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How to Harness the Power of Social Media for Quality Drug Information in Infectious Diseases: Perspectives on Behalf of the Society of Infectious Diseases Pharmacists

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Clinicians, researchers, and the public frequently turn to digital channels and social media for up-to-the-minute information on novel therapeutics and vaccines. The value of credible infectious diseases drug information is more apparent in the setting of the coronavirus disease 2019 (COVID-19) pandemic. This viewpoint by the Society of Infectious Diseases Pharmacists (SIDP) provides guidance on utilizing social media platforms to optimize infectious diseases pharmacotherapy. It includes tips for all levels of users but primarily serves a guide for the infectious diseases clinician who has not yet joined social media. It compares various social media platforms and suggests which to begin with based on user needs, recommends efficient curation of social media content, and outlines a stepwise approach (shown below) to increasing engagement over time. This summary will hopefully spur further quality content and engagement regarding drug information from the infectious diseases social media network.

Keywords. social media; drug information; communication; anti-infective agents; communicable diseases.

For more than a decade, many infectious diseases practitioners across the world have utilized social media as a means of distributing and acquiring information regarding the efficacious and safe use of antimicrobial therapy. The value of rapid, widespread dissemination of credible information and real-time communication became even more apparent during the coronavirus disease 2019 (COVID-19) pandemic. When little was known about the treatment of this new disease, clinicians, researchers, and the public turned to digital channels and social media to crowd-source the globe for up-to-the-minute information on novel therapeutics and vaccines.

This viewpoint by the Society of Infectious Diseases Pharmacists (SIDP) will provide guidance on utilizing various social media platforms in order to optimize infectious diseases pharmacotherapy. As an association of pharmacists and allied healthcare professionals dedicated to promoting the appropriate use of antimicrobial agents, we will share tips on intake and output of social media for all levels of users, from humble lurkers to medical influencers. This viewpoint will compare content found on each platform with a suggestion of where to start, techniques to efficiently curate social media content, and various ways to engage in order to optimize a professional social media experience. Platforms reviewed include Twitter, YouTube, Instagram, Facebook, LinkedIn, and TikTok—with the greatest focus on Twitter as it appears to be the preferred platform among scientists and healthcare professionals for drug information [1]. A suggested approach for getting started with infectious diseases drug information in social media, particularly on Twitter, is outlined in Figure 1.

SOCIAL MEDIA CONTENT COMPARISON

Social media platforms allow users to disseminate and consume information. Each social media platform offers unique functionality to foster engagement and community building. It is not required for users to join all forms of social media to benefit from published drug information content; many users often start by joining one or two platforms that seem to best suit their needs. Table 1 compares characteristics of the most widely used social media platforms among adults. In regard to infectious diseases drug information, Twitter, YouTube, and Instagram are the most widely used social media platforms and will therefore be the primary focus of this section [2].

Twitter

Twitter is a text-based or microblogging platform that enables users to share short messages or "Tweets," up to 280 characters in length. Each Tweet allows for real-time interaction, including retweets, replies, profile follows, and likes. Users can boost engagement and enhance posts by adding a hashtag, attaching a picture, and/or including a link to another website to provide additional content or information related to the Tweet. If more content or context is required or if updates related to a prior post are available, users can publish a series of connected Tweets in a "thread." If this thread is for the purposes of education, it is often termed a "Tweetorial." In addition to this functionality, Twitter allows users to engage others in various campaigns that facilitate real-time discussion, for example, Twitter chats, polls or surveys, journal clubs, scientific conference commentary. Twitter contains the largest and most active existing network of professional accounts by scientists [1]. In SIDP's experience, this includes the largest social network of healthcare experts providing quality content for infectious diseases drug information. The content is focused on premier data sources (eg, published scientific literature, clinical guidelines), is typically incredibly timely (eg, alerts or summary information released the same day a journal article is first published online), and promotes expanded discussion in the infectious diseases community (eg, via peer review/commentary on the new data within the platform). Thus, for individuals just beginning to review drug information on social media, Twitter is likely the preferred platform to find infectious diseases-related content and is a worthwhile starting point in social media.

YouTube

YouTube is a video-based platform that, unlike many other platforms, is unrestricted in length. This allows curators to describe complex infectious diseases drug information content in detail with both audio and visual elements. This content can also easily be republished within other media, such as embedding videos in other websites, for easier dissemination and broader reach. Examples of such content can be found on the SIDP YouTube page (see Supplementary Material), which features free educational videos by infectious diseases pharmacy experts on a wide variety of potential COVID-19 therapeutics. Since 23 March 2020, these videos have collectively been viewed over 165 000 times in 59 countries/territories (unpublished data as of 20 January 2022). Data from the Pew Research Center suggest YouTube has the largest and fastest-growing user base among adults in the United States [3] and based on SIDP's experience, it also has one of the broadest international user bases. Among all SIDP YouTube video views, the majority originate from outside the United States (55%) and from a variety of different regions around the world (eg, 8% views from the Philippines, 4% from India, 3% from Canada) (unpublished data as of 20 January 2022). Although YouTube appears to have a relatively smaller existing network of professional accounts by health and drug experts than Twitter, it is likely the platform

Getting Started with Infectious Diseases Drug Information in Social Media
TWITTER EXAMPLE

1 Set Up An Account
Select your username or "handle"
https://help.twitter.com/en/using-twitter/create-twitter-account
https://help.twitter.com/en/twitter-guide

2 Populate Profile
Add a picture and short biography, and set your privacy settings

3 Explore
Follow other accounts and lists, and explore hashtags for ID drug information (see Table 2)

4 Follow & Pin a List
Example: Follow, then pin the "SIDP Members" list on mobile Twitter app to show tweets specifically from these Twitter accounts

