# YouTube Is an Inconsistent Source of Information on Orthobiologics: Implications for Content Quality, Reliability, Comprehensiveness, and Patient Decision Making

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**Purpose:** To assess the reliability, quality, and completeness of YouTube videos on orthobiologics and evaluate whether the content aligns with current clinical evidence and regulatory guidelines. **Methods:** One hundred YouTube videos on orthobiologics were analyzed using the *Journal of the American Medical Association* (JAMA) benchmark score, the Global Quality Scale (GQS), the modified DISCERN questionnaire, and an orthobiologics grading system (OGS). Video views, duration, source, and content type were examined to determine their impact on informational quality. **Results:** Of the 100 videos reviewed, 18 were excluded for reasons such as unrelated content or duplication, leaving 82 for analysis. The average number of views per video was 5,217, with a total of 427,825 views. Most videos (33%) were uploaded by independent users, whereas only 1% were from government or news agencies. The mean JAMA score was 2.8 (indicating low-moderate transparency and credibility); GQS score, 3.2 (reflecting moderate overall quality); modified DISCERN score, 3.7 (representing moderate reliability in discussion of treatments); and OGS score, 9.6 (indicating limited comprehensiveness with many videos lacking critical details). There were no significant associations between video source or verification status and any scoring metrics ($P > .05$). Longer videos were associated with higher JAMA, GQS, DISCERN, and OGS scores ($P < .05$). Health information websites had higher OGS scores ($P = .001$). **Conclusions:** YouTube videos on orthobiologics show low to moderate reliability and quality, with limited comprehensiveness. Most content is produced by independent users, with minimal contributions from verified health organizations. Longer videos were associated with higher quality scores, whereas verification status and video source showed no significant correlation with content quality. **Clinical Relevance:** Given YouTube's role as a health information source, this study highlights the need to enhance the quality of educational content on orthobiologics to better support patient understanding and decision making.

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With the rise of social media, video-sharing platforms, and other online resources in recent decades, patients increasingly turn to these sources for health care information. A 2021 global survey revealed that 49% of adults obtained their health and wellness advice primarily from online media in the 3 months leading up to the survey, compared with only 19% from health care providers and 18% from established medical associations.[1] This trend raises concerns because online media, while convenient and accessible, often lacks the regulation and oversight provided by qualified health care professionals. It is also documented that 82% of patients either never or only occasionally bring up the information they find online with their physicians when in a clinical setting.[2] This lack of communication between patients and their physicians may propagate the potential for misinformation, compromising the physician-patient consensual decision-making process. Relying heavily on unregulated online sources exposes patients to advice that may be inaccurate, incomplete, or not suited to their specific health needs.[3-5]

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These challenges are further exacerbated by the role of artificial intelligence algorithms, which can sometimes prioritize engagement-driven content over accuracy, potentially amplifying unregulated or misleading health information.[6] As artificial intelligence—driven content curation expands, there is concern that algorithms may favor sensationalized or commercially motivated videos over scientifically vetted educational material.[7]

Orthobiologics represent a cutting-edge approach in musculoskeletal medicine, harnessing the body's natural healing processes to enhance tissue repair and regeneration. These treatments offer exciting potential for accelerating recovery and improving outcomes in patients with orthopaedic conditions.[8,9] As research continues to evolve, these biological therapies hold promise for revolutionizing musculoskeletal care by reducing pain, improving function, and potentially delaying or even preventing the need for surgical intervention.[10]

The issues related to online content quality are particularly relevant in this rapidly evolving field of orthobiologics in which patients are increasingly seeking online information about treatments involving biological substances to enhance musculoskeletal healing. Various treatments, such as platelet-rich plasma and concentrated bone marrow aspirate, have been more extensively researched and used in clinical practice,[11-14] whereas others, including adipose-derived mesenchymal stromal cell therapies and amniotic therapies, remain largely investigational, with more limited high-quality evidence supporting their use.[15,16] Recently, direct-to-consumer marketing of orthobiologics by United States companies has increased significantly, often outpacing clinical evidence and regulatory oversight and raising concerns.[17] The marketing tactics of clinics and businesses particularly through social media, video content, and print media often present overwhelmingly positive portrayals of cellular therapies while omitting essential information about potential risks, limitations, and lack of regulatory approval. This selective marketing raises significant ethical concerns because it may mislead patients and compromise their ability to provide fully informed consent. Without a balanced understanding of the benefits and risks, patients are vulnerable to making decisions based on incomplete or biased information, further fueling the rise of "stem cell tourism" and perpetuating vague regulatory language that obscures the true status of these marketed products.[18-21] In contrast, qualified physicians and clinician-scientists are making tremendous strides by delivering a responsible and balanced perspective on orthobiologics. Their work highlights the true risks and benefits of these therapies supported by legitimate data and promising research that explores the potential benefit of orthobiologic use when applied in appropriate and evidence-based contexts.[11-14]

