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Radiology Content on TikTok: Current Use of a Novel Video-Based Social Media Platform and Opportunities for Radiology

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A B S T R A C T

Purpose: TikTok, the fastest growing social media application worldwide, has been infrequently studied in medicine. We analyzed the top radiology-related posts on TikTok in order to describe opportunities for radiology engagement.

Materials and Methods: We retrieved the top 300 posts meeting the search criteria "radiology." User- and post-related data were categorized based on a prespecified coding system. Descriptive statistics were reported. Kruskal-Wallis H and Mann-Whitney U tests were performed to assess for differences in followers, plays, likes, and comments among posts and users.

Results: 284 working posts were broadcast by 187 unique users with median 119 followers (interquartile range [IQR]: 31-1,206) and 20 posts (IQR: 7-49). Most (81%, 151/187) were nonphysician radiology personnel, while only 5% (9/187) were radiologists. Posts by radiologists had more plays than those by nonphysician radiology personnel (median 3643 vs 1282, $P = 0.001$). The 284 posts had median 1520 plays (IQR 429-4374), 60 likes (IQR 18-272), and 2 comments (IQR 0-9). Most posts were work-related (184/284, 65%), followed by clinical (68/284, 24%), personal (30/284, 11%), or promotional (2/284, 1%). However, posts by radiologists were mostly clinical (65%, 31/48) and represented a large majority of posted imaging cases (29/33, 88%). Posts about COVID-19 represented 38% (107/284) of the study sample and 48% (93/193) of posts after the first U.S. COVID-19 case COVID-19 posts had significantly more comments (3 vs. 2, $P = 0.034$) and more likes approaching significance (89 vs 51, $P = 0.134$) than non-COVID-19 posts.

Conclusions: Though radiologists represent a minority of TikTok users their post represent the majority of this platform's clinical content. This presents an important opportunity for radiologists to utilize TikTok for contemporary, unique content creation and engagement with nonphysician radiology personnel.

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Introduction

Social media is being leveraged by a growing number of users,[1] with over 70% of American adults[2] and over 90% of healthcare workers[3] utilizing one or more social media platforms. In medicine, social media has been used as a vehicle to distribute health information,[4-6] assess public health literacy and opinion,[7-10] recruit clinical trial participants,[11,12] and disseminate health interventions.[13-15] Prior research on social media has shown its potential to positively impact the doctor-patient relationship and induce patient behavioral changes.[16-18]

Social media research in radiology has highlighted the uses of Twitter (Twitter, San Francisco, CA),[19-23] Facebook (Facebook, Menlo Park, CA),[22,24-26] YouTube (YouTube, San Bruno, CA),[27-29] and Instagram (Instagram, Menlo Park, CA)[30-36] for education and patient interfacing. These platforms, however, now face steep competition from newer platforms offering innovative modes of communication. One such platform is TikTok (ByteDance, Beijng, China), a video-based social media application founded in 2017, which has since gained over 500 million active users and one billion downloads.[37] The most rapidly growing social media application worldwide, TikTok offers users a platform to create and share videos of up to 60 seconds with other users and the public.[38] Content can be easily edited and overlaid with music, text, and other special effects with minimal to no technological experience required.[39] These capabilities may prove particularly attractive in the field of radiology, which requires the clear display and annotation of images and video clips. The application of TikTok, however, has been infrequently studied in medicine and radiology, only previously being described in the field of oral and maxillofacial surgery, with other investigators calling for more widespread application and study.[40-44]

The goal of the present study was to analyze top radiology-related posts on TikTok, characterize the source and content of information, and identify and describe areas for potential engagement in the field of radiology.

Materials and Methods

This cross-sectional, descriptive study was deemed exempt from Institutional Review Board (IRB) review due to the public nature of retrieved information. The IRB required that accounts included in this research would not be published. Data collection maintained compliance with the privacy rule of the Health Insurance Portability and Accountability Act (HIPAA).

Conflicts of Interest: The authors declare no conflict of interest.

