

Evaluation of Social Media Utilization by Academic Plastic Surgery Programs during the COVID-19 Pandemic

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Background: In response to the cancellation of away rotations and the shift to virtual interviews due to the coronavirus disease of 2019 (COVID-19) pandemic, residency programs have pursued other methods of sharing program details, most notably with the use of social media. This study aimed to evaluate the extent of social media utilization in the setting of the COVID-19 pandemic by plastic surgery residency programs.

Methods: Instagram, Twitter, and Facebook accounts of plastic surgery programs, program directors, and chiefs were identified. Number of followers, total posts, and posts since March 1, 2020, were extracted. Account content was categorized as informational, social, operative, research, self-promotional, guest lecture, education, or other. Spearman's coefficient was used to determine correlations among account data. Differences among regions and program pathways were evaluated using the Kruskal-Wallis test.

Results: Since March 1, 2020, 17 Instagram, five Twitter, and three Facebook accounts have been created. Instagram was most widely used and followed (1720 posts, 1235.7 ± 735.9 followers) compared with Twitter (722 tweets, 325.6 ± 451.0 followers) and Facebook (430 posts, 338.3 ± 363.3 followers). Although the majority of content was informational (45.1 percent), Instagram contained more social content (21 percent), Twitter contained more research (21 percent), and Facebook contained more self-promotional content (25 percent). Integrated-only programs on average posted more on Instagram (21.5 ± 15.1 posts) than did independent-only programs (9.4 ± 8.5 posts), and post volume moderately correlated with number of followers. There were no statistically significant differences among regional means.

Conclusion: Plastic surgery residency programs have incorporated social media into their recruitment strategies and will likely continue to increase and diversify their posts to effectively engage with future applicants. (*Plast. Reconstr. Surg.* 148: 825e, 2021.)

The coronavirus disease of 2019 (COVID-19) pandemic has caused rapid shifts to remote working and learning across many industries in the United States, resulting in increased demand and upward spikes in usage of social media platforms for communication.¹ For medical professionals, social media have been an increasingly integral platform for the distribution of knowledge, communication with patients and peers, and hosting of virtual medical conferences.²⁻⁴

After the Coalition for Physician Accountability announced recommendations for the suspension of away rotations, as well as implementation of virtual residency interviews for the 2020/2021 residency application cycle,⁵ social media have become an influential platform for residency programs to distribute information about their respective programs to potential applicants.

Instagram, Facebook, and Twitter are among the most popular social media sites worldwide. Previous studies have shown growing use of these platforms by medical academic communities

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for facilitating collaboration, networking, and education.⁶⁻¹⁰ Other studies have explored positive impacts of social media use, including one study that reported an increased attendance at a microsurgery conference, and concluded that most attendees considered social media as useful tools due to their information dissemination efficiency.^{11,12}

Plastic and reconstructive surgery residency program recruitment may arguably be among the most affected by the absence of away rotations, with 27 percent of applicants matching at programs where they did an away rotation.¹³ As a result, outreach to prospective applicants during the current pandemic is likely an indispensable part of the recruitment process, even with plastic and reconstructive surgery residency programs historically being more active than other specialty programs on social media.^{7,14-16} The American Council of Academic Plastic Surgeons (ACAPS) has taken the initiative to host meet-and-greet sessions to provide opportunities for interaction between programs and applicants.¹⁷ In addition to these sessions, individual programs have tasked themselves with finding additional ways to interact with applicants. To the best of our knowledge, no studies have investigated social media use by plastic and reconstructive surgery programs during the COVID-19 pandemic. Accordingly, this study aimed to evaluate the extent of social media utilization by plastic and reconstructive surgery programs in the 2020/2021 application cycle and to make subsequent recommendations for programs seeking to increase their social media reach and presence in the future.

MATERIALS AND METHODS

This study was categorized as nonhuman subject research by the Beth Israel Deaconess Medical Center Institutional Review Board (protocol 2020D000876). The ACAPS website was accessed on September 2, 2020, to obtain updated lists of integrated (<https://acaplasticsurgeons.org/multimedia/files/ACGME/Integrated-Plastic-Surgery-Programs.pdf>) and independent (<https://acaplasticsurgeons.org/multimedia/files/ACGME/Independent-Residency-Programs.pdf>) plastic and reconstructive surgery residency programs.

Search Strategy and Selection Criteria

Identification of plastic and reconstructive surgery residency program social media accounts was conducted through electronic searches in Instagram,

Twitter, and Facebook using the full or abbreviated program names in combination with “plastic and reconstructive surgery,” “plastic surgery,” “plastics,” “prs,” or “ps.” If accounts were not found, Google was searched using the same string combination with the addition of “Instagram,” “Twitter,” or “Facebook.” In addition, residency program websites were reviewed for social media account links, and followers of identified accounts were screened. Program directors and chiefs of plastic and reconstructive surgery were identified through program websites, and their social media accounts were searched using the same strategy mentioned above.

All searchable U.S. plastic surgery program director, chief, and residency program Instagram, Twitter, and Facebook accounts were included in this study. Private, administrative, clinical, and strictly personal accounts of other faculty and residents were excluded.

Data Extraction

The following information was extracted from each social media account when applicable: number of followers, number following, age of account, total number of posts, and content of posts since March 1, 2020. March 1, 2020, was chosen as the starting period for data collection in order to capture the full scope of COVID-19-motivated social media content from the time the pandemic was officially declared by the World Health Organization.¹⁸ Each post or tweet was then grouped into the following categories (defined below): program information, social, operative, research/conference, self-promotional, guest lecture/visiting professor, educational, or other. Program information posts included any post of resident/faculty spotlights, match results, resident education/rotations, meet-and-greet/virtual open house, and any other post aimed to update followers about the residency program. Social posts included photographs taken outside of the hospital in a social setting, “challenges” trending on social media (e.g., #ACAPSchallenge), and participation in social movements (e.g., #DiversifyPRS). Posts containing photographs taken in the operating room or photographs of surgical before-and-after results were considered operative. Posts of research conferences, presentations, publications, and journal club meetings were considered as research. Self-promotional posts were considered as any post that advertised cosmetic procedures or highlighted the status of the hospital or institution. Guest lecture and visiting professor posts also included screenshots of online video conferences. Posts educating viewers on plastic surgery topics

and COVID-19 guidelines and recommendations were considered as educational posts. All other posts were grouped into the “other” category.

