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Evaluation of YouTube As A Source For Graves' Disease Information: Is High-Quality Guideline-Based Information Available?

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Abstract

Objective. To understand the quality of informational Graves' disease (GD) videos on YouTube for treatment decision-making quality and inclusion of American Thyroid Association (ATA) treatment guidelines.

Study Design. Cross-sectional cohort.

Setting. Informational YouTube videos with subject matter "Graves' Disease treatment."

Method. The top 50 videos based on our query were assessed using the DISCERN instrument. This validated algorithm discretely rates treatment-related information from excellent (≥4.5) to very poor (<1.9). Videos were also screened for ATA guideline inclusion. Descriptive statistics were used for cohort characterization. Univariate and multivariate linear regressions characterized factors associated with DISCERN scores. Significance was set at $P < .05$.

Results. The videos featured 57,513.43 views (SD = 162,579.25), 1054.70 likes (SD = 2329.77), and 168.80 comments (SD = 292.97). Most were patient education (52%) or patient experience (24%). A minority (40%) were made by thyroid specialists (endocrinologists, endocrine surgeons, or otolaryngologists). Under half did not mention all 3 treatment modalities (44%), and 54% did not mention any ATA recommendations. Overall, videos displayed poor reliability (mean = 2.26, SD = 0.67), treatment information quality (mean = 2.29, SD = 0.75), and overall video quality (mean = 2.47, SD = 1.07). Physician videos were associated with lower likes, views, and comments ($P < .001$) but higher DISCERN reliability ($P = .015$) and overall score ($P = .019$). Longer videos ($P = .015$), patient accounts ($P = .013$), and patient experience ($P = .002$) were associated with lower scores.

Conclusion. The most available GD treatment content on YouTube varies significantly in the quality of medical information. This may contribute to suboptimal disease understanding, especially for patients highly engaged with online health information sources.

Keywords

DISCERN, Graves' disease, social media, treatment decision-making, YouTube

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Graves' disease (GD) is an autoimmune thyroid disease that is the most common cause of hyperthyroidism. Typically occurring between the ages of 20 and 50, GD is estimated to affect 1.2% of the population in the United States, with women affected more frequently than men.[1] Hyperthyroidism from GD can result in various symptoms and end-organ dysfunction, leading to serious illness.[2,3] Patients also may suffer from extrathyroidal symptoms such as ophthalmopathy or dermopathy.[4] There may be additional psychosocial impacts,[5-8] and without adequate treatment, can result in increased anxiety, depression, and inability to work.[9-11] Primary therapeutic modalities include anti-thyroid drugs (ATDs), radioactive iodine (RAI), and thyroidectomy,

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and each carries specific benefits and risks to be considered on an individualized basis to optimize treatment.[4] Therefore, an accurate understanding of GD is crucial to inform patient engagement and participation in therapeutic decisions.

The rise of the internet and social media has increased the number of patients that use the internet as their initial source of health information, with 56% and 79% of internet users reporting using internet-based health information.[12,13] YouTube, an online video-sharing platform, is a particular source of interest due to its use by over 80% of US adults.[14] Additionally, the tool has become a leading source for patients seeking information on the risks, considerations, and long-term effects of various treatment modalities for specific morbidities.[15] However, these videos often exhibit low content quality and reliability, which may be attributed to nonexpert creators' low barrier for medical media creation.[16-18] Among adults, those between the ages of 18 and 34 exhibit the highest internet and social media usage rates.[14] Thus, young adult and middle-aged patients affected by GD likely use online medical information sources, including YouTube.

Previous studies have evaluated the quality of available YouTube videos discussing the treatment of hypothyroidism, Hashimoto's Disease, and thyroid cancer using the DISCERN instrument.[16,17,19] However, data on media regarding GD and hyperthyroidism are lacking. Additionally, prior studies on thyroid diseases have not explored variables associated with higher DISCERN scores. As such, this study investigated GD content on YouTube to assess the quality of online medical information based on DISCERN content analysis, determine the inclusion of established treatment guidelines provided by the American Thyroid Association (ATA), and understand factors associated with these measures of content quality. The authors hypothesized that videos lacking physician involvement would contain lower treatment decision-making content quality and a lower prevalence of guideline-informed information.

Methods

This study was deemed exempt by the University of Southern California Institutional Review Board.