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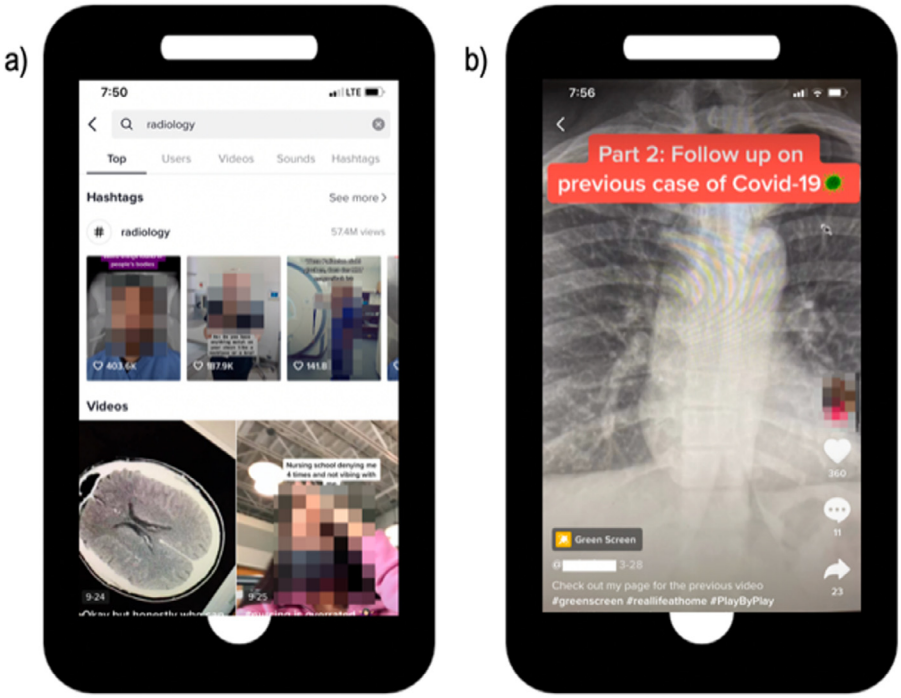

FIG 1. TikTok platform interface, demonstrating examples of (a) a search for content using the term "radiology" via the "Top" content tab, and (b) a radiology-related post with quantitative data, including date posted, plays, likes, and comments.

TikTok accounts can be created using an application downloaded to any smartphone; as of the study initiation date (April 2020), there was no mechanism to create an account on the TikTok webpage. Accounts are public by default, but can optionally be made private for only approved users to access. Individual posts are created on TikTok by filming or uploading a video, modifying it with optional special effects, backgrounds, and overlaid text using TikTok's in-app editing software, and posting the final video with descriptive text (not overlaid on the video itself). Using the discover function, users can search for posts of interest, the results of which are organized by TikTok's algorithm, which prioritizes posts based on video content (including captions, sounds, and hashtags), device and account settings (including location and device type), and—after sufficient use of the application—user interactions (including past likes, follows, shares, and comments).[45]

TikTok allows any member of the public to search the platform on a mobile device without first creating an account. The lead investigator (VP) utilized this capability to conduct a search for publicly available posts meeting the search criteria "radiology" via the "Top" content tab during April 2020 (Fig 1a). This search criterion was selected after conducting several preliminary searches for users and posts utilizing different search criteria. For example, an initial search for "radiology" and "radiologists" in the user tab resulted in minimal to no posted content or users only tangentially associated with the field of radiology (results not shown). No active interactions, including account creation or follows, likes, comments, or messages, were required for this study. The goal of this search methodology was to generate content that would be viewable by a member of the public or a potential novice user of TikTok interested in radiology content. The top 300 posts generated by this search were retrieved.