8 Compose a Tweetorial or Thread
Create a series of connected Tweets
https://help.twitter.com/en/using-twitter/create-a-thread

7 Participate in a Chat or Journal Club
Examples: @ASP_Chat, #BCIDP, #SIDP_JC, @IDJClub

6 Compose a Tweet
Examples: Share an article, include a link to the article and a figure/table, tag others, add relevant hashtags such as #IDTwitter or #TwitteRx; Live tweet from a scientific conference to share new data or observations using the conference hashtag

5 Engage with a Tweet
Examples: "Like" or "Reply" to a Tweet; Retweet
https://help.twitter.com/en/twitter-guide/twitter-101/find-your-way-around-twitter-by-taking-a-tour-twitter-help
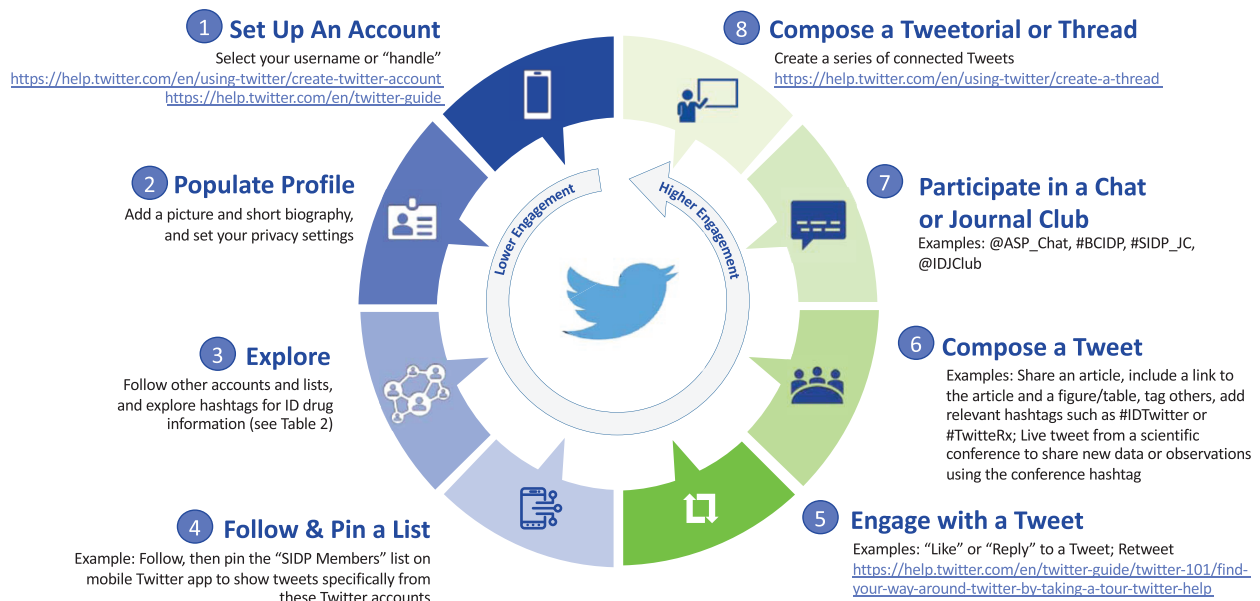
Figure 1. Getting started with infectious diseases drug information in social media: Twitter example.

Table 1. Comparison of Select Social Media Platforms

Social Media Platform (Year of Release)	SIDP Account Statistics in 2022[a]			Global Statistics in 2021				
	Reach	Geography	Age	Monthly Active Global Users	Percent of US Adults to "Ever Use" Platform	General User Demographics	Content Characteristics	Comments
Twitter (2006)	20 513 Followers	Data not available[b]	Data not available[b]	353 million	23%	• Younger and less engaged audience; less than half of general users report daily use • However, most frequently used platform for scientists; nearly half follow discussions and post professional content	• Text-based platform • Tweets limited to 280 characters; however, can include hyperlinks, polls, images, and videos • Allows for unique campaigns, eg, Twitter Chats, Journal Clubs, threads, "Tweetorials," scientific conference coverage, and "Twitter Storms"	• Most useful platform to start with as an individual healthcare provider interested in infectious diseases drug information • Large existing network of accounts focusing on drug information • #IDTwitter and #TwitteRx have the largest impressions/reach on this platform
YouTube (2005)	2649 Subscribers Total > 165 000 Video Views	Majority followers outside the US (45% US, 55% International) Followers in 59 countries/territories	Most common (31%): 25-34 years old Second most common (20%): 65 + years old	2.2 billion	81%	• Broadest and growing audience • Use is high among all age groups, regardless of race, income, or education status	• Video-based platform • Allows for in-depth audio/visual explanation of complex ID pharmacotherapy topics	• Broadest potential future audience for drug information, especially for the general public and/or international audiences • Fewer accounts focused on drug information compared to Twitter, though steadily growing
Instagram (2010)	1370 Followers	Majority of followers within the US (77% US, 23% International)	Most common (62%): 25-34 years old Second most common (7%): 35-44 years old	1.22 billion	40%	• Younger and more diverse audience • Engaged	• Image-based platform • Designed for "mobile use" • Post detailed images/graphics or video within various channels: feed, stories, reels, IGTV, or guides	• Broad potential for drug information/medical education given younger audience and visual platform • Fewer accounts focused on drug information compared to Twitter, though steadily growing
Facebook (2004)	2207 Followers 2026 Page Likes	Majority followers outside the US (45% US, 55% international) Followers in 45 countries/territories	Most common (16-26%): 25-34 years old Second most common (11-22%): 35-44 years old	2.41 billion	69%	• Broad and most engaged audience; 70% of users report daily use	• Social networking platform • Accommodates many content formats (eg, text, images, videos, and stories)	• Significant potential for engagement with the general public and/or international audiences regarding drug information (eg, shares, comments) • Group pages can be useful, especially for organizations • May be more difficult to separate professional from personal uses as an individual user; however, could be a helpful avenue to engage with family, friends, and other members of the general public regarding drug information