Residency program websites were accessed to obtain the number of residents and faculty and to ascertain each program’s director and chief. The number of years in practice of the program directors and chiefs were calculated from the dates of the American Board of Plastic Surgery certification obtained from the board’s website. The ACAPS website was accessed to identify programs that participated in the meet-and-greet program. Lastly, the U.S. Census Bureau website and the Johns Hopkins University coronavirus tracker were accessed to obtain county population size and number of confirmed COVID-19 cases by state. Data were collected by two authors (E.S. and E.L.) during the month of September of 2020.

Statistical Analysis

Instagram, Twitter, and Facebook data were paired with program and demographic data for correlation analysis. The Shapiro-Wilk test was used to assess for normality of data. Correlation studies were performed using Spearman’s rank correlation coefficient, and the Kruskal-Wallis test was conducted to examine the differences between means of social media data grouped by program type and geographical region. A value of $p < 0.05$ was defined as statistically significant. All calculations were conducted using IBM SPSS Statistics for Mac software, version 25 (IBM Corp., Armonk, N.Y.).

RESULTS

Of the 100 U.S. plastic surgery residency programs in the 2020/2021 academic year, 46 programs were integrated only, 18 programs were independent only, and 36 programs offered both integrated and independent positions. A total of 86 programs had Instagram accounts, 37 had Twitter accounts, and 36 had Facebook accounts. Fourteen programs did not have any accounts. Of the programs with social media accounts, 19 (22.1 percent) had accounts on all three social media platforms, 35 (40.7 percent) had two accounts, and 32 (37.2 percent) had only one account. Since March 1, 2020, 17 programs had created Instagram accounts, five had created Twitter accounts, and three had created Facebook accounts. [Table 1](#) highlights the top 10 most active residency programs on social media by post volume during the COVID-19 pandemic. Furthermore, a total of 69 programs participated in the ACAPS meet-and-greet program. Forty programs held additional virtual informational sessions, such as Instagram Live question-and-answer sessions with residents, Zoom question-and-answer sessions with faculty, and Plastic Surgery Research Council/ACAPS co-hosted “coffee chats.”

Regarding program leadership, 28 program directors and 27 chiefs had Instagram accounts, 15 program directors and 37 chiefs had Twitter accounts, and 34 program directors and 11 chiefs had Facebook accounts. On average, program Instagram accounts had the greatest number of followers (1235.7 ± 735.9), followed by program

Table 1. Top 10 Plastic Surgery Residency Programs by Number of Posts during COVID-19 (March of 2020 to August of 2020)

Rank	Instagram	Twitter	Facebook
1	University of California (Irvine)	University of Wisconsin Hospitals and Clinics	University of California (San Diego)
2	Oregon Health & Science University	University of Iowa Hospitals and Clinics	University of Texas Medical Branch Hospitals
3	Washington University/B-JH/SLCH Consortium	University of Pennsylvania Health Systems	Brigham and Women’s Hospital/Harvard Medical School
4	University of Texas Medical Branch Hospitals	Stanford Health Care – Sponsored by Stanford University	Stanford Health Care – Sponsored by Stanford University
5	University of Southern California/LAC+USC	Temple University	University of Colorado School of Medicine
6	Medical College of Wisconsin Affiliated Hospitals	University of California, San Diego	Mayo Clinic College of Medicine and Science (Rochester)
7	Rutgers Health/New Jersey Medical School	Brigham and Women’s Hospital/Harvard Medical School	University of Washington
8	University of California (San Diego)	Lahey Clinic	Carilion Clinic – Virginia Tech Carilion School of Medicine
9	Cooper Hospital-University Medical Center	University of Colorado School of Medicine	Ohio State University
10	Mayo Clinic College of Medicine and Science (Rochester)	University of California (Irvine)	Virginia Commonwealth University Health System

B-JH, Barnes Jewish Hospital; SLCH, St. Louis Children’s Hospital; LAC+USC, Los Angeles County and University of Southern California Medical Center.

Program names reported according to their listing on the Electronic Residency Application Service (ERAS).

director (1068.7 ± 1361.3) and chief (679.6 ± 575.0) accounts. On the other hand, program director Twitter accounts had more followers on average (1543.4 ± 3508.2) than chief (1434.1 ± 4587.2) and program (325.6 ± 451.0) accounts. With regard to Facebook, there were an average number of 1601.1 ± 1642.7 followers for chief accounts, 512.1 ± 1086.5 followers for program director accounts, and 338.3 ± 363.3 followers for program accounts. Additional characteristics of social media accounts are included in [Table 2](#).

Upon further analysis of social media accounts by program type, almost all programs offering integrated positions had Instagram accounts (95.1 percent) and a moderate number had Twitter (41.5 percent) and Facebook (40.2 percent) accounts. In contrast, only 44.4 percent of independent-only programs had Instagram accounts, 16.7 percent had Twitter accounts, and 16.7 percent had Facebook accounts. Programs offering both integrated and independent positions had, on average, the greatest number of Instagram followers (1370.3 ± 936.3), Facebook followers (419.3 ± 429.5), and Facebook posts during COVID-19 (13.71±14.2). Integrated-only program accounts had, on average, the greatest number of Instagram posts (95.8 ± 98.2), Instagram posts during COVID-19 (21.41 ± 15.1), Twitter followers (398.4 ± 552.9), total tweets (139.0 ± 225.1), and tweets during COVID-19 (17.0 ± 35.4). Despite these findings, the only statistically significant difference between program types was mean number of Instagram posts during COVID-19 between integrated-only (21.5 ± 15.1) and independent-only (9.4 ± 8.5) programs ($H = 6.095, p = 0.047$) ([Table 3](#)).