Quantitative data were obtained for users (number of followers and overall number of posted videos) and posts (date posted, language, and number of plays, likes, and comments) directly from each user's public TikTok page (Fig 1b). A qualitative coding system was developed during review of a sample of initial posts in order to categorize user account and individual post type (Table 1). Specifically, user accounts were categorized using information provided within the account's optional biography section and/or using context clues in posts associated with the user's account. Posts were categorized and subcategorized using a holistic evaluation of the content of the video, text overlaid on the video, and/or text provided within the post description. Note was also made of whether posts were related to the coronavirus disease 2019 (COVID-19) pandemic and when they were posted in relation to the first confirmed case of COVID-19 in the United States, on January 20, 2020.[46]

All users and posts were independently evaluated by 2 of 3 reviewers (VP, a radiology attending with 8 years of online media research experience, KM, a radiology fellow, and JTL, a first-year medical student). Initial reviews of posts and users were conducted within a confined 4-week period during the months of April and May

TABLE 1
Coding system used to categorize user and post data retrieved from TikTok during a search for top "radiology" content during April 2020

Category	Codes
User type	Radiologist, nonphysician radiology personnel, nonradiology healthcare worker, other (patient, educational platform), uncategorized
Post type	Clinical, personal, promotional, work-related
Clinical subtype	Imaging case (radiography, computed tomography, magnetic resonance imaging, ultrasound, fluoroscopy, mixed modality), training, patient perspective, other
Personal subtype	Celebratory, humor, family, scenery, musical, selfie, other
Promotional subtype	Other social media account, website, product, course, other
Work-related subtype	Imaging/interpretation, sanitation/safety, satisfaction/pride, troubles/frustrations, entertainment, other
COVID-19-related post	Yes, no

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2020, and within one month of initial post-retrieval. Post timestamps were not published by TikTok during the initial coding period; upon subsequent publication of timestamps by TikTok in June 2020, post-dates were retrieved for those posts still publicly available. Discrepancies were reviewed in consensus by all 3 reviewers.

Summary descriptive statistics, including frequency, median, interquartile range (IQR), and maximum (max), were computed. User types and categorizable post types were identified as "major" if representing ≥5% of all unique user and post types, respectively. Major user and post types were analyzed within subsequent comparative analyses to assess whether major user or post types were associated with a larger numbers of followers or post plays, likes, or comments. Specifically, Kruskal-Wallis H tests were performed to assess whether there was a significant difference in the mean rank followers among major user categories as well as to identify if there were significant differences in mean rank post plays, likes, or comments based on major user or post types. Post hoc Dunn's pairwise comparisons were performed to assess for significant differences between individual groups, with Bonferroni correction for multiple comparisons. A Mann-Whitney U test was performed to assess whether posts related to COVID-19 achieved greater or fewer plays, likes, or comments than those not related to COVID-19. All tests were deemed significant at a 2-tailed P value of <0.05. Statistics were performed in SPSS version 23 (IBM, Armonk, NY).

Results

We retrieved a total of 300 posts. Sixteen posts were excluded because the link was no longer functional at the time of coding. The remaining 284 posts were posted by 187 unique users. Posts (from which timestamps were retrieved [249/284] were posted to TikTok between June 2018 and April 2020.

Results by User Type

The 187 unique users had a median of 119 followers (IQR: 31-1,206, max: 94,600) and 20 total posts (IQR 7-49, max 1,730). The demographics of these users are displayed in Figure 2. A large majority of unique users (151/187, 81%) were nonphysician radiology personnel, defined as radiology technologists, nurses, administrators, managers, front desk personnel, and other staff, whereas 5% (9/187) of users were radiologists (including radiology trainees). The remaining users consisted of nonradiology healthcare workers (14/187, 7%) and other users (4/187, 2%), the latter of which comprised patients (2/187, 1%) and educational platforms (2/187, 1%). A total of 9 users (5%) were unable to be categorized.