Table 1. Continued

| Social Media Platform (Year of Release) | SIDP Account Statistics in 2022[a] | | | Global Statistics in 2021 | | | | |
	Reach	Geography	Age	Monthly Active Global Users	Percent of US Adults to "Ever Use" Platform	General User Demographics	Content Characteristics	Comments
LinkedIn (2002)	2693 Followers	Majority of followers within the US	Most common (45%): Followers in entry level positions; Second most common (26%): Followers in senior level positions	294 million	28%	• Working age adults with higher education	• Professional networking and career development platform	• Often used to amplify drug information/medical education originating from other platforms (eg, Twitter, YouTube, Instagram)
TikTok (2016)	N/A	N/A	N/A	1 billion	21%	• Majority of users are < 40 years of age • Most popular content are for entertainment purposes	• Short video-based platform • Designed for mobile use	• Creative outlet for medical influencers to share timely information • Limited functionality to include reputable references • Limited experience curating drug information on this platform

[a]Unpublished data as of 20 January 2022.
[b]Twitter removed Audience Insights from its analytics tools in January 2020.
[References: [1, 3, 35]].

with the largest potential reach based on frequency of use and varied demographics of its broad audience.

Instagram

Instagram is an image-based platform that allows users to post pictures and/or short videos (3–60 seconds) with captions into an Instagram "feed." Unlike Twitter, Instagram post captions are not as limited in length (ie, maximum 2200 characters), and captions cannot include links to external websites. Rather, users can incorporate external links within the biography section of their profile. Like Twitter threads, Instagram allows users to collate a series of images or video clips in a single post. Additional Instagram content channels include stories, reels, IGTV, and guides. Of these, the most popular is the Instagram "story," where users can post temporary text, pictures, and/or video content that can be viewed for 24 hours. These stories can encourage user engagement by integrating multiple choice questions, polls or surveys and allow viewers to submit questions for the user. Account followers can share content from the stories to reach a wider audience. Beyond 24 hours, these stories may be organized into "highlights" and pinned to the user's profile for continued viewing. In regard to infectious diseases drug information content, these unique features allow Instagram users to disseminate engaging, fun content in a variety of media formats. Instagram is popular with a younger audience, as evidenced by a recent survey in which 71% of respondents aged 18–29 years old reported using Instagram [3]. Similarly, 62% of SIDP's Instagram followers are between 25 and 34 years of age (unpublished data as of 20 January 2022). Given Instagram's visual, interactive platform and younger audience, it is likely well-positioned for education regarding infectious diseases drug information. Users interested in reviewing or being quizzed on infectious diseases drug information content may begin with this social media platform first. An example of such education is demonstrated in the account by Timothy Gauthier, PharmD (see Supplementary Material).

Other Social Media Platforms

Facebook, LinkedIn, and TikTok are other social media platforms that can contain infectious diseases drug information. In SIDP's experience, Facebook and LinkedIn have similar capabilities to post drug information via text, images, and/or video content that can then be shared throughout the user's network on the platform. Facebook is valuable as the largest social media network in the world, whereas LinkedIn is useful as a network targeted specifically toward professionals. In contrast to these 2, TikTok is a rapidly growing platform that features creative, short videos that are often set to music. There are currently limited examples of high-quality drug information on this platform, as it focuses more heavily on entertainment. Yet given the popularity of TikTok among a younger audience, it has the

potential to be an engaging educational tool for introductory concepts in infectious diseases pharmacotherapy.

Getting Started

Once you have selected which social media platform(s) you would like to join, you can set up your account(s) (Step 1 in Figure 1). For the remainder of this review, Twitter will be utilized as the example platform to describe each step to harness the power of social media for drug information; however, the principles described herein remain generalizable to other platforms.

It is generally best practice to create a separate professional account from any personal one on the same social media platform [4]. When selecting a username (or "handle" as it's referred to on Twitter), a simple, effective strategy to communicate your field of practice and expertise is to utilize your first and last name with or without credentials. Some users may opt to use a hybrid of their name and field of interest, incorporating a clever play on words (eg, @IDPharmProf, @Crasspofungin). As outlined in Step 2 of Figure 1, the user can enhance first impressions by filling out profile information, including a high-quality headshot, a short biography, relevant affiliation(s), and summary of area(s) of practice or expertise [5]. Privacy settings should also be carefully considered. A user may choose to begin with a relatively private account until they are comfortable with the new platform (ie, the lurker), then gradually loosen these settings as they desire to engage more and allow others to find their posts more easily (ie, the influencer).

EFFICIENT CURATION

To harness the full potential of social media, users should customize their experience to show desired content while filtering out unwanted information. In doing so, efficient social media "curators" can benefit from access to timely and high-quality drug information. Thus, the next step to finding infectious diseases drug information is to explore social media (Step 3 of Figure 1).

Building a social media account strategically focusing on a particular area of interest will ensure one's feed is well-curated with relevant material. Table 2 provides a list of users and hashtags that focus on drug information that will likely interest an infectious diseases audience. Hashtags are short and relevant phrase(s) that begin with the # symbol; users can easily search posts with the same hashtag. For example, #IDWeek2020 was seen on many tweets surrounding **ID**Week™ 2020, allowing users to identify popular tweets and retweet to stay engaged while in a virtual conference experience [6]. Both those virtually attending the conference and other individuals following along could search this hashtag and identify major posters, summaries from presentations that were tweeted live, as well as updates from the official **ID**Week™ account.