Stratifying programs by geographic region revealed no statistically significant differences between means ([Table 4](#)). West Coast programs had, on average, the greatest number of Instagram followers (1406.1 ± 707.8), total Instagram posts (125.3 ± 96.3), and Instagram (28.1 ± 19.3) and Facebook (15.2 ± 14.3) posts during COVID-19. Although Midwest programs have the lowest proportion of Twitter (17.9 percent) and Facebook (21.4 percent) accounts, their average numbers of Twitter followers (449.2 ± 625.0), total tweets (231.6 ± 268.0), tweets during COVID-19 (60.8 ± 64.1), and Facebook followers (612.7 ± 423.1) were higher than those of any other geographical region.

[Figure 1](#) demonstrates the number of posts or tweets during each month of the COVID-19 pandemic. Instagram was the most widely used platform, followed by Twitter, then Facebook. June of 2020 had the greatest combined number of posts. Across all social media accounts, programs

Table 2. General Characteristics of Plastic Surgery Residency Program and Leadership Instagram, Twitter, and Facebook Accounts

	Total	Mean	SD	Range
No. of programs	100	—	—	—
Instagram				
Program				
Accounts	86	—	—	—
Followers	106,274	1235.74	735.94	26–4312
Following	26,731	310.83	275.89	0–1769
Age, days	—	630.63	63.89	0–1785
Total posts	7240	84.19	89.03	0–533
Posts from 3/1/20 to 8/31/20	1720	20.00	14.03	0–65
Program director				
Accounts	28	—	—	—
Followers	22,442	1068.67	1361.28	10–5908
Total posts	2262	107.71	190.09	1–827
Chief				
Accounts	27	—	—	—
Followers	16,310	679.58	575.03	5–1743
Total posts	2556	106.50	176.87	0–780
Twitter				
Program				
Accounts	37	—	—	—
Followers	12,046	325.57	450.98	0–2194
Following	7932	214.38	594.61	0–3612
Age, days	—	1160.84	777.04	45–2967
Total tweets	4790	129.46	194.89	0–771
Tweets from 3/1/20 to 8/31/20	722	19.49	34.62	0–158
Program director				
Accounts	15	—	—	—
Followers	23,151	1543.40	3508.23	1–14,200
Total tweets	17,728	1181.87	2903.22	0–11,900
Chief				
Accounts	37	—	—	—
Followers	48,760	1434.11	4587.15	1–26,200
Total tweets	23,684	696.59	1813.07	0–9498
Facebook				
Program				
Accounts	36	—	—	—
Followers	12,193	338.28	363.30	7–1297
Likes	11,564	320.86	342.43	6–1192
Age, days	—	1610.03	1111.32	43–3624
Posts from 3/1/20 to 8/31/20	430	10.78	11.77	0–35
Program director				
Accounts	34	—	—	—
Followers	7169	512.07	1086.52	4–4341
Total posts	7085	506.07	1089.60	4–4349
Chief				
Accounts	11	—	—	—
Followers	12,808	1601.00	1642.66	32–4371
Total posts	12,637	1579.63	1667.22	16–4408

overwhelmingly posted informational (45.1 percent) and social (17.1 percent) content, followed by research (10.0 percent), self-promotional (8.6 percent), operative (6.58 percent), educational (4.9 percent), other (4.9 percent), and guest lecture/visiting professor (2.9 percent) content ([Fig. 2](#)). Most informational posts on Instagram and Facebook were spotlights (33.5 percent), whereas meet-and-greet/virtual open house posts were the most prevalent on Twitter (41.2 percent).

On examination of the correlation matrix for Instagram, the number of posts during COVID-19

Table 3. Characteristics of Plastic Surgery Residency Program Instagram, Twitter, and Facebook Accounts by Program*

	Integrated Only	Independent Only	Both	Kruskal-Wallis (H)
No. of programs	46	18	36	—
Instagram				
Accounts	44 (95.7%)	8 (44.4%)	34 (94.4%)	—
Followers	1,202.64 (550.6)	846.00 (355.6)	1,370.29 (936.3)	3.37
Following	379.52 (345.0)	175.88 (84.8)	253.68 (144.6)	4.15
Age, days	705.74 (63.7)	479.50 (30.9)	567.21 (66.3)	3.11
Total posts	95.80 (98.2)	43.63 (26.4)	78.71 (81.1)	2.34
Posts from 3/1/20 to 8/31/20	21.41 (15.1)	9.38 (8.5)	20.67 (12.2)	6.10†
Twitter				
Accounts	20 (43.5%)	3 (16.7%)	14 (38.9%)	—
Followers	398.40 (552.9)	159.67 (73.9)	257.07 (258.7)	0.23
Following	321.05 (776.1)	119.67 (83.6)	82.29 (107.1)	2.32
Age, days	975.20 (672.1)	1,404.33 (464.8)	1,373.86 (868.2)	1.97
Total tweets	139.00 (225.1)	130.33 (30.4)	115.64 (157.4)	1.97
Tweets from 3/1/20 to 8/31/20	17.00 (35.4)	53.67 (47.8)	15.71 (23.1)	1.27
Facebook				
Accounts	20 (43.5%)	3 (16.7%)	13 (36.1%)	—
Followers	293.81 (298.2)	51.00 (46.1)	419.29 (429.5)	3.01
Likes	279.48 (283.6)	47.67 (44.3)	396.57 (402.4)	3.01
Age, days	1,653.85 (999.2)	663.33 (443.4)	1,761.08 (1,229.3)	2.49
Posts from 3/1/20 to 8/31/20	10.76 (11.1)	3.67 (4.5)	13.71 (14.2)	0.64

*Data for followers, following, age, posts, tweets, and likes are reported as average (SD).