Study Design

This cross-sectional, observational study assessed YouTube videos' characteristics and content quality related to GD treatment. Videos were obtained from a YouTube search using the keywords "Graves' Disease treatment." The search and subsequent analysis were conducted in May 2023 under an "incognito" webpage to minimize the influence of YouTube's suggestion algorithm based on user video history. Due to research showing that 90% of users do not navigate past the first page of results and even fewer past the second page, we selected the first 50 resultant videos based on the traditional 25 video-per-page structure of YouTube before the current infinite scroll structure.[20] These videos represent those most likely encountered by patients.[21] Exclusion criteria included videos unrelated to GD or discussing other thyroid disorders. Non-English language videos and duplicate videos were also excluded. After excluding eight videos, the initial 50 eligible YouTube videos were analyzed for treatment-related information quality.

Data Collection

Descriptive video characteristics, such as duration, age of video, number of views, likes, comments, and subscriber count were recorded. Videos were screened for medical professional involvement, and physician creators were characterized by specialty. The type of user account (physician, healthcare group, academic institution, academic society, and entertainment), type of video (patient experience, patient education, provider education, operation, advocacy, self-promotion, and entertainment), and origin of upload (US and non-US) were recorded.

Healthcare groups encompassed clinics, physician groups, and other collections of healthcare professionals. Health information accounts educated on health-related topics, and entertainment accounts published noneducational content. Patient experience videos were centered around patients emphasizing the process of treating GD. Advocacy videos stressed the importance of treating GD. Self-promotion videos advertised a medical service, and entertainment videos were defined as primarily noneducational.

Three independent reviewers (C. T., C. L., D. C.) evaluated video informational quality using the DISCERN scale—a 15-question, 5-point validated scale that assesses treatment-related information quality, with higher scores indicating higher quality content. The 15 questions are divided into three categories: reliability, quality, and overall rating. Scores 4.5 and over are considered as "excellent," those from 4.2 to 4.4 as "very good," 3.4 to 4.1 as "good," 2.6 to 3.3 as "average," 1.9 to 2.5 as "poor," and <1.9 "very poor."[22] To enhance the reliability of the evaluation process, reviewers collectively assessed a subgroup of videos using the DISCERN handbook guidelines. The guidelines were discussed among the reviewers beforehand to ensure a clear understanding of the evaluation criteria. Moreover, to cover a diverse range of content quality, representative videos were chosen to represent all possible rating levels outlined in the guidelines. This approach aimed to minimize interrater variability and achieve a more consistent and objective assessment of the videos' health information.

Two reviewers (O. A. A. and R. D.) screened each video for inclusion of treatment recommendations supported by the 2016 ATA Guidelines for Diagnosis and Management of Hyperthyroidism and Other Causes

of Thyrotoxicosis.[4] Recommendations, categorized as RAI therapy, ATDs, or thyroidectomy-focused, were preselected (T. E. A.) based on relative importance and classification as strong recommendations (**Table 1**).[4] Whether a video focused primarily on a singular modality and whether any or all three modalities were referenced at all were also recorded. Incongruence between reviewers was resolved via discussion.

Data Analysis

The statistical analysis was performed in IBM SPSS Statistics for Macintosh, version 28.0.0.0 (IBM Corp.). Descriptive statistics and paired *t*-tests were used to characterize the videos. Univariate and multivariate analyses with Welch's *T*-test and Fischer's exact test were conducted to study the factors associated with higher DISCERN scores. Subgroup analyses identified differences in the quality and reliability of videos based on various factors, including physician involvement. Significance was set at $P < .05$.

Results

Video Demographics

The videos garnered 57,513.43 mean views (standard deviation [SD] = 162,579.25), 1054.70 mean likes (SD = 2329.77), and 168.80 mean comments (SD = 292.97), with a mean duration of 12.13 minutes (SD = 11.43). The mean video age of 60.40 months (SD = 39.20) showed an uploading tendency after the 2016 guidelines; 15 videos were uploaded prior to 2016 (**Table 2**). Most videos were posted by accounts within the United States (n = 40, 80.0%) and had an average of 319,088.50 subscribers (SD = 650,052.03). Healthcare groups (15, 30.0%) were the most common account type, followed by nonphysician providers (8, 16.0%) and physicians (7, 14.0%). Most videos (26, 52.0%) were educational videos designed to inform viewers about GD's physiology, progression, and treatment, followed by personal video blogs detailing patients' experiences with GD (12, 24.0%). A notable 27 videos (54.0%) featured one or more licensed physicians sharing information about GD, of which endocrinologists (n = 9, 18.0%) and endocrine surgeons (n = 9, 18.0%) were the most commonly included.

The 50 videos included in this study were scored using the validated DISCERN scale to assess the reliability, quality, and overall value of YouTube videos on GD, as summarized in **Table 2**. Overall, videos displayed poor reliability, quality, and overall score (reliability: 2.26, SD = 0.67; quality: 2.29, SD = 0.75; overall: 2.47, SD = 1.07) The Fleiss's Kappa measure of interrater agreement was 0.31, suggesting fair agreement among graders.