With over 2.7 billion monthly active users globally, YouTube (Alphabet, Mountain View, CA) is one of the most influential platforms for content consumption, education, and marketing, with nearly half of the world's internet users accessing the platform each month in 2024.[22] Reports from online marketing platforms indicate that YouTube is the second most visited website globally, surpassed only by Google (Alphabet).[23] As a result, the video-sharing platform has become a significant breeding ground for the dissemination of health care information on many different medical topics. Previous studies have assessed the content quality of YouTube videos on a broad range of health-related topics including vaccinations, smoking cessation, obesity management, and cardiopulmonary resuscitation.[24-27] Particularly within the realm of sports medicine, content and reliability evaluations exist for videos reviewing anterior cruciate ligament injuries, posterior cruciate ligament injuries, knee osteoarthritis, patellar dislocations, hip arthritis, and concussions.[2,28-32]

Although prior studies have assessed the quality and reliability of YouTube videos on various medical and musculoskeletal topics, the extent to which orthobiologic-related content meets similar standards remains unclear. Given the proliferation of online information and concerns surrounding promotional practices in regenerative medicine, a systematic evaluation of YouTube videos on orthobiologics is warranted. The purpose of this study was to assess the reliability, quality, and completeness of YouTube videos on orthobiologics and evaluate whether the content aligns with current clinical evidence and regulatory guidelines. We hypothesized that a significant portion of the content on orthobiologics might have lacked critical information regarding risks and benefits of treatment, potentially misleading patients seeking these therapies.

## Methods

### Search Strategy

A search of the YouTube online library (https://www.youtube.com) was performed using the keyword "orthobiologics" on October 16, 2023. To account for YouTube's personalized search algorithm, which is heavily influenced by factors such as a user's viewing history, prior searches, and geolocation, the search was conducted in Google Chrome's incognito mode.[33] YouTube's default setting for organizing search results is by relevance, so the search was conducted using this default order. The first 100 eligible videos were further assessed for this study. Videos were excluded from the study if they were not in English, required the user to sign in, lacked appropriate audio support, were age

restricted, were duplicates of already included videos, or were irrelevant to the orthopaedic search topic. Age-restricted and sign in—required videos were excluded to ensure that the analyzed content was publicly accessible without additional barriers, aligning with the study's goal of evaluating readily available educational materials.

### Video Characteristics

Characteristics of the analyzed videos were gathered and organized in a Microsoft Excel spreadsheet (Redmond, VA). The following variables were collected: (1) video title, (2) video duration, (3) number of views, (4) source or uploader of the video, (5) days since upload, (6) view ratio (views per day), (7) number of likes and dislikes, (8) like ratio (Likes × 100/Total likes + dislikes), and (9) video power index. The video power index, used in other studies to standardize measurements of relative likeness and popularity, was calculated as (Like ratio × View ratio)/100.[34]

Videos were categorized based on their primary focus. "General information" videos provided an overview of orthobiologics, whereas "specific product/condition" videos centered on a single orthobiologic therapy or orthopaedic condition. The sources or uploaders of each video were then categorized into appropriate groups. The categories for source or uploader included (1) independent users, (2) medical advertisements or profit companies, (3) university channels or professional organizations, (4) health information websites, and (5) government or news agencies. Uploader account verification status was also recorded.