†Significant at the 0.05 level (one-way) between integrated-only and independent-only programs.

correlated with program size ($r = 0.34, p < 0.01$), number of followers ($r = 0.50, p < 0.01$), number of accounts following ($r = 0.44, p < 0.01$), age of account ($r = 0.42, p < 0.01$), total posts ($r = 0.68, p < 0.01$), and number of followers ($r = 0.46, p = 0.03$) and posts ($r = 0.45, p = 0.04$) on chief accounts. The full correlation matrix for Instagram is listed in Table 5. Number of tweets on program accounts during COVID-19 was correlated with number of Twitter followers ($r = 0.35, p = 0.04$), accounts following ($r = 0.55, p < 0.01$), total tweets ($r = 0.59,$

$p < 0.01$), and program director followers ($r = 0.73, p = 0.02$) and tweets ($r = 0.76, p = 0.01$); however, there was no correlation with program size, number of COVID-19 cases by state, or chief followers and tweets (Table 6). In contrast to Instagram and Twitter, number of Facebook posts during COVID-19 correlated with size of county ($r = 0.95, p < 0.01$) and number of COVID-19 cases by state ($r = 0.61, p < 0.01$) (Table 7). There were insufficient numbers of Facebook program director and chief accounts to perform a correlation analysis with

Table 4. Characteristics of Plastic Surgery Residency Program Instagram, Twitter, and Facebook Accounts by Geographical Region*

	Northeast	Midwest	South	West	Kruskal-Wallis (H)
No. of programs	25	28	32	15	—
Instagram					
Accounts	22 (88.0%)	24 (85.7%)	26 (81.3%)	14 (93.3%)	—
Followers	1,374.64 (1,016.5)	1,153.21 (670.7)	1,102.69 (394.3)	1,406.07 (707.8)	2.85
Following	312.91 (371.6)	306.33 (244.1)	322.27 (233.4)	294.00 (203.4)	1.46
Age, days	595.67 (55.6)	622.42 (67.9)	595.54 (57.0)	762.51 (73.9)	1.40
Total posts	82.18 (87.4)	84.46 (108.6)	63.50 (47.3)	125.29 (96.3)	2.55
Posts from 3/1/20 to 8/31/20	17.57 (12.2)	18.96 (12.8)	15.10 (12.3)	28.07 (19.3)	2.76
Twitter					
Accounts	14 (56.0%)	5 (17.9%)	9 (28.1%)	9 (60.0%)	—
Followers	310.50 (280.7)	449.20 (625.0)	163.89 (151.0)	442.00 (634.6)	2.13
Following	106.93 (120.2)	120.60 (128.2)	54.22 (46.7)	593.78 (1,090.0)	2.95
Age, days	1,041.14 (837.4)	1,116.6 (701.9)	1,290.00 (813.4)	1,242.44 (585.0)	1.33
Total tweets	94.07 (123.0)	231.60 (268.0)	75.89 (114.7)	181.33 (249.1)	1.25
Tweets from 3/1/20 to 8/31/20	16.57 (23.7)	60.80 (64.1)	2.67 (3.0)	17.89 (19.8)	4.36
Facebook					
Accounts	9 (36.0%)	6 (21.4%)	13 (40.6%)	8 (53.3%)	—
Followers	259.33 (386.6)	612.67 (423.1)	221.46 (243.4)	330.40 (310.2)	4.61
Likes	242.33 (355.7)	580.00 (400.0)	213.69 (235.3)	312.50 (295.8)	4.40
Age, days	1,020.33 (621.2)	1,964.83 (1,293.3)	1,924.38 (1,147.5)	1,496.50 (956.9)	3.71
Posts from 3/1/20 to 8/31/20	8.89 (11.0)	12.50 (9.4)	9.38 (11.7)	15.20 (14.3)	2.17

*Data for followers, following, age, posts, tweets, and likes are reported as average (SD).

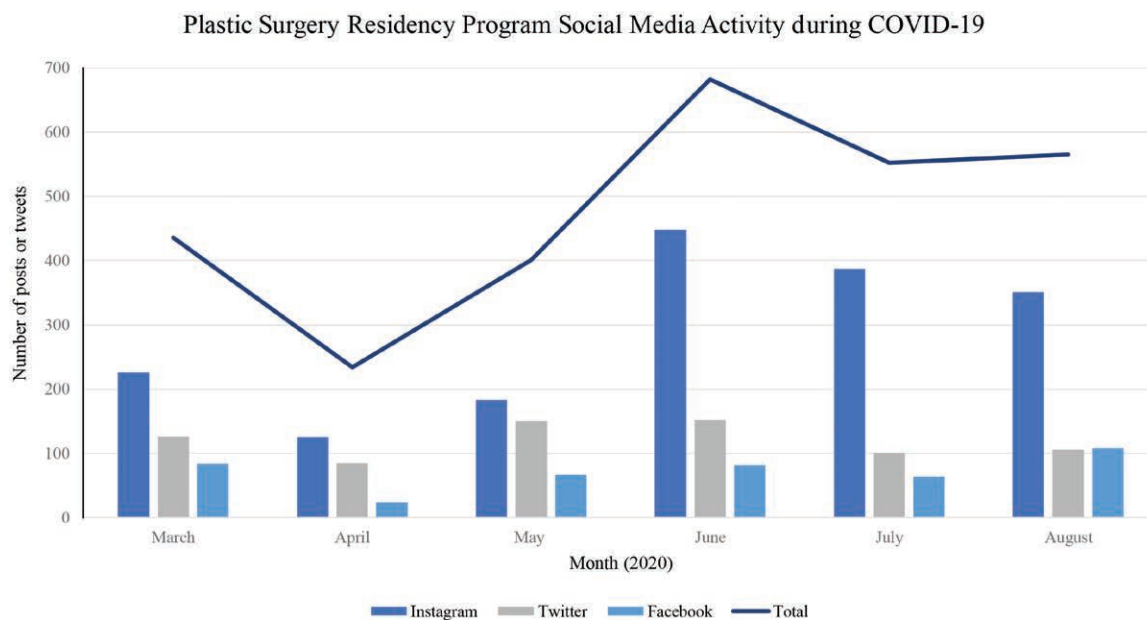


Fig. 1. Plastic surgery residency program social media activity during COVID-19 (March of 2020 to August of 2020).

residency program Facebook data. Tables 6 and 7 lists the full correlation matrices for Twitter and Facebook, respectively.