- Followers: Nonradiology healthcare workers had the highest median followers with 3,425 (IQR: 107-23,475, max: 94,600), followed by radiologists with 1,737 (IQR: 486-3,427, max: 13,600), uncategorized users with 339 (IQR: 21-1,653, max: 54,700), other users with 270 (IQR: 86-23,849, max: 31,700), and nonphysician radiology personnel with 78 (IQR: 29-824, max: 49,200). Mean rank followers were significantly different among the 3 major user groups (nonphysician radiology personnel, nonradiology healthcare workers, radiologists, P= 0.003), with a significantly higher mean rank for nonradiology healthcare workers compared to nonphysician radiology personnel (P = 0.012). Other pairwise comparisons were not significant.
- Plays: Posts by nonradiology healthcare workers had the largest median number of plays with 4,709 (IQR: 885-60,750, max: 482,300), followed by radiologists with 3,643 (IQR: 1,777-7,338, max: 958,800), nonphysician radiology personnel with 1,282 (IQR: 424-3,620, max: 1,400,000), uncategorized users with 706 (IQR: 173-6,030, max: 45,700), and other users with 263 (IQR: 163-2,126, max: 3,982). Mean rank plays were significantly different among the major user categories ($P<$ 0.001), with a significantly higher mean rank for radiologists compared to nonphysician radiology personnel (P= 0.001). Other pairwise comparisons were not significant.
- Likes: Posts by nonradiology healthcare workers had the largest median likes with 196 (IQR: 58-3,114, max: 20,600), followed by radiologists with 105 (IQR: 51-330, max: 6,899), nonphysician radiology personnel with 48 (IQR: 18-253, max: 44,100), uncategorized users with 35 (IQR: 9-506, max: 1,113), and other users with 8 (IQR: 6-1,132, max: 2,252). Mean rank likes were significantly different among the major user categories (P= 0.026); however, no pairwise comparison was significant after Bonferroni correction.

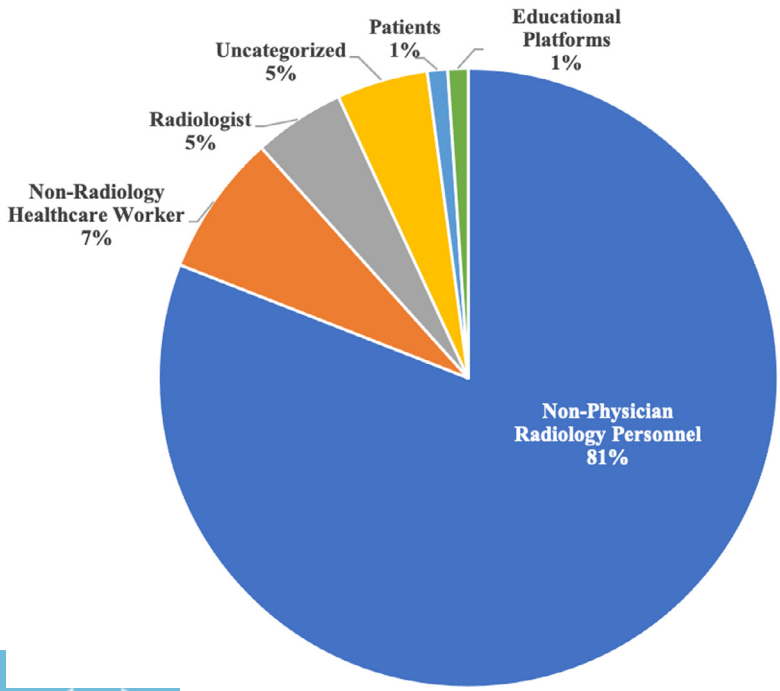

FIG 2. Unique user types posting the 284 posts retrieved from TikTok by a search conducted in April 2020 for posts meeting the search criteria "radiology."