### Assessment of Video Reliability, Educational Quality, and Content Completeness

Two reviewers (K.M.J., T.P.) individually viewed and scored all 100 videos using the following evaluation systems: (1) *Journal of the American Medical Association* (JAMA) benchmark score, (2) Global Quality Scale (GQS), (3) modified DISCERN questionnaire, and (4) orthobiologics grading system (OGS). The JAMA benchmark score, GQS, and modified DISCERN tool are established scoring systems that have been used in similar YouTube-based studies on orthopaedic conditions.[2,28,31,34-36] Although the JAMA and DISCERN systems were originally developed for written content, they have been widely adopted in prior research assessing video-based health information, particularly in orthopaedic and musculoskeletal studies.[28,31] In this study, their application follows established methodologies for evaluating transparency, reliability, and educational quality in audiovisual formats. The OGS is a newly developed grading system, created by us specifically for this study and not previously used in any other research. It was designed to systematically evaluate key factors relevant to orthobiologics-related content in a structured and reproducible manner. Each of these tools assesses different aspects of video content.

The JAMA benchmark score assessed source reliability based on 4 criteria: authorship, attribution, currency, and disclosure. Each criterion was scored on a scale of 0 to 1, with a maximum of 4 indicating fully sufficient transparency and credibility.[37]

The GQS assessed overall content quality, evaluating factors such as clarity, coherence, depth of information, and educational value. Each video was rated using a 5-point scale, with higher scores indicating better educational quality. Scores of 4 and 5 denoted high-quality content, characterized by thorough explanations, clear presentation, and comprehensive topic coverage. A score of 3 indicated moderate quality, where information was generally accurate but lacked depth or detail. Scores of 1 and 2 reflected poor quality, often marked by minimal coverage, unclear presentation, or limited usefulness to viewers. Although the GQS has not been formally validated, it has been widely adopted in previous studies.[35,36]

The modified DISCERN tool was used to assess the reliability and quality of treatment-related information, specifically evaluating whether videos presented a balanced and unbiased discussion of risks, benefits, and treatment options. Originally developed to assess the quality of written health information, the DISCERN tool has been adapted for multimedia content to evaluate the reliability of treatment details.[38] The modified DISCERN tool assigns scores based on 5 yes-no questions, with a maximum score of 5 points. Scores of 4 and 5 indicate high-quality, reliable content that thoroughly addresses treatment benefits and risks with minimal bias. A score of 3 reflects moderate reliability, where information is somewhat useful but lacks depth or balance. Scores of 1 and 2 denote low-quality content, often characterized by incomplete information, unclear treatment risks, or potential bias. Higher scores indicate greater reliability and thoroughness in the presentation of treatment information. The guidelines and scoring systems for the JAMA, GQS, and modified DISCERN tools are presented in Table 1.

We developed the OGS to systematically assess the comprehensiveness of video content on orthobiologics. It evaluates key concepts—such as indications, mechanisms of action, risks, and regulatory considerations—with a focus on ensuring alignment with current clinical evidence and guidelines. The OGS was developed based on guidelines from the American Academy of Orthopaedic Surgeons[39] and incorporates 20 evaluation criteria, similar to other recently developed assessments used in related studies[2,30,31] (Table 2).

Although the OGS follows a structured approach similar to other content evaluation methods, it was developed specifically for this study to assess orthobiologic content. Each video received 1 point per criterion,

**Table 1.** Scoring Criteria and Interpretation for Video Assessment: JAMA Benchmark Score, GQS Score, and Modified DISCERN Score

| Scoring System | Criteria, Score, or Item Number | Description |
|---|---|---|
| JAMA benchmark score | Authorship | The affiliations and credentials of all authors and contributors are provided. |
| | Attribution | The references and sources for all content are provided, and all copyright information is clearly listed. |
| | Currency | The dates of content posting and updates, if applicable, are provided. |
| | Disclosure | Full disclosure for video ownership, conflicts of interest, sponsorships, advertising, and commercial funding is provided. |
| GQS score | 1 | The video is unlikely to be useful for patients; it consists of poor quality and flow with information missing. |
| | 2 | The video is of limited use to patients; it generally consists of poor quality and flow with limited information given. |
| | 3 | The video is somewhat useful for patients; it consists of moderate quality and flow with some information adequately discussed. |
| | 4 | The video is useful for patients; it consists of good quality and flow with most of the relevant information discussed. |
| | 5 | The video is very useful for patients; it consists of excellent quality and flow. |
| Modified DISCERN score (Each item scored 1 = "Yes" or 0 = "No"; total out of 5) | 1 | Are the aims clear and achieved? |
| | 2 | Are reliable sources of information used (e.g., publication cited or speaker is specialist on topic)? |
| | 3 | Is the information presented balanced and unbiased? |
| | 4 | Are additional sources of information listed for patient reference? |
| | 5 | Are areas of uncertainty mentioned? |