Following specific lists within Twitter (or interest groups within Facebook) is another way to curate one's feed to display content (Step 4 of Figure 1). For example, SIDP has a Twitter list entitled "SIDP Members" that includes a selection of members who are active on Twitter. Using the Twitter mobile app, users can: (1) go to the @SIDPharm Twitter account; (2) select the ellipses ("…") button in the top right corner; (3) select "View Lists"; (4) follow "SIDP Members"; (5) go to "Lists" in their own Twitter profile; and (6) set "SIDP Members" as a "Pinned List." Once complete, users will see "SIDP Members" as an optional tab at the top of their Twitter feed; they can easily select this list to view curated posts by any account within the list. As users decide who and what to follow and engage with, it is important to be mindful that information can be biased and inaccurate [7]. It is also important to note that social media can become an "echo chamber" if a user only follows like-minded individuals [8]. Feed curation is a continuous process, but the initial account build is critical for a robust feed.

Once a Twitter feed is curated with relevant content, it can be leveraged for professional growth through networking, sharing ideas, and real-time learning. Recently published important trials can be discussed by the authors themselves on Twitter, such as @MerinoTrial engaging with its followers and answering questions about the trial. With the rapid release of new literature on Twitter, one way to keep up and allow time to

Table 2. Common Twitter Hashtags and Key Accounts/Lists to Follow for Infectious Diseases Drug Information

Common hashtags to explore
#IDTwitter
#TwitteRx
#IDPharmacy
#MedEd
#MedTwitter
#FOAMed
#ASPChat

Suggested accounts to follow
@IDSAinfo
@SIDPharm
@ASMicrobiology
@PIDSociety
@MAD_ID_ASP
@accpinfdprn
@PharmacoJournal
@IDJClub
@ASP_Chat
@CRE_REDUCE
@CDCgov
@US_FDA
@NIHCOVIDTxGuide
@ASHPOfficial

Public list to follow and pin
SIDP members

digest information is to use the bookmark function on Twitter and save the Tweet with the article for future reading (Figure 2).

ENGAGEMENT

As a user becomes more proficient with social media, they will likely increase their engagement over time. Engagement is a commonly used term when discussing social media, and it describes how content relates to action [9]. Drug information-related engagement on social media is wide-ranging: from simply viewing and/or "liking" a post (low engagement) to creating and disseminating original content (medium engagement) and further extending to involvement outside social media in organizations or causes, as motivated by something viewed on social media (high engagement) [9].

Simple Engagement

Content on social media feeds is also dictated by complex algorithms that identify and prioritize items most likely to interest a user. To do this they take into account factors such as who you follow, the type of content you interact with (eg, like, favorite, share, view, click, retweet, respond, post, save) and how you engage with that content (eg, frequency of interactions, time spent interacting). At this step in the process, a user would typically perform simple engagements such as a "like" or a "retweet" for posts in their feed (Step 5 of Figure 1). See Figure 2 for a roadmap comparing the basic functions within Twitter, Instagram, and Facebook. Users should prioritize interacting with posts regarding infectious diseases pharmacotherapy if that is the desired focus of material in their feed. This serves as

an extension of the efficient curation discussed above. As users begin to build their accounts, the social media algorithm will suggest additional accounts to follow and prioritize content in their feed accordingly. Of note, blocking or restricting accounts that a user does not want to interact with or changing security settings will likely impact a user's feed.

Creating Content

Next, a user can attempt to compose a Tweet (Step 6 of Figure 1). In the experience of the SIDP Social Media Committee, the following items should be included in each post to increase one's influence and encourage engagement by viewers: (1) images or other visual content, (2) appropriately trending hashtags, (3) the Twitter handles of influential and relevant accounts, and (4) links to citations or other relevant webpages (Figure 3). According to Twitter statistics, adding visual content such as pictures or videos increased the number of retweets by 35% and 28%, respectively [10]. Particularly high-impact images, for example, infographics, which visually depict complex ideas or concepts, have been used to disseminate education and research findings among a wider range of users [11]. Infographics can be used to summarize data from clinical trials through the creation of a visual abstract (see Supplementary Material) and are increasingly being used by journals to promote published articles. This type of infographic summarizes the key methodology and conclusions of a study and can be shared with other healthcare professionals and learners through social media platforms [11].

Use of a hashtag was also found to increase engagement via "retweeting" by 16% [10]. All social media platforms listed in Table 1 currently use hashtags to promote engagement.

Action/Tool	Twitter	Instagram	Facebook	Function
Like	♡	♡	👍	Indicator for items that fit your interests
Message	✉	◁	💬 & ✎	Direct individual or group communications
Retweet/share	⟲	Not a button	↪	Share an item with your followers
Bookmark/Save	🔖	🔖	🔖	Files content for future review
List	☰	Not available	Not a button	Groups specific accounts into one feed
Compose	✐	⊕	Not a button	Initiates formation of a tweet or post
Tag	👤	🖼	👥	Links posted content to selected accounts
Comment	💬	💬	💬	Enables user communications
Notification	🔔	❤1	🔔	Alerts user of new activity
Story	⊛	⊛	📖	Initiates the formation of a story
Profile	👤	⊛	⊛	Brings user to their profile

Figure 2. Social media buttons and basic function descriptions. Note that the SIDP logo shown here is an example of a social media profile image. Abbreviation: SIDP, Society of Infectious Diseases Pharmacists.