Treatment Methods Discussed

Most videos included some discussion of all three treatment modalities (28, 56.0%), while others focused on only a single intervention (Surgery only: n = 2, 4.0%; RAI only: n = 3, 4.0%; ATD only: n = 3, 6.0%), and others mentioned none at all (7, 14.0%) (**Table 3**). Of the videos that mentioned surgery (36, 50.0%), 18 (50.0%) discussed the ATA surgery guidelines, with 12 (33.3%) explicitly stating the preference for total thyroidectomy and 6 (16.7%) stating the importance of greater surgeon experience. Of the videos that discussed RAI (36, 60.0%), 16 (36.1%) mentioned pregnancy contraindications, and 3 (8.3%) discussed the necessity of optimizing secondary health issues before RAI administration. Finally, of the 34 videos (68.0%) that discussed ATDs, 12 (35.3%) examined one or more potential adverse effects, and 6 (17.6%) mentioned the necessity of thyrotropin receptor antibody (TRAb) testing before discontinuation.

Table 1. Guidelines Used for Evaluation from 2016 American Thyroid Association Guidelines for Diagnosis and Management of Hyperthyroidism and Other Causes of Thyrotoxicosis

Categories	Video inclusion criteria	ATA guideline citation
General	Which modality(s) are stated in the video: RAI therapy, ATDs, or thyroidectomy stated as possible modalities?	Page 1350—Recommendation 3
	Are all three methods (RAI therapy, ATDs, and thyroidectomy) stated as possible modalities?	Page 1350—Recommendation 3
RAI	Does the video state that RAI is contraindicated in pregnancy?	Page 1351—Recommendation 3
	Does the video state that other health issue(s) should be optimized/controlled prior to RAI therapy? "cardiovascular complications such as atrial fibrillation, heart failure, or pulmonary hypertension and those with renal failure, infection, trauma, poorly controlled diabetes mellitus, and cerebrovascular or pulmonary disease"	Page 1353—Recommendation 7
Surgery	Does it report total thyroidectomy as the preferred surgical procedure?	Page 1359—Recommendation 27
	Does it support/report that surgery should be performed by a high-volume surgeon?	Page 1360—Recommendation 28
ATDs	Does it correctly report at least one of the adverse effects of ATD that requires physician involvement? "pruritic rash, jaundice, acholic stools, dark urine, arthralgias, abdominal pain, nausea, fatigue, fever, or pharyngitis"	Page 1355—Recommendation 14
	Does it suggest TRAb testing prior to ATD discontinuation?	Page 1358—Recommendation 21

Table 2. General Video Characteristics

Characteristics	All videos (n = 50) (n, %)
Video metrics (mean, SD)	
Duration (min)	12.13 (11.43)
Age (months)	60.40 (39.20)
Likes (#)	1054.70 (2,329.77)
Views (#)	57,513.43 (162,579.25)
Comments (#)	168.80 (292.97)
Account subscribers (#)	319,088.50 (650,052.03)
Type of user account	
Patient	4 (8.00)
Physician	7 (14.00)
Healthcare group	15 (30.00)
Nonphysician provider	8 (16.00)
Academic institution	4 (8.00)
Medical journal	1 (2.00)
Device company	2 (4.00)
Academic society	1 (2.00)
Entertainment account	4 (8.00)
Type of video	
Patient experience	12 (24.00)
Patient education	26 (52.00)
Provider education	9 (18.00)
Operation	0 (0.00)
Advocacy	0 (0.00)
Self-promotion	3 (18.00)
Entertainment	0 (0.00)
Country of origin	
US	40 (80.00)
Non-US	9 (18.00)
Physician involvement	27 (54.00)
Specialty/occupation	
Otolaryngology (ENT)	2 (4.00)
Endocrinologist	9 (18.00)
Endocrine Surgeon	9 (18.00)
Naturopathic	2 (4.00)
Chiropractor	1 (2.00)
Internal Medicine	3 (6.00)
Plastic Surgery	2 (4.00)
Radiology	1 (2.00)
Family Medicine	1 (2.00)
DISCERN rating (mean, SD)	
Reliability	2.26 (0.67)
Quality	2.29 (0.75)
Overall	2.47 (1.07)

Table 3. Characteristics of Mentioned Modalities and American Thyroid Association Guidelines

