Rosacea videos on social media: A comparison of accuracy, quality, and viewer engagement

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Abstract

Background: Little is known regarding the accuracy, quality, and viewer engagement of video-based online education.

Objective: To assess the accuracy, quality, viewer engagement, and viewer experience of rosacea videos on social media.

Methods: Reviewers searched "rosacea" and examined videos on YouTube in September 2018. Videos were categorized by source: 1) Healthcare sources: university/professional organizations, industry, and individuals that were healthcare professionals, and 2) Non-healthcare sources: lay media and individuals that were not healthcare professionals. Video accuracy was measured using the Dy et al. Accuracy Scale (DAS) and Accuracy in Digital-health Instrument (ANDI). Video quality was measured using the Global Quality Scale (GQS). Viewer engagement was measured by the engagement ratio. $\frac{\text{(total likes+dislikes+comments)}}{\text{total views}}$

Results: Of the videos analyzed, 71.7% of videos were from non-healthcare sources. Videos produced by healthcare sources (28.3%) were significantly more accurate than those produced by non-healthcare sources, as measured by ANDI (3.57±0.83 versus 2.54±1.07, P=0.001). Videos created by non-healthcare sources received significantly greater engagement than those by healthcare professionals (viewer engagement ratio 0.031±0.044 versus 0.014±0.013, P=0.0159).

Conclusion: Rosacea videos on social media produced by non-healthcare sources were less accurate and of lower quality but received greater viewer engagement than those produced by healthcare sources.

Keywords: rosacea, social media, video, information, dermatology

Introduction

Patients suffering from chronic skin conditions such as rosacea are likely to seek out information online to understand their disease, treatment options, and connect with others coping with similar symptoms. Because rosacea primarily affects the face, patients with severe symptoms may avoid social interactions and often report a reduced quality of life with concomitant anxiety and depression [1]. There is a large population of patients who have moderate-to-severe rosacea who are not under medical care, resulting in suboptimal health outcomes [2]. The complexity of the disease burden from rosacea, combined with patients' limited healthcare interaction, cumulatively increases the potential harm from potentially misleading information on social media.

For many patients with rosacea, interactions on social media may be outpacing traditional face-to-face exchanges as patients seek out online platforms to address their medical concerns [3-4]. Video-based social media websites are popular online platforms that are currently widely used by both patients and medical professionals for free viewing and sharing of health information. For example, websites such as YouTube generate over 1.9 billion user visits per month and over a billion hours of videos watched per day [5]. A significant number of these videos

contain content on dermatology topics, with focuses on advocacy, treatment, and self-care tips [6-10].

Although YouTube videos may appear personalized and authentic to viewers, there are questions regarding the accuracy and quality of the information presented [4]. Sorting through these videos to differentiate between accurate health information sources versus misleading sources can be challenging for most patients [4]. Moreover, studies in other medical specialties have discovered that many YouTube videos contain information that are misleading or contradictory to trained healthcare provider and clinical guidelines [4,11]. Although there have been a few studies on YouTube videos for dermatologic topics such as atopic dermatitis, psoriasis, and skin cancer [7,10,12], the accuracy and quality of online educational materials in dermatology has not been evaluated extensively. There exists a critical gap in the literature assessing the accuracy and quality of online video-based educational content for rosacea. In this study, we aimed to determine the accuracy, quality, viewer engagement, and viewer experience of rosacea videos on YouTube.

Methods

For the video selection process, a physician and a physician-in-training, both medically trained about rosacea, anonymously entered the search term "rosacea" into the search engine on YouTube during September 2018 (**Figure 1**). We examined the top sixty videos (the first three pages) of the search results, as previous studies have demonstrated that YouTube viewers typically disregard subsequent videos [13-16].

From the initial 60 videos that were screened, we selected videos that included content pertaining to rosacea pathogenesis, epidemiology, clinical manifestations, or treatment. We excluded videos that were unavailable or not in English.

For each video, we collected the following data: URL, title, channel name, length, date of upload, and number of likes, dislikes, and comments. The selected videos were then categorized according to source: 1) university, government, or professional organizations (such as the American Academy of Dermatology [AAD]); 2) pharmaceutical, device, or cosmetic industry; 3) lay media, defined as news, entertainment, and education channels; 4) individuals who were healthcare professionals (e.g. physicians and other healthcare providers); and 5) individuals who were not healthcare professionals (lay persons or patients). We also classified the above producers into two large source categories: 1) "healthcare source," which included university/professional organizations, industry, and individuals who are healthcare professionals, and 2) "non-healthcare source," which included the lay media and individuals who are not healthcare professionals. The selected videos were also categorized based on whether the content was primarily anecdotal.