LinkedIn also supports this promotion strategy, as the broad hashtag (eg, #socialmedia) is typically used for initial searches and a more specific, niche hashtag (eg, #socialmediatips) will allow the content to persist in the feed [12]. It is essential to understand and use the correct spelling of these hashtags. For example, #TwitteRx is more popular, with more than 36 000 tweets as of this writing while #TwitterRx has approximately 15 700 tweets [13].

In addition to the structural features of a social media post, a user should consider what drug information would be the most interesting and useful to share. High-impact drug information on social media generally includes knowledge that is curated by medication experts and discusses relevant pearls or clinical conundrums. The SIDP Twitter list, mentioned above, is replete with examples highlighting the dissemination of such valuable antimicrobial drug information. These posts share an insider glimpse on how experts optimize medication use practices in infectious diseases, such as managing an active intravenous posaconazole shortage by administering crushed delayed-release posaconazole tablets (see Supplementary Material for example by Robert Wright, PharmD) or opening and administering isavuconazole capsules via the enteral route (see Supplementary Material for

example by Matthew Davis, PharmD) [14, 15]. Other examples include introducing novel educational concepts, such as the "HECK-YES" mnemonic to recall clinically relevant bacteria with a propensity for inducible AmpC production that can inactivate select beta-lactams (see Supplementary Material for example by Samuel Aitken, PharmD), or collecting and sharing key information in real-time across the healthcare community, such as informally surveying US hospitals regarding receipt of remdesivir during the early days of its national allocation (see Supplementary Material for example by Conan MacDougall, PharmD). These clinical pearls are ideal examples of valuable drug information, as they are practice-changing updates that can be described briefly, supported with available literature, and shared to educate a wide audience of physicians, nurses, pharmacists, and other allied health professionals. Thus, providing drug information via social media increases accessibility to medication experts and promotes earlier adoption of clinical best practices that previously may have only been shared with smaller, local audiences. What was once a verbal education point to a small healthcare team on patient rounds is amplified with the help of social media to enhance collective understanding of valuable clinical drug information among a wider audience.
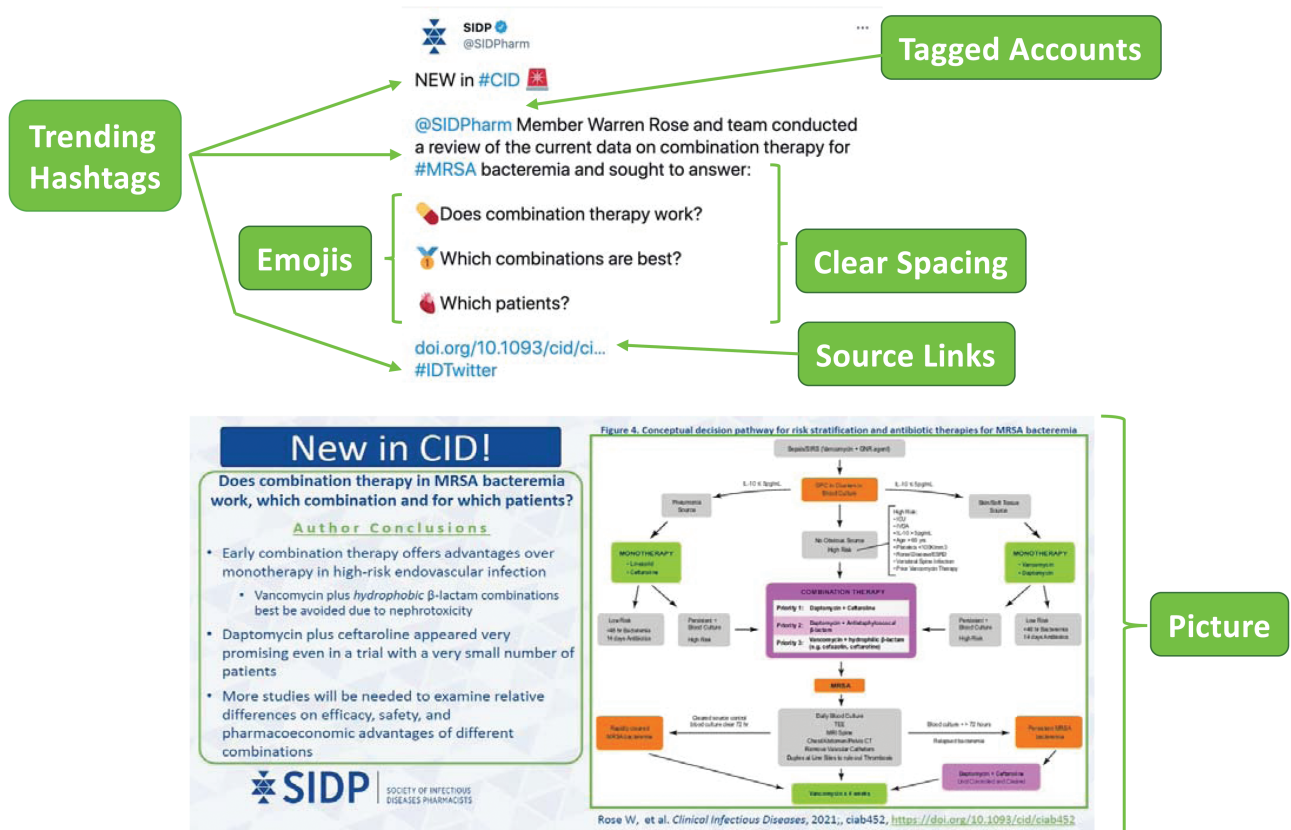

Figure 3. Components of a social media post to maximize user engagement. Abbreviations: CID, Clinical Infectious Diseases; SIDP, Society of Infectious Diseases Pharmacists.