DISCUSSION

The 2020/2021 residency application cycle brought unparalleled changes for applicants and residency programs due to the impacts of the COVID-19 pandemic. Although the pandemic had already disrupted the conventional residency selection process with the cancellation of away rotations and shift to virtual interviews, these unprecedented times also present unique opportunities for systematic improvements and innovation for the match process.

The field of plastic surgery was already a relatively early adopter of social media, with some plastic surgeons initially using it for marketing purposes.^{19–24} More recently, academic plastic surgeons have used it to establish themselves as engaged community members.^{20,25,26} Currently, plastic and reconstructive surgery residency programs are incorporating social media into their recruitment strategies to share program details beyond what is found on program websites, especially with applicants and residencies at a disadvantage in determining optimal matches from the loss of in-person engagement.

Our study demonstrates that although Instagram was the most recently adopted social media platform by plastic and reconstructive surgery residency programs compared with Facebook and Twitter, it has rapidly grown to

become the most prevalent (Fig. 3). Seventeen programs created Instagram accounts during COVID-19, amounting to 86 programs now with accounts. This is an increase from 69 programs reported by Chartier et al.,⁶ who collected data up to May of 2020. In addition, Instagram had the highest average number of followers per account (1235.7 ± 735.9), representing a greater reach than Facebook (338.3 ± 363.3) and Twitter (325.6 ± 451.0) in the plastic surgery academic community (Table 2). However, equally as important as social media reach and presence is the utilization of each platform in congruence with social media trends and desired target audience.

There are unique differences in Instagram, Twitter, and Facebook utilization practices by plastic surgery programs, as demonstrated in our study. Informational content was most often posted, representing 51 percent of Instagram posts, 34 percent of tweets, and 40 percent of Facebook posts (Fig. 2). This is a substantial increase when compared with a 2019 study that reported 23 percent of Instagram posts were informational.⁸ Whether this increase was a direct response to the COVID-19 impact on the application cycle or a collateral result from increased social media utilization as a whole cannot be determined. However, both factors likely played a role. Although all social media platforms contained a high proportion of informational content, differences were found among the other content categories. In general, Instagram has been regarded as a platform for social posts,^{27,28} and this is reflected in our data, with programs

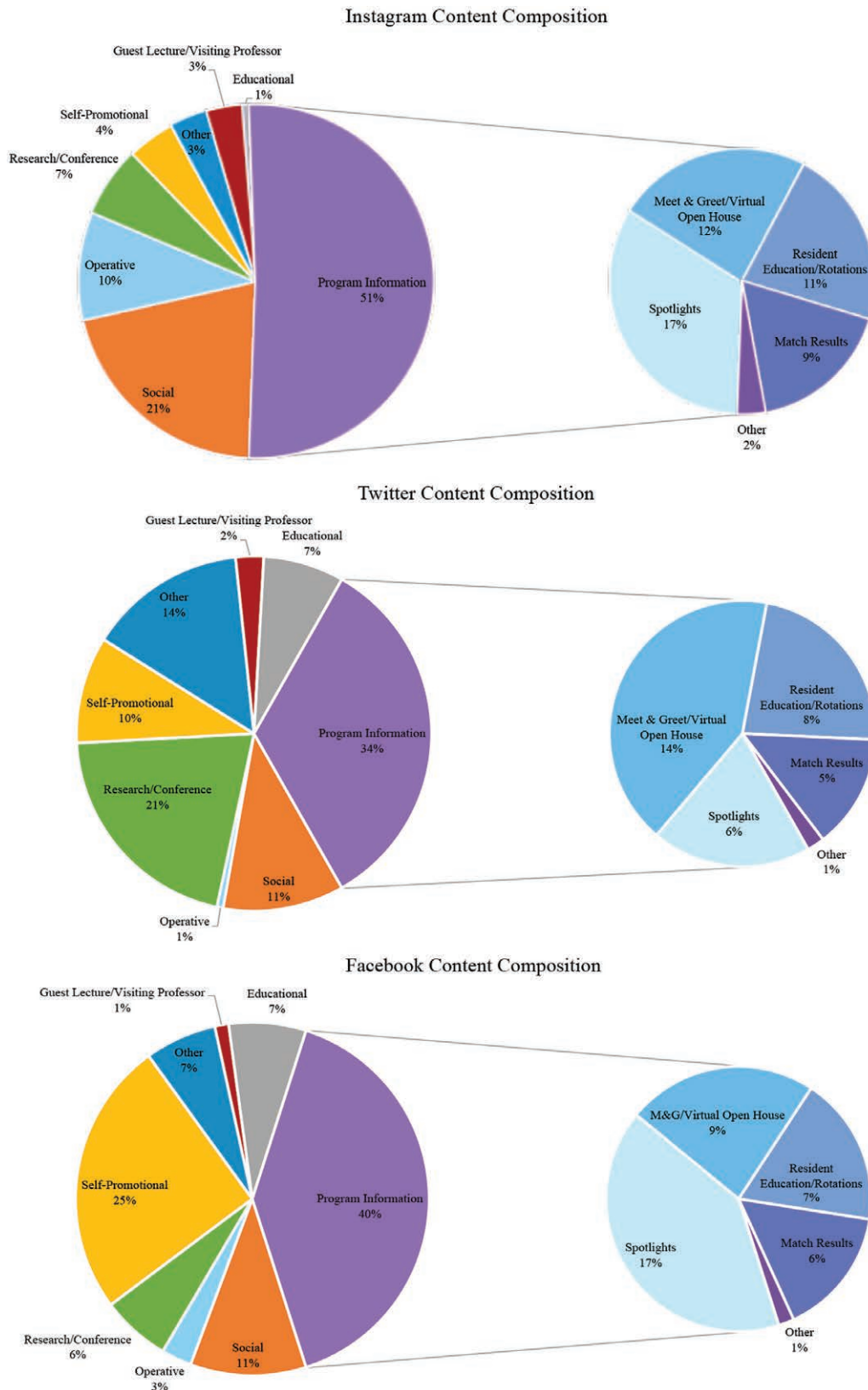


Fig. 2. Social media content breakdown of plastic surgery residency program Instagram (above), Twitter (center), and Facebook (below) accounts during COVID-19.