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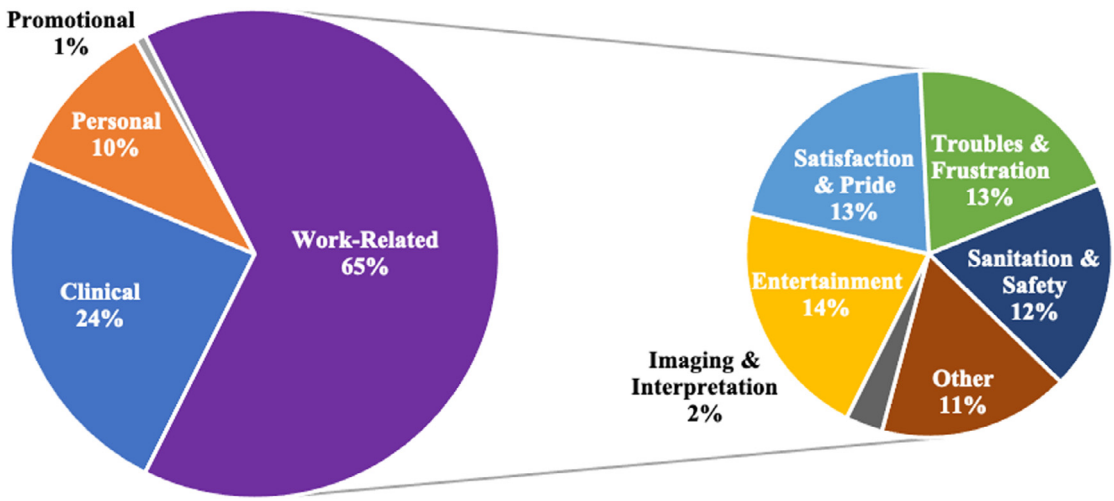

FIG 3. Post types of the 284 posts retrieved during a search conducted in April 2020 for "top" posts meeting the search criteria "radiology" on TikTok, with subcategorization of work-related posts.

- Comments: Posts by nonradiology healthcare workers had the largest median comments with 6 (IQR: 0-49, max: 403), followed by radiologists with 3 (IQR: 0-10, max: 164), nonphysician radiology personnel with 2 (IQR: 0-8, max: 593), uncategorized users with 2 (IQR: 1-14, max: 307), and other users with 1 (IQR: 1-6, max: 10). There was no significant difference in mean rank comments among the major user categories (P= 0.295).

Results by Post Type

The 284 posts in our study had a median of 1,520 plays (IQR: 429-4,374, max: 1,400,000), 60 likes (IQR: 18-272, max: 44,100), and 2 comments (IQR: 0-9, max: 593). The majority of posts were work-related (184/284, 65%), followed by clinical (including educational imaging cases) (68/284, 24%), personal (30/284, 11%), and promotional (2/284, 1%; Fig 3).

Work-related posts had median 1,452 plays (IQR: 431-4,269, max: 519,600), 69 likes (IQR: 18-295, max: 44,100), and 2 comments (IQR: 0-10, max: 593). Clinical posts had median 2,693 plays (IQR: 445-6,737, max: 1,400,000), 60 likes (IQR:19-336, max: 22,200), and 3 comments (IQR:0-10, max: 480). Personal posts had median 1,126 plays (IQR: 318-2,150, max: 40,900), 45 likes (IQR: 22-148, max: 3,258), and 2 comments (IQR: 0-3, max: 307). Promotional posts had median 222 plays (IQR: N/A, max: 263), 10 likes (IQR: N/A, max: 11), and 2 comments (IQR: N/A, max: 2). There was no significant difference in mean rank among the 3 major post types (work-related, clinical, personal) with respect to number of plays (P= 0.055), likes (P= 0.564), or comments (P= 0.483). The results of post subcategorization are as follows:

- Work-related posts were most frequently entertainment-related, displaying staff having fun at work (39/184, 21%), followed by posts displaying satisfaction or pride (38/184, 21%), and troubles or frustrations (36/184, 20%) (Fig 3).
- Clinical posts most frequently presented educational imaging cases (33/68, 49%), of which most used computed tomography (15/33, 45%), followed by radiography (10/33, 30%), magnetic resonance imaging (5/33, 15%), ultrasound (1/33, 3%), fluoroscopy (1/33, 3%), and mixed modality (1/33, 3%). The remaining clinical posts were related to patient perspectives (18/68, 26%), radiology training (15/68, 22%), and other topics (2/68, 3%). Most radiologist posts were clinical (31/48, 65%) and radiologists posted 88% (29/33) of all imaging cases
- Personal videos were most frequently humorous (8/30, 27%) or musical (8/30, 27%). The remaining personal videos presented family-related content (3/30, 10%), selfies (3/30, 10%), celebration (2/30, 7%), scenery (1/30, 7%), and other topics (5/30, 17%).
- All promotional posts (2/2, 100%) advertised a product.