During the COVID-19 pandemic, SIDP utilized social media to promote sharing of new drug information with our followers through individual Tweets and different Twitter chats. Strategies included the use of trending hashtags; creation of infographics to summarize published articles; and tagging of journals, authors, and members of our organization and network. These engagement methods led to an increase of over 4000 unique followers for the SIDP Twitter account between March 2020 and March 2021 (unpublished data as of 10 June 2021).

Engaging the Network

The final steps to harness infectious diseases drug information in social media involve fully engaging one's network in conversation (Steps 7 and 8 of Figure 1). While conversation can certainly be sparked with a brief tweet or retweet, official organization accounts, interest groups, and even individual users often create opportunities for followers to engage in a deeper discussion surrounding a topic, such as vaccine hesitancy [7, 16]. These are often done via events such as Twitter chats (eg, #ASPchat) or virtual journal clubs (eg, #IDJClub). For instance, the American Society of Health-System Pharmacists (ASHP) recently partnered with SIDP to host a Twitter chat, that is, #COVIDVaxChat, where Twitter followers engaged in a discussion regarding COVID-19 vaccines (see Supplementary Material). Specific healthcare-led hashtags that conveyed more positive emotions (eg, #VaccineConfidence) helped differentiate the conversation from the potentially negative associations surrounding vaccine hesitancy and conspiracy theories [17]. Twitter chats can also produce a forum to discuss practice-changing guidelines, as exemplified by another joint SIDP and ASHP Twitter chat, that is, #VancoChat, which discussed the revised consensus guidelines for vancomycin therapeutic drug monitoring published in 2020 (see Supplementary Material) [18]. Twitter participants were able to directly engage with each other and with guideline authors, for example, Michael Rybak (@IDpharmresearch), Thomas Lodise (@lodise_tom), and Jennifer Le (@idpedle), to discuss real-world implications of the new recommendations.

One of the highest levels of social media engagement is to publish an educational thread, also known as Tweetorial, as described above. It can review any drug information concept, yet some of the most popular threads provide expert-level interpretations and commentary of recently published literature (see Supplementary Material for example by Erin McCreary, PharmD). Tweetorials that uncover the origins of and/or review the underlying data for common concepts in infectious diseases pharmacotherapy are also incredibly helpful and well received, such as reviewing the mechanism of the anti-inflammatory effect of macrolides (see Supplementary Material for example by Anthony [Tony] Breu, MD). Successful Tweetorials contain much of the same features as an engaging individual tweet, that is, images or other visual content, hashtags, handles, and links to citations or other relevant webpages, and these features are often employed in combination throughout multiple posts in the thread. Although these take extensive time and research to create, Tweetorials offer some of the highest quality and cutting-edge drug information of any social media format.

BENEFITS OF SOCIAL MEDIA ENGAGEMENT

Taking the plunge into social media may seem daunting, but there is a lot to gain for all users, from new clinicians to experienced veterans. One benefit of these platforms is removing the barriers of distance and time [19]. With networking once limited by location (eg, in-person meetings a few times annually), social media now allows for peer-to-peer interactions any time. Beyond the obvious networking benefits, social media, particularly Twitter, provides ample clinical and career development opportunities.

Twitter allows users to share articles within moments of publication, resulting in increased access and more widespread dissemination, improved citations for authors, and heightened scrutiny with informal peer review via comments [20]. Because of its dynamic structure, new content and discussion are continually available for review on Twitter. Keyword searches can often assist with literature searches that rival PubMed, assuming appropriate discretion is utilized. This rapid sharing of new information was evident throughout the onset of the COVID-19 pandemic, with infectious diseases clinicians collaborating on the management of complex patients, operational pearls for newly approved or Emergency Use Authorized therapeutic agents, and ways to increase equitable access to vaccines [21].

The emphasis on real-time collaboration of multidisciplinary experts and contributors on social media also mimics the team-based approach we rely on to provide optimal patient care. The interactive events described above allow for critical evaluation of emerging evidence, new or continuing education for clinicians, and improved rapport/collegiality among peers from various backgrounds [22]. Among 134 surveyed participants of #IDJClub, 39% reported improved confidence in literature appraisal and 42% described gained clinical knowledge [22]. By harnessing Twitter and other social media platforms as educational tools and networking opportunities, one can develop clinical expertise and expand personal influence to promote professional advancement.

POTENTIAL PITFALLS OF SOCIAL MEDIA

The social, professional, and educational benefits of social media have been discussed above, but healthcare providers should be aware of the potential pitfalls of using these platforms. These challenges include maintaining patient

confidentiality, unwanted commentary, and preventing the spread of false information, whether or not intentional, also known as misinformation.

Social media platforms allow for sharing ideas and discussing challenging cases, but users should always maintain patient confidentiality and privacy [23–25]. In this vein, clinicians should be aware of institutional policies regarding their employees' presence on social media. Employees may be liable for unprofessional or unethical posting that could reflect poorly on their employer [24]. Chretien and colleagues examined the tweets of self-identified physicians with public profiles who had ≥ 500 followers on Twitter to determine whether physicians were behaving unprofessionally. The authors reviewed 5156 tweets from 260 users and found 3% of total tweets were unprofessional. Thirty-eight of the tweets (0.7%) contained potential patient privacy violations, 33 (0.6%) contained profanity, 14 (0.3%) contained sexually explicit material, and 4 (0.1%) included discriminatory statements [26].