Table 5. Spearman Correlation Matrix for Instagram Accounts (Residency Program, Program Director, and Chief), Program Size, Program Leadership Years in Practice, County Size, and COVID-19 Cases

Variables (Instagram)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1) No. of residents	1.000																	
(2) No. of faculty	0.472†	1.000																
(3) No. of residents and faculty	0.869†	0.823†	1.000															
(4) Years in practice (chief)	0.110	0.062	0.091	1.000														
(5) Years in practice (PD)	-0.185	0.072	-0.073	0.032	1.000													
(6) Size of county	0.211*	0.175	0.224*	0.107	0.021	1.000												
(7) COVID cases by state†	0.173	0.079	0.173	0.104	-0.040	0.403†	1.000											
(8) PG no. of followers	0.473†	0.283†	0.450†	0.082	-0.272*	0.042	0.156	1.000										
(9) PG no. following	0.064	0.166	0.162	0.141	-0.079	-0.089	0.166	0.511†	1.000									
(10) PG account age (wk)	0.277†	0.113	0.261*	-0.040	-0.146	-0.050	0.063	0.777†	0.468†	1.000								
(11) PG total no. of posts	0.356†	0.257*	0.379†	0.032	-0.177	-0.061	0.084	0.823†	0.548†	0.833†	1.000							
(12) PG no. of posts from 3/1/20 to 8/31/20	0.333†	0.225*	0.344†	0.140	-0.070	-0.136	0.088	0.499†	0.439†	0.424†	0.684†	1.000						
(13) PD no. of followers	-0.254	-0.225	-0.240	-0.413	-0.109	0.127	-0.141	0.314	0.502*	0.546*	0.520*	0.261	1.000					
(14) PD no. following	-0.107	-0.165	-0.170	-0.149	-0.164	0.222	-0.020	0.369	0.411	0.456*	0.477*	0.280	0.890†	1.000				
(15) PD no. of posts	-0.218	-0.179	-0.183	-0.227	-0.272	0.052	-0.051	0.346	0.463*	0.421	0.469*	0.273	0.842†	0.770†	1.000			
(16) Chief no. of followers	0.310	0.405*	0.345	-0.210	0.091	0.310	0.132	0.368	0.467*	0.410	0.441*	0.463*	0.524	0.667	0.619	1.000		
(17) Chief no. following	0.139	-0.028	0.076	-0.340	-0.026	0.117	0.170	0.193	0.533*	0.428*	0.328	0.377	0.833*	0.881†	0.905†	0.683†	1.000	
(18) Chief no. of posts	0.201	0.121	0.159	-0.360	0.306	0.098	0.141	0.096	0.282	0.337	0.324	0.452*	0.619	0.762*	0.786*	0.753†	0.737†	1.000

PG, program; PD, program director.
 *Correlation significant at the 0.05 level (two-tailed).
 †Correlation significant at the 0.01 level (two-tailed).
 ‡As of September 10, 2020.

Table 6. Spearman Correlation Matrix for Twitter Accounts (Residency Program, Program Director, and Chief), Program Size, Program Leadership Years in Practice, County Size, and COVID-19 Cases

Variables (Twitter)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1) No. of residents	1.000																	
(2) No. of faculty	0.472†	1.000																
(3) No. of residents and faculty	0.869†	0.823†	1.000															
(4) Years in practice (chief)	0.110	0.062	0.091	1.000														
(5) Years in practice (PD)	-0.185	0.072	-0.073	0.032	1.000													
(6) Size of county	0.211*	0.175	0.224*	0.107	0.021	1.000												
(7) COVID cases by state†	0.173	0.079	0.173	0.104	-0.040	0.403†	1.000											
(8) PG no. of followers	0.151	0.285	0.230	0.109	0.009	0.051	0.111	1.000										
(9) PG no. following	-0.070	0.076	0.037	0.233	0.111	0.051	0.061	0.747†	1.000									
(10) PG account age (wk)	-0.036	0.206	0.056	-0.091	-0.118	-0.054	0.003	0.415*	0.112	1.000								
(11) PG total no. of tweets	0.015	0.162	0.094	0.058	0.015	-0.028	-0.075	0.805†	0.740†	0.361*	1.000							
(12) PG no. of posts from 3/1/20 to 8/31/20	0.043	-0.012	0.044	0.053	0.057	0.083	-0.001	0.345*	0.546†	-0.212	0.587†	1.000						
(13) PD no. of followers	-0.248	-0.242	-0.230	-0.159	-0.426	0.139	0.041	0.395	0.394	0.079	0.297	0.732*	1.000					
(14) PD no. following	-0.226	-0.041	-0.154	-0.177	-0.473	0.207	-0.278	0.146	0.297	-0.115	-0.018	0.750*	0.892†	1.000				
(15) PD no. of tweets	-0.384	-0.457	-0.412	-0.179	-0.206	-0.048	-0.085	0.317	0.371	-0.043	0.170	0.759*	0.871†	0.781†	1.000			
(16) Chief no. of followers	0.338	0.271	0.357*	-0.170	0.277	0.196	0.251	-0.100	-0.383	0.109	0.047	-0.189	0.786*	0.750	0.393	1.000		
(17) Chief no. following	0.079	0.103	0.088	-0.219	0.121	0.056	0.159	-0.284	-0.407	-0.058	-0.059	-0.058	0.750	0.821*	0.321	0.854†	1.000	
(18) Chief no. of tweets	0.122	0.014	0.094	-0.163	0.221	0.020	0.302	-0.348	-0.400	-0.082	-0.075	-0.163	0.250	0.107	0.250	0.768†	0.743†	1.000

PG, program; PD, program director.
 *Correlation significant at the 0.05 level (two-tailed).
 †Correlation significant at the 0.01 level (two-tailed).
 ‡As of September 10, 2020.