Characteristic	All videos (n = 50) (n, %)
Primary treatment focus of video	
Surgery	5 (10.00)
RAI	5 (10.00)
ATD	6 (12.00)
All Equally	19 (38.00)
None of the above (none of three modalities)	7 (14.00)
All three modalities mentioned	28 (56.00)
Not all mentioned, specific modalities	
Surgery only	2 (4.00)
RAI only	2 (4.00)
ATD only	3 (6.00)
RAI and Surgery	5 (10.00)
RAI and ATD	2 (4.00)
Surgery and ATD	1 (2.00)
No ATA guidelines mentioned at all	27 (54.00)
Videos that mentioned surgery	36 (60.00)
Thyroidectomy guidelines mentioned	
Total thyroidectomy preferred	12 (33.33)
High volume surgeon preferred	6 (16.67)
Videos that mentioned RAI	36 (60.00)
Radioactive iodine guidelines mentioned	
Pregnancy contraindication	13 (36.11)
Optimized health before use	3 (8.33)
Videos that mentioned ATDs	34 (68.00)
Anti-thyroid drug guidelines mentioned	
Reports at least one adverse effect for physician involvement	8 (23.53)
TrAB testing prior to ATD discontinuation	4 (11.76)

Physician Versus Nonphysician Media

Videos created by nonphysicians had significantly longer mean duration than those posted by physicians (13.97, SD = 8.21 vs 10.56, SD = 13.55; $P < .001$), had more likes (2094.65, SD = 3143.27 vs 168.81, SD = 312.25; $P < .001$), views (126,609.91, SD = 259,093.91 vs 17,520.21, SD = 26,150.54; $P = .005$), comments (284.68, SD = 374.18 vs 57.96, SD = 108.36; $P < .001$), and subscribers to their accounts (554,666.22, SD = 892,160.84, vs 118,411.19, SD = 178,792.78; $P < .001$). (**Table 4**) Nonphysicians were more likely to post patient experience videos (9, 39.1%) than physicians (3, 11.1%, $P = .021$). Videos featuring physicians received a significantly higher DISCERN score in terms of reliability (2.32, SD = 0.81 vs 2.18, SD = 0.47; $P = .015$) and overall value (2.69, SD = 1.22 vs 2.20, SD = 0.80; $P = .019$). Surgery was significantly more likely to be the primary treatment focus in videos involving physicians (5, 18.5% vs 0, 0.0%; $P = .030$). Videos featuring physicians were significantly more likely to recommend thyroidectomy by a high-volume thyroid (6, 22.2% vs 0, 0.0%; $P = .016$). Absence of any ATA guidelines was more frequent in videos without physician involvement (17, 73.9% vs 10, 37.0%; $P = .009$).

Thyroid Expert Versus Nonthyroid Expert Media

Table 5 depicts videos created by "thyroid experts" (20, 40.0%), inclusive of specialists in otolaryngology,

Table 4. Comparison of Video Characteristics between Physician and Nonphysician-Involved Media

Characteristic	Physician (n = 27) (n, %)	Nonphysician (n = 23) (n, %)	*P* value
Video metrics (mean, SD)			
Duration (min)	10.56 (13.55)	13.97 (8.21)	**<.001**
Age (months)	61.94 (42.16)	57.8 (36.21)	.152
Likes (#)	168.81 (312.25)	2094.65 (3143.27)	**<.001**
Views (#)	17,510.21 (26,150.54)	126,609.91 (259,093.91)	**.005**
Comments (#)	57.96 (108.36)	284.68 (374.18)	**<.001**
Account subscribers (#)	118,411.19 (178,792.78)	554,666.22 (892,160.84)	**<.001**
Type of user account			
Patient	-	8 (34.78)	-
Physician	5 (18.48)	2 (8.70)	.318
Healthcare group	14 (51.90)	1 (4.35)	**<.001**
Nonphysician provider	-	8 (34.78)	-
Academic institution	4 (14.81)	-	-
Medical journal	1 (3.70)	-	-
Device company	1 (3.70)	1 (4.35)	.908
Academic society	1 (3.70)	-	-
Entertainment account	1 (3.70)	3 (13.04)	.225
Type of video			
Patient experience	3 (11.11)	9 (39.13)	**.021**
Patient education	17 (63.00)	9 (39.13)	.093
Provider education	4 (14.81)	5 (21.74)	.525
Operation	-	-	-
Self-promotion	3 (11.11)	-	-
Country of origin			
US	22 (81.48)	18 (78.26)	.777
non-US	4 (14.81)	5 (21.74)	.525
DISCERN rating (mean, SD)			
Reliability	2.32 (0.81)	2.18 (0.47)	**.015**
Quality	2.39 (0.84)	2.17 (0.63)	.188
Overall	2.69 (1.22)	2.20 (0.80)	**.019**
Primary treatment focus of video			
Surgery	5 (18.52)	0 (0.00)	**.030**
RAI	4 (14.81)	1 (4.35)	.219
ATD	4 (14.81)	2 (8.70)	.507
All equally	9 (33.33)	10 (43.48)	.461
Other	2 (7.41)	5 (21.74)	.145
None of the above	3 (11.11)	5 (21.74)	.524
All three modalities mentioned	16 (59.3%)	12 (52.17)	.320
Modality mentioned			
Surgery only	1 (3.70)	1 (4.35)	-
RAI only	2 (7.41)	0 (0.00)	-
ATD only	0.00 (0.00)	3 (13.04)	-
RAI and surgery only	3 (11.11)	2 (8.70)	-
RAI and ATD only	1 (3.70)	1 (4.35)	-
Surgery and ATD only	0.00 (0.00)	1 (4.35)	-
Videos that mentioned surgery			
Thyroidectomy guidelines mentioned			
Total thyroidectomy preferred	9 (33.33)	3 (13.04)	.094
High volume surgeon preferred	6 (22.22)	0 (0.00)	**.016**
Videos that mentioned RAI			
Radioactive iodine guidelines mentioned			