A total of 107/284 (38%) posts were related to the COVID-19 pandemic. All posts with retrieved timestamps (93/93, 100%) were posted after the first confirmed case of COVID-19 in the United States, comprising 48% (93/193) of posts thereafter. The remaining 14 were unable to be assigned a date when dates were retrieved, due to a lag time between the time of initial posting and date retrieval. COVID-19-related posts were predominantly work-related (87/107, 81%), with smaller proportions being personal (11/107, 10%) or clinical (9/107, 8%). COVID-19-related posts had significantly higher mean rank comments (median 3 vs 2, P = 0.034) than non-COVID-19-related posts, and a greater number of likes, with the difference approaching statistical significance (median 89 vs 51, P= 0.134). The two groups had equivalent mean rank plays (median 1,450 vs 1,551, P = 0.807).

Discussion

To our knowledge, this is the first study to analyze radiology-related content on TikTok, and among the first of its kind in medicine. Our comprehensive evaluation of radiology-related content demonstrated a broad array of primarily nonclinical, work-related content covering contemporary issues like the COVID-19 pandemic, with the potential to reach a large audience. Our findings describe an important and timely opportunity for radiologists to be early adopters of this popular platform in order to generate clinically oriented content, engage professionally, and discuss contemporary topics.

Prior analyses of social media use in radiology have remained hyper-focused on entrenched social media sites such as Facebook, Twitter, Instagram, and YouTube.[16,19,21,22,25,30,32,47-54] There has been comparatively less attention to more recent, yet commonly utilized platforms, like TikTok. In fact, a recent review of social media prepared by the Radiology Research Alliance Social Media Task Force omitted TikTok entirely.[33] Our results, however, suggest that there is a huge potential on the world's fastest growing social media platform,[37] with individual user accounts reaching over 90,000 followers and individual posts reaching over 1,000,00 plays, 44,000 likes, and 500 comments.

One of the striking findings in our study was the heavy representation of nonphysician radiology personnel, constituting 81% of

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unique users. In stark contrast, only 5% of users were radiologists or radiology trainees. Delayed use among radiologists may be a reflection of known barriers to the use of social media among physicians and its delayed adoption particularly among older practicing physicians.[43,55,56] Other social media platforms, however, are commonly utilized among radiologists and have been shown to be helpful for professional networking,[19,43,55,57] likely due to their longstanding presence. TikTok is growing at such a rapid rate that earlier adoption of this platform may be warranted, compared to its predecessors. For radiologists, this includes adopting its use for networking, not only with other radiologists, but also with a wide range of nonphysician stakeholders, ranging from executives, managers, middle managers, technologists, nurses, front desk administrative staff, and information technology personnel. In fact, a recent study highlighted that gaining such intradepartmental perspectives is both desired and educational.[58] During the ongoing COVID-19 pandemic, safe social distancing practices have challenged our social connections, making it harder to forge bonds via direct contact with those at work. With its large nonphysician user base, TikTok provides radiologists a unique opportunity to safely engage nonphysician radiology personnel, actively facilitating interdisciplinary discussion during times of social distance, as these groups post videos and play, comment on, and like one another's videos.