The scope of this study did not involve direct patient contact; consequently, there is no written informed consent to disclose. The protocol for this study was reviewed and approved by the University of Southern California Institutional Review Board (#HS-18-00868).

Outcomes

We evaluated the videos for the following outcomes: accuracy, quality, viewer engagement, and overall viewer experience. Two independent raters (AC and AB) used four scales to evaluate each video. The order by which the raters used these scales was randomized. Any discrepancies between the two raters greater than one point were adjudicated through discussion.

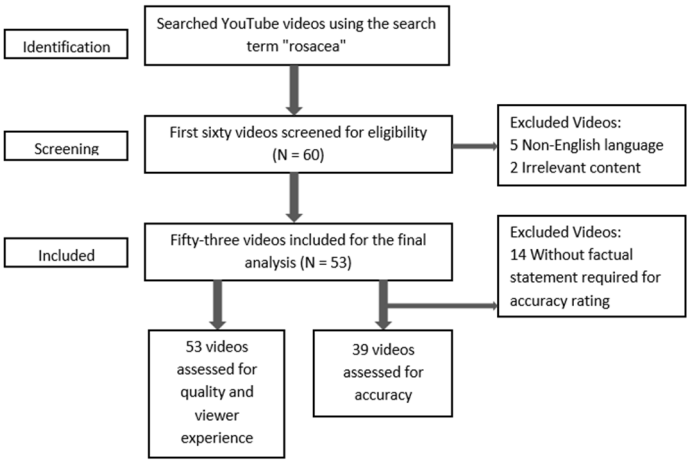


Figure 1. *A flow chart summarizing the video selection process.*

Accuracy was defined as the state of being correct or precise based on the Consensus Guideline published by the National Rosacea Society Expert Committee and the American Academy of Dermatology [18-20]. Accuracy was assessed using the validated Accuracy in Digital-health Instrument (ANDI) and an adaptation of the Dy et al. Accuracy Scale (DAS), (**Table 1**), [15-17].

Quality was defined as the quality of the information and presentation. Quality was assessed using the Global Quality Scale (GQS), which was adapted from the validated DISCERN scale and modified to evaluate rosacea [21]. The GQS accounts for video quality, flow, breadth and depth of relevant information covered, and overall usefulness of the video to measure a rater's likelihood of recommending the video to another person with rosacea (**Table 1**).

Viewer engagement was assessed by an engagement ratio as used in previous literature [3], defined as the sum of the number of likes, dislikes, and comments divided by the total number of views. Overall viewer experience was assessed using tehe Armstrong Viewer Assessment (AVA), (**Table 1**), [17].

Statistical Analysis

The mean scores for each outcome were calculated by averaging the two rater's scores if the difference in their scores was 1. If the difference in the two rater's scores were two or more, the raters discussed their scores and came to a consensus. The Cohen kappa coefficient was assessed to examine interrater reliability for each of the four scales. We used one-way analysis of variance (ANOVA) to compare the means of the accuracy scales, GQS, AVA, and viewer engagement ratio among the five video sources. A Welch t-test was used to compare the means of the

Table 1. *Assessment scales for scoring accuracy, quality, and viewer experience.*

Accuracy	
Dy et al. Accuracy Scale (DAS)	1 = 25% of less of the information is accurate 2 = 26-50% of the information is accurate 3 = 51-75% of the information is accurate 4 = 76-100% of the information is accurate
Accuracy in Digital-health Instrument (ANDI)	0 = Not accurate at all 1 = Minimally accurate 2 = Fairly accurate 3 = Mostly accurate 4 = Completely accurate
Quality	
Global Quality Scale (GQS)	1. Poor quality, poor flow, most information is missing, not at all useful for patients – I would highly discourage a patient with rosacea from watching this video. 2. Generally poor quality and poor flow, some information listed but many important topics missing, of very limited use to patients – I would discourage a patient with rosacea from watching this video. 3. Moderate quality, suboptimal flow, some important information is adequately discussed but others poorly discussed, somewhat useful for patients – I would neither encourage nor discourage a patient with rosacea from watching this video. 4. Good quality and generally good flow. Most of the relevant information is listed, but some topics not covered, useful for patient – I would encourage a patient with rosacea from watching this video 5. Excellent quality and flow, very useful for patients – I would highly encourage a patient with rosacea to watch this video.
Viewer Experience	
Armstrong Viewer Assessment (AVA)	0 = Very poor 1 = Poor 2 = Fair 3 = Good 4 = Very Good