(*continued*)

Table 4. (continued)

Characteristic	Physician (n = 27) (n, %)	Nonphysician (n = 23) (n, %)	*P* value
Pregnancy contraindication	8 (29.63)	5 (21.74)	.526
Optimized health before use	2 (7.41)	1 (4.35)	.650
Videos that mentioned ATDs			
Anti-thyroid drug guidelines mentioned			
Reports at least one adverse effect	5 (18.52)	3 (13.04)	.599
TrAB testing prior to ATD discontinuation	4 (14.81)	0 (0.00)	.054
No guidelines mentioned	10 (37.04)	17 (73.91)	**.009**

Bold-face values are statistically significance $P < .05$.

endocrine surgery, and endocrinology, were compared to those produced by nonthyroid expert health professionals (11, 22.0%). A greater percentage of thyroid expert videos than nonthyroid experts mentioned the ATA guideline endorsement of seeking treatment from a high-volume surgeon (6, 30.0% vs 0, 0.0%, $P = .043$). No other significant differences were observed in video metrics or DISCERN assessments.

Factors Associated with Increased Overall Video Quality

In the univariate linear regression model of factors associated with overall DISCERN scores, duration of the video ($\beta = 0.032$, 95% confidence interval [CI]: 0.007-0.057, $P = .015$), videos posted by a medical journal user account (2.249, 0.158-4.340, $P = .036$), and videos aimed to educate providers (0.787, 0.022-1.552, $P = .044$) were positively associated with an increased DISCERN score (**Table 6**). Conversely, videos posted by patient user accounts (−1.003, −1.787 to −0.218, $P = .013$) and patient experience videos (−1.053, −1.703 to −0.403, $P = .002$) were negatively associated with a higher DISCERN score. Neither physician nor "thyroid expert" involvement significantly affected the DISCERN score in this statistical model.

In the multivariate linear regression model (**Table 7**), medical journal user accounts were negatively associated with a higher DISCERN score (2.416, 0.359-4.474, $P = .022$). Negative correlates included patient accounts (−1.176, −2.041 to −0.311, $P = .009$) and patient experience videos (−1.026, −1.694 to −0.357, $P = .003$).

Discussion

In this study assessing the quality of GD content on YouTube, we found that generally the content scored poorly in reliability, quality of treatment information, and overall quality. Higher quality scores were seen in videos associated with thyroid experts, medical journals, and provider education videos yet had lowered rates of engagement and viewership. Conversely, videos posted by patient user accounts, and patient experience videos were associated with lower scores but were more popular with higher engagement measures.

The power and pervasiveness of social media and internet-based information is significant. Over the past two decades, patients have increasingly turned to the Internet as an initial source of health information, often prioritizing it over direct contact with healthcare professionals.[12] In the United States alone, approximately 56% to 79% of internet users seek online health information, underscoring the immense power of this tool in guiding patient health inquiries.[13] YouTube is particularly relevant, with 83% of Americans using the online video-sharing platform, and is popular with young adults in the United States, as 95% of those aged 18 to 29 endorse utilizing the platform.[14,23]

Based on popularity, relevance, and user history rather than content quality, YouTube algorithms expose users to poor-quality information that could promote subpar health habits or treatment decision-making.[24] Moreover, the absence of an entry barrier for creating health-related video content may increase the volume of videos with poor content reliability and accuracy. These factors are concerning as higher engagement is associated with videos containing inaccurate medical information,[25,26] and a greater negative response is linked to videos with optimal content quality.[25,27,28] While good quality content is possible, it is not the standard for treatment-related videos on YouTube.[15,29]