Table 7. Spearman Correlation Matrix for Facebook Accounts (Residency Program, Program Director, and Chief), Program Size, Leadership Years in Practice, County Size, and COVID-19 Cases

Variables (Facebook)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) No. of residents	1.000														
(2) No. of faculty	0.472†	1.000													
(3) No. of residents and faculty	0.869†	0.823†	1.000												
(4) Years in practice (chief)	0.110	0.062	0.091	1.000											
(5) Years in practice (PD)	-0.185	0.072	-0.073	0.032	1.000										
(6) Size of county	0.211*	0.175	0.224*	0.107	0.021	1.000									
(7) COVID cases by state†	0.173	0.079	0.173	0.104	-0.040	0.403†	1.000								
(8) PG no. of followers	0.172	0.091	0.178	-0.226	-0.091	-0.183	0.065	1.000							
(9) PG no. of likes	0.171	0.083	0.168	-0.235	-0.087	-0.211	0.049	0.997†	1.000						
(10) PG account/page age (wk)	0.137	-0.003	0.079	-0.072	-0.117	-0.240	0.000	0.579†	0.584†	1.000					
(11) PG no. of posts from 3/1/20 to 8/31/20	0.143	0.176	0.215	0.147	-0.069	0.953†	0.606†	-0.088	-0.117	-0.157	1.000				
(12) PD no. of followers	-0.161	0.023	-0.198	-0.169	-0.047	0.749†	0.107	—	—	—	—	1.000			
(13) PD no. of likes	-0.146	0.035	-0.172	-0.161	-0.051	0.763†	0.137	—	—	—	—	0.998†	1.000		
(14) Chief no. of followers	0.182	0.395	0.228	0.190	0.146	0.857†	0.690	—	—	—	—	—	—	1.000	
(15) Chief no. of likes	0.279	0.355	0.263	0.048	0.073	0.833*	0.714*	—	—	—	—	—	—	0.976†	1.000

PG, program; PD, program director; —, insufficient "n" for correlation analysis.

*Correlation significant at the 0.05 level (two-tailed).

†Correlation significant at the 0.01 level (two-tailed).

‡As of September 10, 2020.

posting more social content on Instagram (21 percent) than Twitter (11 percent) or Facebook (11 percent). Conversely, Twitter has been used more professionally, with many academic physicians utilizing it for disseminating research.^{9,29-31} In our study, Twitter had relatively more posts than Instagram and Facebook that were categorized as research (21 percent versus 7 percent and 6 percent, respectively). Interestingly, 25 percent of Facebook posts were self-promotional, suggesting greater engagement with patients and the general public compared with Instagram (4 percent) and Twitter (10 percent). With distinct differences in social media content and utilization trends, it may provide additional benefit to consider the target audience programs would like to engage with, as well as the content they would like to share.

As hospitals and residency programs were restructuring resident teams and adapting to decreased surgical volume during the first 6 months of the COVID-19 pandemic,³²⁻³⁴ the volume of social media posts also varied, peaking in June of 2020 (Fig. 1). By June, ACAPS announced meet-and-greets, the Plastic Surgery Research Council announced question-and-answer sessions, and some programs began hosting their own virtual sessions with residents and/or faculty.^{17,35} However, our study demonstrated no correlation between content volume and number of local COVID-19 cases by state ($r = 0.09$, $p = 0.42$). Altogether, this suggests that social media activity was driven by program events and activities, given that COVID-19 case burden alone was an insufficient catalyst. As further evidenced by the timing correlation of the Association of American Medical Colleges recommending the shift to virtual interviews in mid-May of 2020 and a peak in social media activity in June of 2020,⁵ the establishment of planned virtual events in response to the pandemic likely served as motivation for plastic and reconstructive surgery residency programs to increase their individual presence on social media to generate interest and showcase themselves. Programs that were successful in maintaining a strong presence on social media utilized each platform beyond its “stereotypical” purpose by capitalizing on newer sharing capabilities, such as video posts and livestreams. They also “cross-posted” information they wanted to share, which involves posting the same content across multiple platforms to reach more viewers.

Furthermore, a recent study reported that social media positively affected plastic surgery residency applicants with regard to perception of programs and intended rank positions.³⁶ With this