Table 2. *Video characteristics sorted by healthcare professional and non-healthcare professional sources.*

	Healthcare	Non-Healthcare	P-value
Number of Video (%)	15(28.3)	38(71.7)	
Number of Views (%)	1677132 (40.5)	2461288 (59.5)	
Mean Video Length, minutes (SD)	6.99 (6.03)	9.84 (7.23)	0.0766
Mean Upload Duration, days (SD)	920 (800)	693 (834)	0.3658
Mean Number of Views (SD)	111809 (170086)	64771 (81537)	0.3195
Mean Number of Likes (SD)	997 (1352)	1022 (1812)	0.9556
Mean Number of Dislikes (SD)	86 (240)	58 (158)	0.6725
Mean Number of Comments (SD)	185 (193)	167 (217)	0.7729
Mean Viewer Engagement Ratio (SD)	0.0140 (0.0126)	0.0313 (0.0441)	*0.0159
Mean DAS (SD)	3.64 (0.75)	2.90 (1.06)	*0.0074
Mean ANDI (SD)	3.57 (0.83)	2.54 (1.07)	*0.0010
Mean GQS (SD)	3.70 (0.86)	2.82 (0.73)	*0.0009
Mean AVA (SD)	3.13 (0.90)	2.30 (0.78)	*0.0022

DAS – Dyer et al Accuracy Scale; ANDI – Accuracy in Digital-health Instrument; GQS – Global Quality Scale; AVA – Armstrong Viewer Assessment
*P≤0.05 is considered statistically significant.

accuracy scales, GQS, AVA, and viewer engagement ratio between the healthcare and non-healthcare video sources. We performed data analysis with Stata Statistical Software Version 13.0 (Stata Corp, College Station, TX).

Results

A total of 60 videos were screened for inclusion. Of these videos, 53 met the study inclusion and exclusion criteria (**Figure 1**). The two independent raters were found to have substantial interrater reliability on all four assessment scales (ANDI = 0.7653, DAS = 0.8043, GQS = 0.7018, and AVA = 0.6207), [22]. Video characteristics for the selected YouTube videos were classified into healthcare sources versus non-healthcare sources in **Table 2**, by different source groups in **Table 3**, and the presence of personal anecdotes in **Table 4**.

We classified the videos into two broad categories: healthcare videos, which encompassed university/professional organizations, industry, and individual healthcare professionals, and non-healthcare videos, which included non-healthcare individuals and lay media videos (**Table 2**). Our results show that 71.7% of videos were non-healthcare in origin, whereas 28.3% were from healthcare sources. We then further categorized the videos based on five source types: university/professional organizations, industry, lay media, individual healthcare professionals, and non-healthcare individuals (**Table 3**). We found that 56.6% of videos originated from non-healthcare professional individuals, 20.8% from healthcare professionals, 15.1% from lay media, 5.7% from industry, and 1.9% from university/professional organizations (**Figure 2**). Additionally, 54.7% of