This study supports this phenomenon, as GD treatment videos demonstrated poor reliability, quality, and overall value according to the DISCERN instrument. These data are consistent with previous studies displaying low DISCERN scores for YouTube content on thyroid-related topics, such as thyroid cancer and hypothyroidism.[16,17] Additionally, patients with limited health information literacy, often those of low education level or ethnic minority groups, are at increased risk of the adverse effects of poor information quality appraisal, which include increased hospitalizations, morbidity, and mortality.[30,31] Our findings highlight a substantial need for physicians and healthcare groups to expand patient education beyond the point of consultation to the online landscape and increase the quality of content produced. While clinical training may not traditionally prepare physicians for this emerging source of patient information, it is increasingly significant due to the power and widespread use of social media and online media sources.

Table 5. Comparison of Video Characteristics between Thyroid Expert and Nonthyroid Expert Involved Media

Characteristic	Thyroid expert (n = 20) (n, %)	Nonthyroid expert (n = 11) (n, %)	*P* value
Video metrics (mean, SD)			
Duration (min)	11.17 (15.31)	8.90 (6.19)	.644
Age (months)	67.70 (45.73)	50.00 (28.67)	.256
Likes (#)	141.00 (310.54)	290.36 (314.87)	.212
Views (#)	15,651.00 (27,448.28)	19,408.17 (23,062.38)	.773
Comments (#)	40.94 (81.67)	87.82 (127.33)	.254
Account subscribers (#)	125,564.15 (168647.29)	73,283.55 (173,179.37)	.420
Type of user account			
Patient	-	-	
Physician	0 (0.00)	5 (45.45)	**.001**
Healthcare group	13 (65.00)	1 (9.09)	**.003**
Nonphysician provider	0 (0.00)	4 (36.36)	**.004**
Academic institution	3 (15.00)	1 (9.09)	.639
Medical journal	1 (5.00)	0 (0.00)	.451
Device company	1 (5.00)	0 (0.00)	.451
Academic society	1 (5.00)	0 (0.00)	.451
Entertainment account	1 (5.00)	0 (0.00)	.451
Type of video			
Patient experience	2 (10.00)	1 (9.09)	.935
Patient education	13 (65.00)	8 (72.73)	.660
Provider education	3 (15.00)	1 (9.09)	.639
Self-promotion	2 (10.00)	1 (9.09)	.935
Country of origin			
US	18 (90.00)	8 (72.73)	.211
non-US	2 (10.00)	2 (18.18)	.516
DISCERN rating (mean, SD)			
Reliability	2.31 (0.92)	2.33 (0.48)	.468
Quality	2.38 (0.92)	2.31 (0.61)	.610
Overall	2.67 (1.35)	2.60 (0.80)	.565
Primary treatment focus of video			
Surgery	5 (25.00)	0 (0.00)	.070
RAI	2 (10.00)	2 (18.18)	.516
ATD	3 (15.00)	1 (9.09)	.639
All Equally	6 (30.00)	3 (27.27)	.873
Other	1 (5.00)	5 (45.45)	**.006**
None of the above	3 (15.00)	0 (0.00)	.177
All three modalities mentioned	12 (60.00)	5 (45.45)	.436
Modality mentioned			
Surgery only	1 (5.00)	1 (9.09)	.695
RAI only	2 (10.00)	2 (18.18)	.783
ATD only	0 (0.00)	0 (0.00)	-
RAI and surgery only	2 (10.00)	2 (18.18)	.639
RAI and ATD only	1 (5.00)	0 (0.00)	.451
Surgery and ATD only	1 (5.00)	0 (0.00)	.451
Videos that mentioned surgery			
Thyroidectomy guidelines mentioned			
Total thyroidectomy preferred	5 (25.00)	4 (36.36)	.505
High volume surgeon preferred	6 (30.00)	0 (0.00)	**.043**
Videos that mentioned RAI			
Radioactive Iodine guidelines mentioned			
Pregnancy contraindication	5 (25.00)	3 (27.27)	.890
Optimized health before use	1 (5.00)	1 (9.09)	.657

(*continued*)

Table 5. (continued)

Characteristic	Thyroid expert (n = 20) (n, %)	Nonthyroid expert (n = 11) (n, %)	*P* value
Videos that mentioned ATDs			
Antithyroid drug guidelines mentioned			
Reports at least one adverse effect	5 (25.00)	0 (0.00)	.070
TrAB testing prior to ATD discontinuation	4 (20.00)	0 (0.00)	.112

Bold-face values are statistically significance $P < .05$.