NOTE. Each scoring system assigns a total score based on the outlined criteria. For the JAMA score, a total of 4 points indicates the highest level of transparency and credibility whereas a score of 1 reflects minimal adherence to these benchmarks. The GQS rates overall video quality, with 5 indicating excellent quality and 1 representing poor quality. The modified DISCERN tool consists of 5 yes/no items, each scored 1 if met. Total score ranges from 0 to 5, with higher scores reflecting greater reliability in treatment discussions.

GQS, Global Quality Score; JAMA, *Journal of American Medical Association*.

with a maximum score of 20 indicating more complete, detailed, and well-rounded content. Videos were categorized as excellent (16-20 points), good (11-15 points), fair (6-10 points), or poor (1-5 points), with higher scores reflecting greater adherence to evidence-based guidelines and more comprehensive coverage of key orthobiologic concepts.

After the independent scoring of all videos, the average score for each scoring assessment was calculated between the 2 reviewers. Interobserver reliability was calculated with the Cohen κ coefficient to assess the degree of agreement between the 2 raters, with agreement categorized as slight (0.00-0.20), fair (0.21-0.40), moderate (0.41-0.60), substantial (0.61-0.80), or almost perfect (0.81-1.00).[40]

## Statistical Analysis

All statistical analyses were performed using RStudio (version 4.3.0; RStudio, Boston, MA). Descriptive statistics were used to quantify video characteristics as well as video reliability, quality, and comprehensiveness scores. Continuous variables (e.g., video views, duration, and like ratio) are presented as means with standard deviations and ranges. Shapiro-Wilk testing assessed for normal distribution of continuous variables. Categorical variables (e.g., video source and verification status) are presented as relative frequencies with percentages. The Kruskal-Wallis test was used to compare video reliability and quality scores across video source categories. This nonparametric approach was selected because of the ordinal nature of these scores and the potential for non-normal distributions. Multivariable linear regression analyses were used to determine the influence of specific video characteristics on video reliability, educational quality, and comprehensiveness. Variables were included in the final model if they exhibited $P < .15$ in the univariable analysis, a commonly used threshold to ensure that potentially relevant predictors are retained for multivariable modeling.[41] Continuous predictor variables (e.g., video duration, views, and like ratio) were included as numerical values, whereas categorical predictors (e.g., video source and verification status) were also included in the model. Assumptions of linear regression were evaluated, including linearity, independence, homoscedasticity, and normality of residuals, using a histogram and Q-Q plot. Robust regression and log transformation were used in the setting of extreme outliers and skewed residuals, respectively. A 2-tailed $P < .05$ was

**Table 2.** Orthobiologics Grading System

| Category | Orthobiologics Grading System Description |
|---|---|
| Presentation | Describes indications |
| | Describes symptoms |
| | Describes patient population |
| Diagnosis and evaluation | Describes physical examination findings |
| | Mentions use of diagnostic imaging |
| | Describes indications for surgical treatment |
| | Mentions commonly associated surgical procedures |
| Treatment | Discusses risks and alternative treatments |
| | Discusses pathologies that may be addressed concomitantly |
| | Discusses joint restoration |
| | Discusses joint replacement |
| Postoperative course | Describes complications |
| | Discusses outcomes |
| General information | Outlines return-to-function timeline |
| | Discusses options for repeated therapy |
| | Discusses orthobiologic nomenclature and therapy differences |
| | Discusses orthobiologic content |
| | Describes mechanism of action |
| | Discusses cost and insurance coverage or lack thereof |
| | Discusses regulatory oversight or approval |

considered to indicate statistical significance. Finally, correlations between the OGS score and the GQS, DISCERN, and JAMA scores were assessed with Spearman rank correlation. A correlation coefficient greater than 0.70 was identified as a strong association, whereas a correlation coefficient of less than 0.7 was identified as a moderate or weak association.