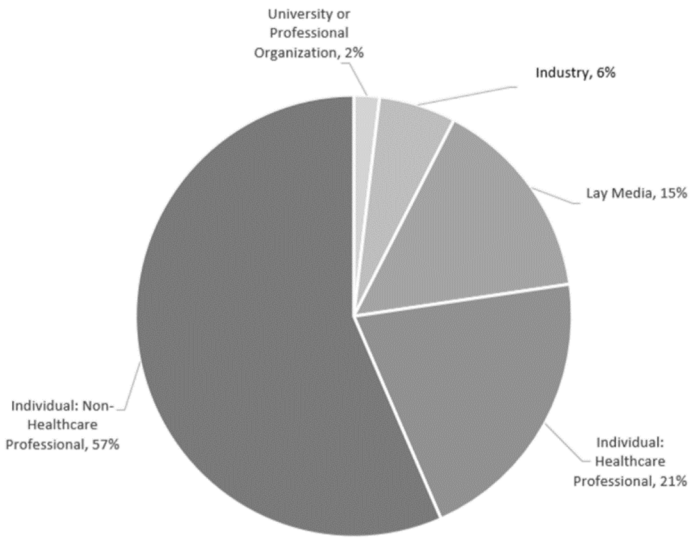


Figure 2. *Sources of rosacea videos on YouTube.*

Table 3. *Summary of video characteristics sorted by video sources.*

	University, Professional Organization	Industry	Lay Media	Individual: Healthcare Professional	Individual: Non-Healthcare Professional	P-value
Number of Video (%)	1 (1.9)	3 (5.7)	8 (15.1)	11 (20.8)	30 (56.6)	
Number of Views (%)	23533 (1.9)	214411 (5.2)	521751 (12.6)	1439188 (34.8)	1939537 (46.9)	
Mean Video Length, minutes (SD)	3.10 (0.0)	2.73 (1.29)	4.86 (3.99)	8.50 (6.41)	11.16 (7.37)	0.0566
Mean Upload Duration, days (SD)	921 (0)	1284 (711)	1709 (1263)	821 (863)	422 (378)	*0.0007
Mean Number of Views (SD)	23533 (0)	71470 (107108)	65219 (74456)	130835 (191157)	64651 (84523)	0.5531
Mean Number of Likes (SD)	119 (0)	157 (222)	319 (401)	1306 (1468)	1210 (1994)	0.5446
Mean Number of Dislikes (SD)	27 (0)	6 (3)	31 (35)	114 (278)	65 (177)	0.8517
Mean Number of Comments (SD)	13 (0)	24 (33)	66 (65)	244 (194)	194 (235)	0.2180
Mean Viewer Engagement Ratio (SD)	0.0068 (0)	0.0040 (0.0024)	0.0118 (0.0166)	0.0173 (0.0132)	0.0365 (0.0478)	0.2819
Mean DAS (SD)	4.00 (0)	4.00 (0)	2.56 (1.32)	3.55 (0.82)	3.06 (0.92)	0.1558
Mean ANDI (SD)	4.00 (0)	3.75 (0.35)	2.19 (1.44)	3.50 (0.92)	2.71 (0.85)	*0.0424
Mean GQS (SD)	4.50 (0)	3.50 (0.50)	2.44 (1.11)	3.68 (0.96)	2.92 (0.57)	*0.0033
Mean AVA (SD)	4.00 (0)	2.83 (0.58)	2.0 (1.20)	3.14 (0.98)	2.38 (0.64)	*0.0136

DAS – Dyer et al Accuracy Scale; ANDI – Accuracy in Digital-health Instrument; GQS – Global Quality Scale; AVA – Armstrong Viewer Assessment
*P ≤ 0.05 is considered statistically significant.

videos contained a personal anecdote, whereas 45.7% did not (**Table 4**).

Overall, these videos collected 4,138,420 views in total. Our results show that the majority of the videos were created by non-healthcare sources, which corresponded to 2,461,288 views and a mean of 1,022 likes. Specifically, individuals who were not healthcare professionals garnered the most views with 1,939,537 views and a mean of 1,210 likes. University/professional organizations had the lowest number of views at 23,533 views and a mean of 119 likes. Of note, we found videos containing personal anecdotes were significantly longer in mean video duration than those without personal anecdotes (11.17±7.43 minutes versus 6.44±5.49 minutes, P=0.0051), (**Table 4**).

Accuracy

Although healthcare sources represented a minority of the videos, they produced videos of significantly higher accuracy than videos created by non-healthcare sources, as measured by mean ANDI score (3.57±0.83 versus 2.54±1.07, P=0.001) and mean DAS score (3.64±0.75 versus 2.90±1.06, P=0.0074) (**Table 2**) (**Figure 3**). Specifically, university/professional organizations showed the highest accuracy scores, as measured by DAS (4.0±0) and ANDI (4.00±0.0 with P=0.0424) (**Table 3**). Industry videos were also highly