Table 6. Univariate Regression of Factors Associated with Increased Overall DISCERN Score

Characteristic	Beta coefficient	95% CI	*P* value
Video metrics (mean, SD)			
Duration (min)	0.032	[0.007-0.057]	**.015**
Age (months)	−0.004	[−0.012-0.004]	.341
Likes (#)	4.088×10^{-5}	[4.088×10^{-5}-4.088×10^{-5}]	.538
Views (#)	6.908×10^{-7}	[6.908×10^{-7}-6.908×10^{-7}]	.584
Comments (#)	-4.386×10^{-4}	[−0.001-0.001]	.393
Account subscribers (#)	3.393×10^{-7}	[-1.269×10^{-7}-8.056×10^{-7}]	.150
Type of user account			
Patient	−1.003	[−1.787 to −0.218]	**.013**
Physician	0.011	[−0.872-0.895]	.980
Healthcare group	0.477	[−0.178-1.132]	.149
Non-physician provider	0.235	[−0.598-1.069]	.573
Academic institution	0.127	[−1.003-1.256]	.823
Medical journal	2.249	[0.158-4.340]	**.036**
Device company	−1.178	[−2.705-0.349]	.127
Academic society	−1.159	[−3.324-1.005]	.287
Entertainment account	0.219	[−0.909-1.348]	.698
Type of video			
Patient experience	−1.053	[−1.703 to −0.403]	**.002**
Patient education	0.470	[−0.129-1.068]	.121
Provider education	0.787	[0.022-1.552]	**.044**
Self-promotion	−0.733	[−2.007-0.540]	.253
Country of origin			
US	0.040	[−0.727 to −0.807]	.917
non-US	−0.025	[−0.823-0.773]	.950
Physician involvement Specialty	0.489	[−0.109-1.088]	.107
Otolaryngology (ENT)	−1.006	[−2.544-0.531]	.194
Endocrinologist	0.426	[−0.362-1.215]	.282
Endocrine Surgeon	0.732	[−0.126-1.590]	.093

Bold-face values are statistically significance $P < .05$.

Physician-involved media were determined to have significantly higher DISCERN reliability and overall value. In contrast, videos not involving a physician had significantly greater likes, views, comments, and account subscribers—factors that increase the proliferative power of the information found within videos on social media.[32] Additionally, under the univariate and multivariate linear regression models, videos posted by patient accounts and patient experience videos were significant for a negative correlation with DISCERN score. These findings are supported by similar studies that have found that patient-derived media is associated with lower content quality via the DISCERN instrument.[33,34] Patient-derived videos may provide patients with reassurance and valuable perspectives but may introduce misunderstandings based on anecdotal experiences.[35,36] While clinician expertise is not expected from layperson accounts, these anecdotes can significantly impact the future decision-making of other patients. Conversely, videos posted by medical journal accounts and videos aimed to educate providers demonstrated a

Table 7. Multivariate Regression of Factors Associated with Increased Overall DISCERN Score

Characteristic	Beta coefficient	95% CI	*P* value
Video metrics (mean, SD)			
Duration (min)	0.063	[−0.003-0.130]	.059
Age (months)	−0.007	[−0.025-0.010]	.367
Likes (#)	0.001	[−0.002-0.004]	.519
Views (#)	0.000	[-1.895×10^{-5}-1.169×10^{-5}]	.593
Comments (#)	−0.001	[−0.004-0.003]	.720
Account subscribers (#)	0.000	[-3.823×10^{-6}-2.956×10^{-6}]	.771
Type of user account			
Patient	−1.176	[−2.041 to −0.311]	**.009**
Physician	−0.227	[−2.586-2.131]	.826
Healthcare group	0.546	[−0.082-1.175]	.087
Non-physician provider	1.026	[−1.671-3.723]	.398
Academic institution	−1.173	[−4.471-2.124]	.428
Medical journal	2.416	[0.359-4.474]	**.022**
Device company	−1.287	[−4.147-1.572]	.322
Academic society	−2.448	[−6.021-1.124]	.149
Entertainment account	−0.132	[−1.244-0.979]	.811
Type of video			
Patient experience	−1.026	[−1.694 to −0.357]	**.003**
Patient education	0.086	[−0.778-0.606]	.804
Provider education	−0.169	[−3.767-2.863]	.756
Self-promotion	−0.218	[−3.178-1.445]	.405
Country of origin			
US	0.307	[−1.928-3.463]	.522
non-US	0.178	[−2.896-3.852]	.747
Physician involvement	0.995	[−0.414-4.625]	.890
Specialty			
Otolaryngology (ENT)	−0.935	[−2.525-0.656]	.243
Endocrinologist	−0.331	[−2.822-0.882]	.256
Endocrine Surgeon	0.098	[−2.105-2.754]	.761

Bold-face values are statistically significance $P < .05$.

positive correlation with DISCERN score. This raises the possibility that collaborations between patient content creators and physicians or healthcare groups may better merge engagement with higher-quality information.[37]

When examining the specific information found in the videos, the majority (56%) discussed all three primary treatment modalities for GD—surgery, radioactive iodine (RAI), and antithyroid drugs (ATD). Yet, videos frequently did not address critical aspects of treatments as advised by ATA guidelines. These recommendations guide clinical management and, with proper adaptation for layperson understanding, can empower patients to become more efficacious shareholders in disease management.