## Results

Of the 100 initial videos identified from the search, 18 were excluded from analysis because they had content unrelated to the subject matter (n = 10), had no audio (n = 2), were age restricted (n = 1), or were duplicates of videos that already met the inclusion criteria (n = 5). The mean number of views per video was 5,217.4 ± 39,801.2. Collectively, the 82 videos were viewed 427,825 times. The maximum number of views was 359,806, and the minimum number of views was 7. Given the large variability in video views, the data were highly skewed, with a small number of videos accumulating disproportionately high view counts. Mean and standard deviation were reported to maintain consistency with prior studies and alignment with statistical modeling conventions. Of the 82 videos analyzed, 69 presented general information on various orthobiologic products and uses, whereas the remaining videos focused on either a specific product or a specific orthopaedic condition. This information and other video characteristics are described in Table 3.

Video source was classified primarily as independent users (n = 27, 33%), whereas government or news agencies were the least frequent video source (n = 1, 1%) (Fig 1). Eighty-one videos (98.7%) were from non-verified YouTube accounts. The mean JAMA score was 2.8 ± 0.86 (of 4), indicating low-moderate transparency and credibility. The mean GQS score was 3.2 ± 1.10 (of 5), reflecting moderate overall quality. The mean modified DISCERN score was 3.7 ± 1.02 (of 5), representing moderate reliability in discussion of treatments. The mean OGS score was 9.6 ± 5.50 (of 20), suggesting limited comprehensiveness, with many videos lacking critical details on indications, mechanisms, risks, regulatory considerations, and current evidence and guidelines (Table 4). Interobserver reliability was categorized as fair for the JAMA tool, with a score of 0.322 (95% confidence interval [CI], 0.176-0.459), and as moderate for the other 3 scoring systems, with the GQS scoring 0.588 (95% CI, 0.481-0.696), the DISCERN tool scoring 0.537 (95% CI, 0.349-0.725), and the OGS scoring 0.593 (95% CI, 0.478-0.708).

There were no significant associations between video source and the JAMA score ($P = .126$), GQS score ($P = .451$), DISCERN score ($P = .071$), and OGS score ($P = .181$). There were no significant associations between verification status and the JAMA score ($P = .592$), GQS score ($P = .732$), DISCERN score ($P = .647$), and OGS score ($P = .932$).

Multivariate linear regression analyses were performed to determine whether independent associations existed between video characteristics, video upload source, video reliability, and educational quality by using the JAMA, GQS, DISCERN, and OGS scores. Longer videos were an independent predictor of increased JAMA ($\beta = .0001$, $P < .001$), GQS ($\beta = .0001$, $P = .022$), DISCERN ($\beta = .0003$, $P < .001$), and OGS ($\beta = .002$, $P < .001$) scores. Video sources originating from health information websites were predictive of greater OGS scores ($\beta = 5.648$, $P = .001$). Spearman rank correlation determined strong associations between the OGS score and the JAMA ($r = 0.710$, $P < .001$), GQS ($r = 0.775$, $P < .001$), and DISCERN ($r = 0.763$, $P < .001$) scales.

## Discussion

This study found that YouTube videos on orthobiologics frequently lacked transparency, educational quality, and comprehensiveness, raising concerns about their reliability as a health information source. The mean JAMA score of 2.8 suggests insufficient transparency and credibility, whereas the GQS and DISCERN scores, which assess overall quality and treatment reliability, respectively, fell within the moderate range but failed to meet high standards. The OGS