The small group of radiologists (9 total users) posting the top content on TikTok comprise a group of "early adopters" and description of their content is informative to guide future use of this novel medium by radiologists. Most videos (65%) posted by radiologists were clinical in nature, in contrast to only 15% posted by nonphysician radiology personnel, highlighting that radiologists can be a force to steer conversation to clinically oriented topics. Furthermore, while only 12% of all posts were imaging cases with instructive clinical images, the majority of which were embedded as backgrounds within videos, 88% of these were posted by radiologists, implying that there is a more specific opportunity for education by radiologists through the presentation of cases. Lastly, radiologists had significantly more post plays than the heavily represented nonphysician radiology personnel, suggesting a greater impact among this population despite an overall lower volume. The positive impact of social media-based education has been investigated in numerous prior studies. For example, Facebook has been used to share clinical vignettes and imaging to produce measurable improvements in educational outcome and image interpretation skills amongst medical students.[25] Similarly, educational YouTube videos have been shown to generate material interest among patients to learn more about imaging modalities to which they would subsequently be exposed.[27] These studies, among others, provide further support for increasing TikTok's radiologist user base, specifically to present educational and case-based clinical material to colleagues, trainees, and patients alike.

Rather than feature clinical material, most posts served as outlets for work-related wins and frustrations, accounting for 65% of all videos in our study. These posts most frequently featured humorous depictions of work-related content, with slightly smaller proportions providing a way to vent frustrations or express pride and satisfaction with work. These videos and perspectives enabled users to express and understand work-related experiences in a unique video format, generating support and feedback from other users along the way.

In addition to work-related engagement, many posts focused on the contemporary topic of the COVID-19 pandemic. In fact, almost half of all posts (48%) broadcast after the first confirmed case in the United States focused on the pandemic. These posts largely consisted of healthcare workers thanking fellow professionals for their essential work, donning a mask, or expressing fear, anguish, or hope about the future. COVID-19-related posts had significantly more median comments than non-COVID-19-related posts, as well as more median likes, with this difference approaching statistical significance. This highlights that TikTok is currently being used to disseminate up-to-date information in the field of healthcare, and that such activity elicits brisk follower engagement. In fact, investigators have recently reported that platforms like TikTok should be used for information distribution in difficult times such as the current pandemic.[44] We expect that TikTok will continue to be used as an outlet for collaboration and discourse as COVID-19 continues to dominate global public health policy and concern.

Concerns have recently been raised by governmental officials and corporations regarding the security of data on TikTok.[59] The interim acquisition of TikTok by Oracle and Walmart, however, allays these security and confidentiality concerns, as the acquiring parties have pledged to ensure the security of U.S. user data.[60] Still, as is true for all social media platforms, we encourage users to maintain professional conduct, particularly taking care to avoid disclosure of patient information which would violate the privacy rule of HIPAA.

This study had several limitations. First, the algorithm by which TikTok chooses to prioritize search results is proprietary and largely confidential. As a result, we conducted several preliminary searches with various criteria prior to adopting our final search methodology for "Top" content containing the word "radiology," which yielded more relevant results than other searches. For example, searches for user accounts containing the words "radiology" or "radiologist" largely uncovered accounts that were not posting radiology-related content or were inactive (data not shown). Second, there was a lag time between initial posting, post retrieval, and ultimately to coding of posts. This resulted in some posts being excluded due to their interim removal or a change in privacy settings during this lag time, despite all 300 posts initially being available and public. However, we attempted to conduct all review within a 4-week window after initial post retrieval. This resulted in an overall small number of excluded posts (n = 16). Lastly, the low frequency of user types other than nonphysician radiology personnel decreases the power of our findings. Still, we believe that our description of early adopters among radiologists is important in order to provide information for prospective users. Further longitudinal analyses may be warranted to more granularly understand adoption in the future.

Radiology-related content on the increasingly popular social media platform TikTok are primarily posted by nonphysician radiology personnel, posting work-related content and discussion of contemporary topics like the COVID-19 pandemic. The minority of radiologists leveraging TikTok are primarily employing it to share the majority of this platform's clinical content. We suggest that more radiologists use this medium for clinical content creation, professional engagement, and contemporary discussion.

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