There was little mention of crucial surgical guidelines for GD, such as a preference for total thyroidectomy (33.3% of videos) and surgery by experienced high-volume surgeons (16.7%). Total thyroidectomy has been associated with nearly negligible disease recurrence risk, starkly contrasting the 8% recurrence rate observed after subtotal thyroidectomy.[38-41] Additionally, studies have highlighted the positive correlation between improved patient outcomes and the thyroidectomy volume performed by the surgeon.[42,43]

Similarly, for those videos that discussed RAI as a treatment option (60.0%), only a minority (36.1%) mentioned the critical consideration of pregnancy contraindications, and few (8.3%) discussed the necessity of optimizing secondary health issues before administering RAI. Radioactive iodine can cause congenital hypothyroidism or, in extreme cases, birth defects and miscarriage.[44,45] Adequate management of conditions that may become unstable during RAI therapy, such as diabetes and cardiovascular, renal, or pulmonary disease, is essential before RAI administration.[46]

Regarding ATD treatment, less than a quarter of videos (23.5%) mentioned potential adverse effects that require physician involvement. These side effects, which include agranulocytosis, arthralgias, abdominal pain, nausea, and fatigue, may significantly impact patients' quality of life during treatment.[47] As poor preparedness for these effects may lead to premature withdrawal, patient exposure to high-quality online information that educates them on possible side effects of ATD use may improve patient adherence and/or communication about an adverse reaction.[47,48] Few sources mentioned the need for TRAb testing before ATD discontinuation (11.8%). TRAb testing is a mainstay for evaluating ATD treatment effectiveness, and an increased recurrence rate is associated with patients lost to follow-up for TRAb testing after ATD therapy.[4,49] This is particularly significant as the recurrence rate with ATD use is high, and recurrence may negatively impact patient quality of life.[50,51]

These findings indicate a significant gap between the content available on YouTube and the evidence-based guidelines recommended by medical experts. While creating high-quality, understandable, and engaging medical information content can be challenging, it remains a worthy cause, as increasing patients' exposure to high-quality medical information significantly increases their decision-making efficacy.[52] Leveraging the higher social media use of younger health professionals also may prove instrumental in bridging the gap between presenting evidence-based guidelines and increasing engagement on platforms like YouTube.[53]

This study has several limitations that warrant consideration. The DISCERN instrument was designed to evaluate the content quality of written media, thus the application to video content may only partially capture information delivery in this format. However, DISCERN has been used pervasively in similar investigations, and no similar video-evaluation instrument is available. The

sampling method focusing on the first 50 video results based on a single search parameter does not capture the vast information available on the dynamic platform but likely represents the most encountered videos during the study period. While not all content is intended, or required, to provide comprehensive and correct GD treatment education to patients, accessing inaccurate and/or incomplete information may still negatively influence patients. While DISCERN evaluation and guideline inclusion allowed for subjective bias, the investigation mitigated bias using multiple raters and calibration meetings.

Conclusion

This is the first study to evaluate social media content about GD treatment on YouTube. Low reliability, overall quality, and limited mention of recommended patient care components may result in the dissemination of suboptimal information to patients and the potential to adversely impact health decisions. These data suggest the need for more robust, evidence-based content about treating GD to inform patients.

Author Contributions

Oluwatobiloba Ayo-Ajibola, conception and design of work, data acquisition and analysis, interpretation of data, drafting of manuscript, critical revision; **Ryan J. Davis**, data acquisition and analysis, interpretation of data, drafting of manuscript, critical revision; **Claire Theriault**, data acquisition and analysis, interpretation of data, drafting of manuscript, critical revision; **Christopher Lamb**, data acquisition and analysis, critical revision; **Deborah Choe**, data acquisition and analysis, critical revision; **Matthew E. Lin**, data acquisition and analysis, interpretation of data, critical revision; **Trevor E. Angell**, conception and design of work, interpretation of data, drafting of manuscript, critical revision; **Daniel I. Kwon**, conception and design of work, interpretation of data, drafting of manuscript, critical revision.

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Supplemental Material

Additional supporting information is available in the online version of the article.

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