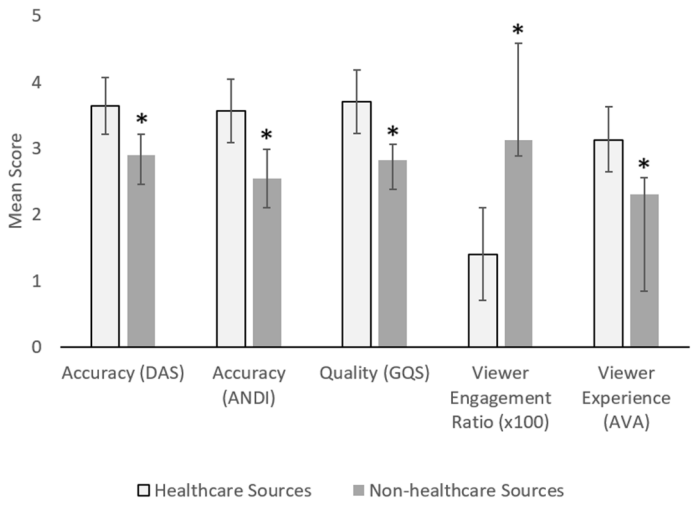


Figure 3. *Video accuracy, quality, viewer engagement, and viewer experience scores between healthcare sources and non-healthcare sources. The mean scores and the 95% confidence intervals are marked. *indicates P≤0.05 for statistical significance.*

Table 4. *Video characteristics sorted by presence of anecdotes.*

	Without Anecdotes	With Anecdotes	P-value
Number of Video (%)	24 (45.3)	29 (54.7)	
Number of Views (%)	2014999 (48.7)	2123421 (51.3)	
Mean Video Length, minutes (SD)	6.44 (5.49)	11.17 (7.43)	*0.0051
Mean Upload Duration, days (SD)	1106 (211)	469 (81)	*0.0043
Mean Number of Views (SD)	83958 (138316)	73221 (91273)	0.7461
Mean Number of Likes (SD)	757 (1126)	1229 (2027)	0.2905
Mean Number of Dislikes (SD)	66 (190)	66 (180)	0.9958
Mean Number of Comments (SD)	138 (156)	200 (243)	0.2686
Mean Viewer Engagement Ratio (SD)	0.015 (0.014)	0.036 (0.049)	*0.0149
Mean DAS (SD)	3.19 (1.11)	3.13 (0.88)	0.8666
Mean ANDI (SD)	2.98 (1.24)	2.80 (0.86)	0.5977
Mean GQS (SD)	3.21 (1.07)	2.95 (0.63)	0.3019
Mean AVA (SD)	2.65 (1.10)	2.45 (0.69)	0.4482

DAS – Dyer et al Accuracy Scale; ANDI – Accuracy in Digital-health Instrument; GQS – Global Quality Scale; AVA – Armstrong Viewer Assessment.
*P ≤ 0.05 is considered statistically significant.

accurate with DAS (4.00±0) and ANDI (3.75±0.35). Lay media videos demonstrated the lowest accuracy scores, as measured by DAS (2.56±1.32) and ANDI (2.19±1.44). Rosacea videos that lacked personal anecdotes were similar in accuracy to those containing anecdotes, determined by both ANDI (2.98±1.24 versus 2.80±0.86) and DAS (3.19±1.11 versus 3.13±0.88) (**Table 4**).

Quality

Videos from healthcare sources were of significantly higher quality than those produced by non-healthcare sources (GQS 3.70±0.86 versus 2.82±0.73, P=0.0009), **Table 2** and **Figure 3**. Specifically, videos from university/professional organizations were of the highest quality, as measured by the GQS (4.50±0, P=0.0033), (**Table 3**). Videos from the lay media were lowest in quality (GQS 2.44±1.11). Additionally, videos with a personal anecdote were of lower quality compared to those lacking anecdotes (GQS 2.95±0.63 versus 3.21±1.07), (**Table 4**).

Viewer Engagement

Viewer engagement across the different categories was measured to account for video popularity, as reflected in the number of likes, dislikes, comments, and views. Our results show that although videos from healthcare sources contained a large number of comments, they were significantly less engaging than non-healthcare videos, as measured by the viewer engagement ratio (0.0140±0.0126 versus 0.0313±0.0441, P=0.0159, **Table 2** and **Figure 3**. Specifically, videos from industry sources had the lowest viewer engagement, with a mean viewer engagement ratio of 0.0040±0.0024. Although this is generally consistent with video popularity, our results show that university/professional organizations have a slightly higher viewer engagement ratio (0.0068±0.0), than industry, despite having the lowest mean number of views, mean likes, and mean number of comments (**Table 3**). Videos originating from individuals who were not healthcare professionals were the most engaging, with a mean viewer engagement ratio of 0.0365±0.0478. Although the presence of personal anecdotes negatively affected the accuracy and quality of rosacea videos, their presence made videos significantly more engaging (viewer engagement ratio of 0.036±0.049 versus 0.015±0.014 for those with and without personal anecdotes, respectively, P=0.0149), (**Table 4**).