**Table 3.** Video Characteristics of YouTube Videos

| Characteristic | Mean | SD | Minimum | Maximum | Median (IQR) | Specific Topic: Quantity of Videos |
|---|---|---|---|---|---|---|
| Video duration | 1,068.0 | 1,544.9 | 30.0 | 7,771.0 | 194 (114.8-1,616.2) | — |
| Views | 5,217.4 | 39,801.2 | 7.0 | 359,806.0 | 178 (77.2-459.8) | — |
| Days since upload | 1,162.0 | 741.3 | 76.0 | 3,294.0 | 1,130 (552.0-1,545.8) | — |
| View ratio | 2.0 | 12.9 | 0.0 | 116.4 | 0.2 (0.1-0.5) | — |
| Likes | 36.5 | 289.7 | 0.0 | 2,627.0 | 1 (0-5) | — |
| Dislikes | 2.0 | 17.3 | 0.0 | 157.0 | 0 (0-0) | — |
| Like ratio | 97.8 | 13.2 | 0.0 | 100.0 | 100 (100-100) | — |
| Video power index | 2.4 | 14.3 | 0.0 | 109.8 | 0.2 (0.1-0.5) | — |
| Specific topic | | | | | | |
| General information | — | — | — | — | — | 69 |
| RCR augmentation | — | — | — | — | — | 3 |
| Knee OA | — | — | — | — | — | 5 |
| Hip pain | — | — | — | — | — | 1 |
| cBMA | — | — | — | — | — | 2 |
| PRP | — | — | — | — | — | 1 |
| ADMSCs | — | — | — | — | — | 1 |

NOTE. Eighty-two videos met the criteria for inclusion and their characteristics were recorded. The view ratio was determined by views per day. The video power index was calculated as (Like ratio × View ratio)/100.

ADMSC, adipose-derived mesenchymal stromal cell; cBMA, concentrated bone marrow aspirate; IQR, interquartile range (25th-75th percentile); OA, osteoarthritis; PRP, platelet-rich plasma; RCR, rotator cuff repair; SD, standard deviation.

score indicated that content was, on average, deficient in comprehensiveness, with many videos lacking critical details. A significant portion of content (33%) was produced by independent users, with only 1% originating from government or news agencies. Longer videos were associated with higher scores across all assessment tools, suggesting that video duration may be linked to more comprehensive content.

These findings are consistent with previous research evaluating YouTube as a source of information in the field of sports medicine. Cassidy et al.[28] found that videos on anterior cruciate ligament injuries were often of low quality and unreliable, and Kunze et al.[2] reported similar results for posterior cruciate ligament content. Abed et al.[31] showed that YouTube videos on patellar dislocations generally lacked transparency, and Wong et al.[30] highlighted frequent omissions of critical treatment information in videos about knee osteoarthritis. In a study examining YouTube videos on concussions, Williams et al.[29] found that limited contributions to the website came from professional or academic organizations, underscoring an opportunity

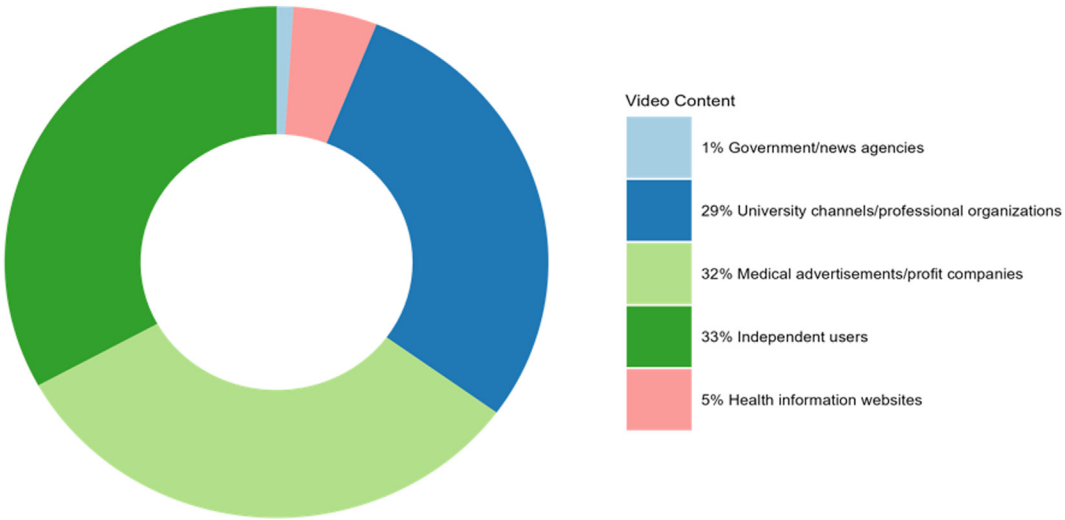


**Fig 1.** Donut chart depicting relative frequency of video content on orthobiologics-related videos. Each color represents a distinct category, labeled adjacent to the chart. Percentages are derived from the 82 videos included in this study.