Public engagement through social media results in both invited and unwanted commentary with other individuals on the platforms. A recent study by Pendergrast et al found that in a survey of 464 participants, 108 physicians (23.3%) reported being personally attacked on social media. Attacks included personal attacks (42.6%) and sexual harassment (n = 18), with women being significantly more likely (44 [16.4%] vs 3 [1.5%], $P < .001$) to report online sexual harassment. In these personal attacks, physicians reported incidents of verbal abuse, death threats, contacting employers and certifying boards, and doxxing (ie, the sharing of personally identifying information on public internet forums typically with malicious intent) [27]. This is one reason that users should consider separate social media accounts for personal and professional use [28].

The character limits and "headliner" content used to promote "likes" and "retweets" may result in the spreading of misinformation. Utilizing quality indicators on these platforms can help users avoid reading and sharing misinformation. First, to identify and/or convey reliable drug information, look for official accounts with the primary objective of disseminating information on the efficacious and safe use of antimicrobials, for example, the Society of Infectious Diseases Pharmacists (@SIDPharm) and the Infectious Diseases Society of America (@IDSAinfo). National pharmacy organizations (eg, @ACCP, @ASHPOfficial) and medical journal accounts (eg, @PharmacoJournal) are additional credible resources that limit the potential of acquiring unreliable drug information. Table 2 summarizes some other suggested accounts to follow.

In addition, users should review the credentials, affiliations, followers, and interactions of the account to assess credibility, especially for individual accounts. Although account credibility is important, it alone does not eliminate the risk of drug-related misinformation. Tweets and posts do not undergo peer review

as do most articles published in medical journals. It is best practice for users to cite traditional sources (eg, original journal articles, government bodies, professional associations) whenever possible in their social media content. Viewers should review the linked citations and websites, if available, and ensure they represent reputable sources. If a post lacks an appropriate reference, it may increase the risk of misinformation [29]. Finally, although hashtags such as #IDTwitter (which can provide fast identification of topics) are valuable assets for curation and engagement, it is crucial to note that not all information found under these hashtags may be validated. Best judgment practices need to inform the application of this knowledge [19]. A search for each of these quality indicators (eg, official organizational or other credible accounts, complete individual user profiles, clear and ample citations to reputable sources) should be performed when consuming any drug information via social media. These platforms provide intimate access to up-to-the-minute drug information and analysis by experts; utilizing a few good habits can help foster identification of quality drug information and prevent the spread of misinformation.

TRACKING IMPACT

Understanding and tracking the impact of one's social media presence has become increasingly important as social media has grown, especially in the field of medicine. Analytic software and tools, including those freely available within a platform itself (eg, Twitter analytics), can help facilitate evaluating the impact of social media activity [30]. For example, SIDP routinely tracks the success of individual tweets, hashtags, or social media campaigns by reviewing Twitter analytics, including tweet impressions (ie, number of times a user is served a Tweet in a timeline or search), tweet engagements (ie, number of times a user interacted with a Tweet by clicking on it or expanding it), profile visits, mentions, and growth in followers over time. More detailed analyses can be pursued using an Application Programming Interface (API). APIs are free, publicly available platforms offered by the specific social media company as a way for the general public (eg, other application software developers, researchers, an interested social media user) to query and extract social media platform data for further use or analysis. Recent publications have used this approach to evaluate the trends and reach of Twitter at professional conferences, for example, **ID**Week™ 2020 and the International Consortium for Prevention and Infection Control (ICPIC) 2019 [6, 31]. Finally, third-party companies such as Symplur can provide readily available data and visualizations to track the impact of healthcare hashtags used in professional conferences, Twitter chats, or disease topics. In 24 hours (5–6 May 2021) there were more than 6900 tweets with the hashtag "MedTwitter" with more than 18 million impressions among 5171 participants [32]. Visualizing the impact of certain hashtags can help one better

target future drug information posts and increase one's social media presence.

Social media impact may further extend to advocacy efforts and provide leverage when approaching governing bodies or companies to advocate for patient needs [33]. Furthermore, there is increasing attention on professional social media activity as a component of digital scholarship that can be used to support promotion and tenure [34].

CONCLUSION

Although requiring a bit of work to set up, participation in social media can be an excellent source of infectious diseases drug information. This article provides a step-by-step process to get started with one or more social media platforms. Hopefully, this summary will spur the infectious diseases community to build on the momentum generated within social media in recent years, especially during this global COVID-19 pandemic.