Viewer Experience

Videos from healthcare sources provided a significantly greater viewer experience than those produced by non-healthcare sources (AVA 3.13±0.90 versus 2.30±0.78, P=0.0022), **Table 2** and **Figure 3**. Although university/professional organizations produced videos with the lowest number of views, they provided the greatest viewer experience, as measured by AVA (4.00±0, P=0.0136), (**Table 3**). Lay media videos provided the lowest viewer experience (AVA 2.0±1.20). Compared to videos without personal anecdotes, videos with personal anecdotes provided a lesser viewer experience (AVA 2.45±0.69 versus 2.65±1.10), (**Table 4**).

Discussion

To our knowledge, our study is among the initial efforts to assess the accuracy and quality of rosacea videos on social media. These study findings demonstrate the heterogeneity in the accuracy and quality of videos produced about rosacea for the public.

Accuracy

Compared to videos produced by healthcare sources, those produced by non-healthcare sources were significantly less accurate, **Table 2** and **Figure 3**. Many videos from non-healthcare sources focused on therapies that have not been rigorously tested. The inaccuracies found were centered around the ability of interventions to "cure" rosacea, such as natural remedies, commercial products, or diets that were not substantiated by rigorous scientific evidence. For example, one popular suggestion among the videos included using apple cider vinegar to cure rosacea in addition to treating other conditions such as diarrhea and hypertension.

Quality

With regard to video quality, those produced by healthcare sources had significantly higher quality than those produced by non-healthcare sources, **Table 2** and **Figure 3**. Specifically, the professional organizations such as professional healthcare organizations and academic institutions produced the highest quality videos. These findings were consistent with prior studies on quality of health-related videos on social media [3,7,16].

Viewer Engagement

What is most striking based on our findings is that, despite the lower accuracy and quality of videos created by non-healthcare sources, these videos received the higher viewer engagement, **Table 2** and **Figure 3**. That is, the viewers are more likely to view the videos by non-healthcare sources and express their likes, dislikes, and leave comments. Unfortunately, our findings are consistent with prior studies in other fields showing that inaccurate videos were more engaging than accurate ones [3,23]. It is important to note that we do not fully understand why videos produced by non-healthcare sources are more engaging. One reason why non-healthcare sources may be more engaging is their use of personal anecdotes. The "story-telling" aspect of personal anecdotes may move the viewers emotionally more than statistics and general descriptions of the disease burden and treatments, which are typically used by healthcare sources.

Limitations

Although our sample size is limited, previous studies have shown that YouTube viewers generally disregard additional videos after the initial 60 videos in their search results. In addition, prior studies in other fields have shown that a minimum of 25-50 videos were sufficient to detect clinically meaningful differences in accuracy, quality, engagement, and experience between the comparison groups [13-16].

Conclusion

Rosacea videos on social media that are produced by non-healthcare sources were significantly less accurate and had lower quality than those produced by healthcare sources. However, the rosacea videos by the non-healthcare sources received significantly higher views and engagement, which are key measures of how well these videos are received. One possible reason for their higher engagement is the use of personal anecdotes. These study findings highlight the increasing problem of "misinfodemics" in healthcare education of the public. That is, the spread of inaccurate or unsubstantiated information about disease and therapies among the public. Future efforts should focus on educating patients on

how to distinguish between evidence-based versus non-evidence based medical information and critically evaluate healthcare information from different sources. In addition, dermatologic education of the public should focus on creating not only accurate but also highly engaging videos for the viewers.

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Potential conflicts of interest

Dr. Chen is concurrently serving as a medical officer for the United States Army Reserve. Dr. Armstrong has served as investigator or consultant to AbbVie, Janssen, Lilly, Leo, Novartis, UCB, Ortho Dermatologics, Dermira, Sanofi Genzyme, Regeneron, BMS, Dermavant, and Modernizing Medicine. Baktazh Azizi and Andrea Borba have no conflicts to declare.

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