**Table 4.** Mean Quality and Reliability Scores per Video Content and Video Source Variables

| | JAMA Benchmark Score | | GQS Score | | Modified DISCERN Score | | Orthobiologic Grading System Score | |
|---|---|---|---|---|---|---|---|---|
| Grouping Variables | Mean (SD) | Median (IQR) | Mean (SD) | Median (IQR) | Mean (SD) | Median (IQR) | Mean (SD) | Median (IQR) |
| Video source | | | | | | | | |
| Independent users | 2.8 (0.8) | 2.5 (2.5-3.0) | 3.3 (1.1) | 3.5 (2.8-4.0) | 3.5 (1.2) | 3.5 (3.5-4.5) | 7.8 (3.1) | 7.5 (5.2-10.2) |
| Medical advertisements or profit companies | 2.6 (0.5) | 2.5 (2.5-2.5) | 3.0 (0.9) | 3 (2.5-3.5) | 3.5 (0.6) | 3.5 (3.0-4.0) | 7.8 (3.0) | 7.8 (5.6-9.9) |
| University channels or professional organizations | 3.0 (0.7) | 3.0 (2.5-3.5) | 3.4 (1.0) | 3.5 (2.9-4.1) | 4.0 (0.7) | 3.8 (3.5-4.5) | 8.8 (3.8) | 7.8 (5.5-12.4) |
| Health information websites | 3.0 (0.0) | 3.0 (3.0-3.0) | 3.1 (0.5) | 3.2 (2.9-3.5) | 4.5 (0.4) | 4.5 (4.4-4.6) | 11.9 (0.9) | 12.2 (11.6-12.5) |
| Government or news agencies | 2.5 (NA) | 2.5 (2.5-2.5) | 3.5 (NA) | 3.5 (3.5-3.5) | 4.0 (NA) | 4.0 (4.0-4.0) | 8.0 (NA) | 8 (8-8) |
| *P* value | .126 | | .451 | | .071 | | .181 | |
| Verification | | | | | | | | |
| Yes | 2.5 (NA) | 2.5 (2.5-2.5) | 3.5 (NA) | 3.5 (3.5-3.5) | 4.0 (NA) | 4.0 (4.0-4.0) | 8.0 (NA) | 8.0 (8.0-8.0) |
| No | 2.8 (0.7) | 2.5 (2.5-3.0) | 3.2 (1.0) | 3 (2.5-4.0) | 3.7 (0.9) | 3.5 (3.5-4.5) | 8.3 (3.3) | 7.5 (5.5-11.5) |
| *P* value | .592 | | .732 | | .647 | | .932 | |

NOTE. Video reliability and educational quality were stratified by video source and video verification status.

IQR, interquartile range (25th-75th percentile); JAMA, *Journal of the American Medical Association*; QGS, Global Quality Score; SD, standard deviation; NA, not applicable.

for sports medicine experts to fill a void on this platform by providing educational content on concussion prevention, recognition, and management.

Although unsubstantiated online information is a concern in all areas of sports medicine, it is particularly critical in the field of orthobiologics, where prior literature has highlighted the rise of concerning marketing practices in recent years.[17] Many orthobiologic products are classified as minimally manipulated and intended for homologous use, placing them under Section 361 of the Public Health Service Act rather than requiring full Food and Drug Administration premarket approval like traditional drugs or medical devices.[42] This distinction exempts them from the lengthy Biologics License Application process required under Section 351, although they must still adhere to Food and Drug Administration safety regulations. However, the complexity and variability in biologic product composition present additional hurdles for standardization, and the evolving evidence base, coupled with the need for long-term randomized controlled trials, further complicates regulatory clarity.[43]

