherence and, therefore, may maintain their risk for injury.

During SAH orders, we observed changes in common mechanisms of injury for patients managed by plastic surgery at our institution. Patients suffered a significantly greater proportion of hand injuries secondary to power tool use, 20% in 2019 and 30% during SAH orders, and facial injuries secondary to falls, 31% in 2019 and 45% during SAH orders. Conversely, patients suffered significantly fewer facial injuries related to sports (1% versus 9%, $P < 0.01$). These results suggest that patients during SAH orders are at increased risk for mechanisms of injury occurring in the home setting, while the cessation of most sporting activities reduced some injuries.

Power tool injuries were often secondary to recreational and home improvement use. Garude et al. (2020) reported

a similar significant increase of about 10% in hand injuries stemming from tools at home in their cohort of 248 patients over a 1-month lockdown period in the United Kingdom.²⁰ Falls can be related to alcohol use, and this remained true during SAH orders when 14% of falls were associated with intoxication, compared with 16% in 2019. Liquor stores were not mandated to close during SAH orders in Rhode Island, which was similar to many other states across the United States,²¹ possibly contributing to this trend. This decision was in part made to protect patients with alcohol use disorders from withdrawing at home and further stressing the hospital system. An increased proportion of falls during SAH orders also likely stemmed from at-risk patients (including the elderly and people with disability) now at home, with less support than normal around the house. Recognizing that patients may be at an increased risk for injuries related to these mechanisms, in particular, can allow for targeted patient and provider education and potential interventions to help develop protective strategies.

It is also important to consider the issue of domestic violence when evaluating facial injuries during SAH orders. Boserup et al. 2020 reported a 10%–27% increase in domestic violence incidents in the United States during SAH orders.²² We saw an increased proportion of women presenting with facial trauma related to falls from 35% in 2019 to 47% in 2020. Although we did not see a significant change in domestic-violence-related traumas within this group, it is critical to recognize the potential for these injuries to be related to domestic violence, as patients may not feel comfortable disclosing this information. When evaluating patients, especially during SAH orders, providers should pay special attention to these mechanisms and screen patients appropriately to ensure their safety at home.

There have been limited US studies specifically looking at the effect of SAH orders due to COVID-19 on traumatic injury severity. Hassan et al (2020) found no changes in the location of hand and facial traumatic injuries during their lockdown period in Chicago,¹⁰ but did not study injury acuity. Pichard et al (2020) found during the lockdown in Paris, France, there were more emergency consults for hand trauma that required surgical management.²³ In our cohort, injury patterns in both hand and facial trauma were similar in severity across time periods. Specifically, we did not find a significant change in the need for interventions in the ED or in consultations that required the OR.

In addition, the acuity of hand and facial injuries presenting to the ED was consistent between time periods. The overall proportions of urgent and emergent plastic surgery interventions in the ED during SAH orders were similar to those performed in 2019. It is important for ED and plastic surgery providers to recognize that despite SAH orders, patients are still presenting with traumatic injuries requiring emergent management. These patients should not be neglected and require meticulous care and expedited treatment.

When evaluating patients presented to the ED with primarily hand and facial injuries, we found that there is still a risk for COVID-19 exposure. Among the 102 asymptomatic patients with hand and facial injuries tested in

the ED, 3 were positive (2.9%). In our institution, every patient admitted to the hospital or those who required an eventual operation were tested for COVID-19 by nasopharyngeal swab and PCR analysis. While appropriate precautions were taken for asymptomatic patients who screened positive for COVID-19, this did not alter the necessary operative management for these patients.

In our review of the literature, this is the first reported asymptomatic COVID-19 positivity rate for patients with primarily facial and hand injuries, who are of particular interest to plastic surgeons providing care in the ED. Although the rate is low, it is non-zero. The infection risk to health care providers from asymptomatic patients remains to be determined. Therefore, it is crucial for plastic surgery providers to use personal protective equipment, including scrub caps, eyewear, facemasks, gowns, and gloves, when seeing these patients. Special care should be taken when performing procedures and interventions on the face or mucous membranes that put providers at an increased exposure risk to aerosolized virus. Providers should consider wearing N-95 masks in these circumstances.

There are limitations to this study that are important to recognize. Observations in the epidemiology of injuries suffered during SAH orders are community-specific, and regional differences may occur. Nonetheless, we believe the data presented here from a tertiary Level-1 trauma center can provide a useful insight on how SAH orders may impact patients who are treated by plastic surgeons. More so, observed differences seen during SAH orders can be correlated with policy implementations but do not necessarily mean causation. By performing a comparison to injuries seen over the same months in 2019, we hope to control for some of these confounders.

CONCLUSIONS

COVID-19 and subsequent SAH orders have had an impact on the characteristics of patients presenting to the ED who require a plastic surgery consultation. Overall, there was a substantial decrease in the number of consults to the plastic surgery service during SAH orders. Patients appeared to be at a greater risk for power-tool-related hand injuries and fall-related facial injuries. Injuries of all types and severity still occurred for both hand and facial conditions despite SAH orders. Asymptomatic COVID-19 patients presenting with primarily hand and facial injuries exhibited a 2.9% positivity rate, highlighting the need for plastic surgery providers to exhibit the utmost precaution when managing patients in the ED. By studying the effect of SAH orders on patients treated by plastic surgeons in the ED, providers can better recognize the patients who are at particular risk during this time period and prepare for the types of injuries that will still need to be managed in the ED setting.

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