References

1. Social media for scientists. Nat Cell Biol **2018**; 20:1329.
2. Statista. Most popular social media apps in the United States of as September 2019, by monthly users. **2021**. Available at: https://www.statista.com/statistics/248074/most-popular-us-social-networking-apps-ranked-by-audience/. Accessed 9 August 2021.
3. Pew Research Center. Social media use in 2021. **2021**. Available at: https://www.pewresearch.org/internet/2021/04/07/social-media-use-in-2021/. Accessed 4 June 2021.
4. Bert A. Elsevier Connect. How to use social media for science—3 views. **2014**. Available at: https://www.elsevier.com/connect/how-to-use-social-media-for-science. Accessed 9 August 2021.
5. Mata DA, Tilak G, Loeb S, Ramasamy R. Curating a digital identity: what urologists need to know about social media. Urology **2016**; 97:5–7.
6. Medford RJ, Saleh SN. What Twitter can tell us about #IDWeek2020. Open Forum Infect Dis **2020**; 8:ofaa621.
7. Puri N, Coomes EA, Haghbayan H, Gunaratne K. Social media and vaccine hesitancy: new updates for the era of COVID-19 and globalized infectious diseases. Hum Vaccin Immunother **2020**; 16:2586–93.
8. Cinelli M, De Francisci Morales G, Galeazzi A, Quattrociocchi W, Starnini M. The echo chamber effect on social media. Proc Natl Acad Sci U S A **2021**; 118:e2023301118.
9. Neiger BL, Thackeray R, Van Wagenen SA, et al. Use of social media in health promotion: purposes, key performance indicators, and evaluation metrics. Health Promot Pract **2012**; 13:159–64.
10. Twitter. What fuels a Tweet's engagement? **2014**. Available at: https://blog.twitter.com/en_us/a/2014/what-fuels-a-tweets-engagement. Accessed 9 August 2021.
11. Barlow B, Webb A, Barlow A. Maximizing the visual translation of medical information: a narrative review of the role of infographics in clinical pharmacy practice, education, and research. J Am Coll Clin Pharm **2021**; 4:257–66.
12. Gannon J. LinkedIn. The only article you need to read about LinkedIn hashtags. **2020**. Available at: https://www.linkedin.com/pulse/only-article-you-need-read-linkedin-hashtags-joe-gannon-/ Accessed 4 June 2021.
13. Hashtagify. **2021**. Available at: https://hashtagify.me/hashtag/twitterrx. Accessed 20 January 2022.
14. Mason MJ, McDaneld PM, Musick WL, Kontoyiannis DP. Serum levels of crushed posaconazole delayed-release tablets. Antimicrob Agents Chemother **2019**; 63:e02688–18.
15. McCreary EK, Nguyen MH, Davis MR, et al. Achievement of clinical isavuconazole blood concentrations in transplant recipients with isavuconazonium sulphate capsules administered via enteral feeding tube. J Antimicrob Chemother **2020**; 75:3023–8.
16. Kullar R, Goff DA, Gauthier TP, Smith TC. To tweet or not to tweet—a review of the viral power of Twitter for infectious diseases. Curr Infect Dis Rep **2020**; 22:14.
17. Ojo A, Guntuku SC, Zheng M, Beidas RS, Ranney ML. How health care workers wield influence through Twitter hashtags: retrospective cross-sectional study of the gun violence and COVID-19 public health crises. JMIR Public Health Surveill **2021**; 7:e24562.
18. Rybak MJ, Le J, Lodise TP, et al. Therapeutic monitoring of vancomycin for serious methicillin-resistant *Staphylococcus aureus* infections: a revised consensus guideline and review by the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, the Pediatric Infectious Diseases Society, and the Society of Infectious Diseases Pharmacists. Am J Health Syst Pharm **2020**; 77:835–64.
19. Marcelin JR, Cortés-Penfield N, Del Rio C, et al. How the field of infectious diseases can leverage digital strategy and social media use during a pandemic. Open Forum Infect Dis **2021**; 8:ofab027.
20. Luc JGY, Archer MA, Arora RC, et al. Does tweeting improve citations? One-year results from the TSSMN prospective randomized trial. Ann Thorac Surg **2021**; 111:296–300.
21. Abdul-Mutakabbir JC, Casey S, Jews V, et al. A three-tiered approach to address barriers to COVID-19 vaccine delivery in the Black community. Lancet Glob Health **2021**; 9:e749–50.
22. Schwartz IS, Woc-Colburn L, McCarty TP, Cutrell JB, Cortes-Penfield NW. "135. Impact of #idjclub, a synchronous Twitter journal club, as a novel infectious disease education platform". Open Forum Infect Dis **2020**; 7:S197–98.
23. Goff DA, Kullar R, Newland JG. Review of Twitter for infectious diseases clinicians: useful or a waste of time? Clin Infect Dis **2015**; 60:1533–40.
24. Markham MJ, Gentile D, Graham DL. Social media for networking, professional development, and patient engagement. Am Soc Clin Oncol Educ Book **2017**; 37:782–7.
25. Dong SW, Nolan NS, Chavez MA, Li Y, Escota GV, Stead W. Get privacy trending: best practices for the social media educator. Open Forum Infect Dis **2021**; 8:ofab084.
26. Chretien KC, Azar J, Kind T. Physicians on Twitter. JAMA **2011**; 305:566–8.
27. Pendergrast TR, Jain S, Trueger NS, Gottlieb M, Woitowich NC, Arora VM. Prevalence of personal attacks and sexual harassment of physicians on social media. JAMA Intern Med **2021**; 181:550–2.
28. The Social Media Butterfly. Should you keep your personal and professional social media profiles separate?. **2020**. Available at: https://www.socialmediabutterflyblog.com/2020/08/should-you-keep-your-personal-and-professional-social-media-profiles-separate/. Accessed 9 August 2021.

29. Dixon DL, Reed BN. To tweet or not to tweet? A primer on social media for pharmacists. J Am Coll Clin Pharm **2019**; 2:554–62.
30. Twitter. Twitter analytics. **2021**. Available at: https://analytics.twitter.com/about. Accessed 22 June 2021.
31. Martischang R, Tartari E, Kilpatrick C, et al. Enhancing engagement beyond the conference walls: analysis of Twitter use at #ICPIC2019 infection prevention and control conference. Antimicrob Resist Infect Control **2021**; 10:20.
32. Symplur. #MedTwitter healthcare social media hashtag. **2021**. Available at: https://www.symplur.com/healthcare-hashtags/medtwitter/. Accessed 22 June 2021.
33. Corsini EM, Boeck M, Hughes KA, et al. Global impact of social media on women in surgery. Am Surg **2020**; 86:152–7.
34. Cabrera D, Roy D, Chisolm MS. Social media scholarship and alternative metrics for academic promotion and tenure. J Am Coll Radiol **2018**; 15:135–41.
35. Statusbrew. 100 social media statistics for 2021 [+Infographic]. **2021**. Available at https://statusbrew.com/insights/social-media-statistics/. Accessed on 22 June 2021.