Limited regulatory oversight, combined with the accessibility of online platforms, has fueled the rapid expansion of a direct-to-consumer market, often targeting patients seeking alternative treatments.[22,23] Some marketing strategies have been described in the literature as overly promotional, emphasizing benefits while omitting comprehensive discussions of risks and limitations, potentially fostering unrealistic expectations.[19] This imbalance in communication may exploit patient vulnerabilities, particularly when information lacks sufficient context regarding scientific evidence and the realistic scope of these therapies. Additionally, variability in preparation protocols, patient selection criteria, and procedural techniques complicates efforts to standardize orthobiologic therapies, underscoring the need for stronger oversight and postmarket surveillance.[44,45]

Ramkumar et al.[19] conducted a social media analysis on the marketing of a subset of orthobiologic therapy in musculoskeletal medicine and reported that 94% of posts presented an exclusively positive tone, often with little to no discussion of risks or alternative treatments. Other authors highlight the use of ambiguous language by clinics when describing the regulatory status of their biologic products.[18,21] Meanwhile, ongoing research by qualified physicians and clinician-scientists continues to advance the field, refining and improving these therapies through rigorous study and responsible representation of treatment outcomes.[11-14] Their commitment to providing accurate, evidence-based insights reinforces the importance of clear, patient-centered education to support informed decision making. However, even well-intentioned study groups face challenges in comprehensively addressing orthobiologic preparation, processing, and formulation in peer-reviewed research, reflecting the complexity of this evolving field.[46,47]

The widespread availability of misleading or incomplete information on YouTube regarding orthobiologics may contribute to patient misconceptions about these therapies and potentially pose a substantial risk to patient decision making. As online platforms become increasingly dominant sources for health information

particularly among younger and tech-savvy populations, ensuring access to accurate and evidence-based content remains a priority. If patients rely on content that lacks critical details about risks and effectiveness, they may pursue unproven treatments, misinterpret the safety and benefits of biologic therapies, or hold unrealistic expectations. This highlights a growing need for stronger oversight and a concerted effort from health care professionals to ensure that balanced, well-sourced, and comprehensive educational materials are available to the public. Improving the visibility of high-quality, evidence-based videos through voluntary collaborations between medical organizations, content creators, and online platforms may help users make informed decisions. Encouraging academic institutions, professional societies, and regulatory agencies to engage more actively in online education could provide a broader range of perspectives and increase the availability of well-sourced information. Enhanced collaboration between the medical community, regulatory agencies, and content platforms could help bridge the gap between online health information and evidence-based medicine, guiding patients toward reliable sources of information to support informed decision making.

### Limitations

The interpretation of this study's results should consider several limitations. The videos included in this study were limited to the first 100 videos provided by the search query, reflecting the most-viewed and algorithmically prioritized content at the time of the search. Although the search strategy accounted for potential biases by using Google Chrome's incognito mode to minimize personalization and using default YouTube settings to sort by relevance, the reliance on YouTube's dynamic ranking algorithm means that results may vary depending on factors such as timing, location, or updates to video rankings. This approach aligns with methodologies used in similar studies but may not fully capture the entire spectrum of available content on this topic, potentially limiting the study's generalizability. Additionally, the intent behind each video analyzed remains unclear and likely shaped the content presented by its creators. Videos created for educational purposes may emphasize transparency and reliability, whereas promotional content may prioritize engagement and omit critical details, leading to variability across different assessment tools. Some video creators may not have aimed to provide an in-depth discussion on specific aspects of orthobiologics, which could have influenced the scores assigned by the various assessment tools.

Interobserver reliability for the JAMA score was categorized as fair, which may be due to variability in how authorship and attribution are presented in video content. Unlike written health sources, YouTube videos differ in whether these elements appear in descriptions, via on-screen text, or verbally, leading to potential differences in reviewer interpretation. This variability introduces a level of subjectivity, which may affect the consistency of JAMA score assessments.

Furthermore, the search was conducted using only the keyword "orthobiologics," which may not fully reflect the terms patients commonly use when seeking information. Alternative terms such as "PRP treatment," "stem cell therapy," or "regenerative medicine" might yield different results, potentially limiting the scope of identified videos.

## Conclusions

YouTube videos on orthobiologics show low to moderate reliability and quality, with limited comprehensiveness. Most content is produced by independent users, with minimal contributions from verified health organizations. Longer videos were associated with higher quality scores, whereas verification status and video source showed no significant correlation with content quality.

## Disclosures

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