Plastic Surgery Residency Program Accounts

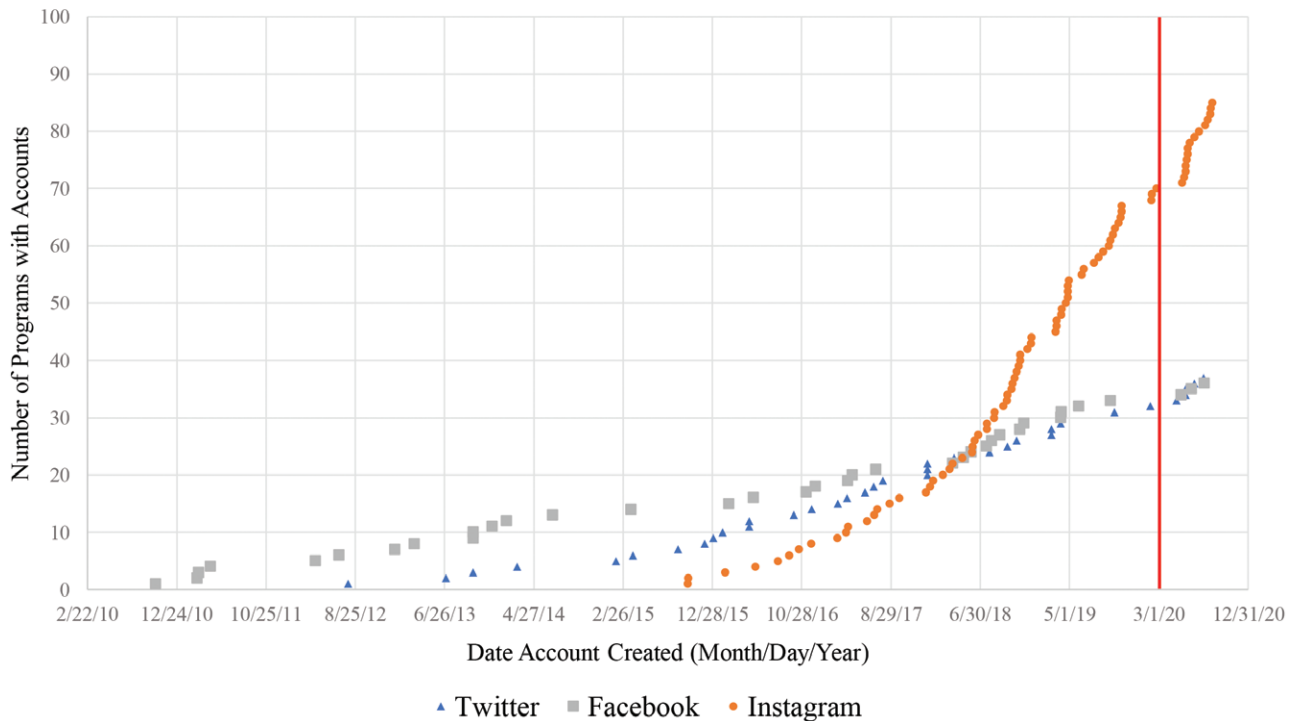


Fig. 3. Growth of plastic surgery residency program Instagram, Twitter, and Facebook accounts.

in mind, [Table 8](#) highlights multiple examples of content that can be shared to generate interest on social media. For programs seeking to increase their social media presence, getting involved with more virtual events, sharing of more resident activities, and participation in social movements and challenges are all ways to get started.

Limitations

There are a few notable limitations of this study. First, there is a subjective role in the categorization of social media content, especially for posts that may not clearly fit into one particular category. This may contribute to content percentage variations among studies. Despite defining categories and settling discrepancies by discussion, direct data comparison with other studies should still be conducted with caution. A second limitation is the variation in patterns of social media profile names. Although the search strategy in this study adopted multiple approaches, including querying social media platforms directly, searching Google, and screening program websites and followers of identified accounts, it remains uncertain whether all possible social media accounts were identified. The substantial effort necessary to identify accounts highlights a potential barrier for new applicants who would likely need to

conduct a similar search protocol in order to follow programs of interest. This limitation could be addressed by publishing a program-verified list of social media account usernames, or by programs uniformly displaying their social media account information on department websites.

Furthermore, this study only quantified and evaluated “permanently” posted social media content. Posts that may be missed with this approach include Instagram Live videos, which are video streams of Instagram users that disappear by default once ended. Since it was impossible to determine whether all Instagram Live videos were saved or reposted, they were excluded from analysis. Lastly, since metrics for assessing social media engagement were not included in this study, future studies can evaluate these measures to determine what type of content the audience is most responsive to.

CONCLUSIONS

The COVID-19 pandemic has led to unprecedented change for the 2020/2021 residency application cycle, with canceled away rotations and a completely virtual residency interview season. These shortcomings incentivized programs to pursue other methods of recruiting applicants, most notably the use of social media platforms,

Table 8. Compiled List of Content Posted by Plastic Surgery Residency Programs during COVID-19

Category	Content
Program information	Meet-and-greet information
	PSRC Q&A information
	Instagram Live Q&A sessions
	Virtual happy hour or open house
	Meet-the-program director
	Faculty spotlight
	Resident spotlight
	Fellowship match results
	Incoming intern match results
	Virtual subinternship information
	Craniofacial plating simulation
	Microsurgery simulation
	Anatomy laboratory photographs
	Resident clinic photographs
	Affiliate hospital information
	Faculty/resident awards
	Photographs of residents on rotations
Suture clinic	
Social	Photographs of social activities (e.g., dinners)
	Social movements (e.g., white coats for black lives, #diversifyPRS)
	Holiday and wedding celebration photographs
	“Throwback” photographs
	Trending social media challenges
Research	Screenshot of recent publications
	Posters presented at conferences
	Photographs at conferences
	Podium presentation photographs
	Journal Club meetings
Self-promotional	School Research Day posts
	“Throwback” photographs to past research symposiums
	Faculty/program featured in the news/magazine
Guest lecture/visiting professor	Cosmetic procedures offered by clinic
	Alumni statements
	Hospital awards/achievements (e.g., voted best in the nation)
Educational	Guest lecture announcement
	Photographs with visiting professors
	Screenshot of Zoom guest lectures and grand rounds
Operative	Education public on various procedures
	COVID-19 outreach/health information
Other	Following COVID-19 guidelines (e.g., staying home)
	Photographs in operating rooms (in compliance with HIPAA)
Other	Photographs of surgical wounds/repair
	General appreciation posts (e.g., staff)
	Patient advocacy
	Photographs of the city
	Blood donations
	Holiday posts without photographs (e.g., July 4th)
	TikTok dance videos

PSRC, Plastic Surgery Research Council; Q&A, question-and-answer session; HIPAA, Health Insurance Portability and Accountability Act.

including Instagram, Twitter, and Facebook. Of the three social networks, Instagram had the greatest reach and was the most widely used among plastic and reconstructive surgery residency programs. Nonetheless, each platform still

bears unique capabilities and target audiences that commend its integration into recruitment strategies by residency programs. Even if in-person interviews and rotations were to resume, the immediate and long-term benefits of social media use should continue to be capitalized upon, along with its continuously evolving potential.

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