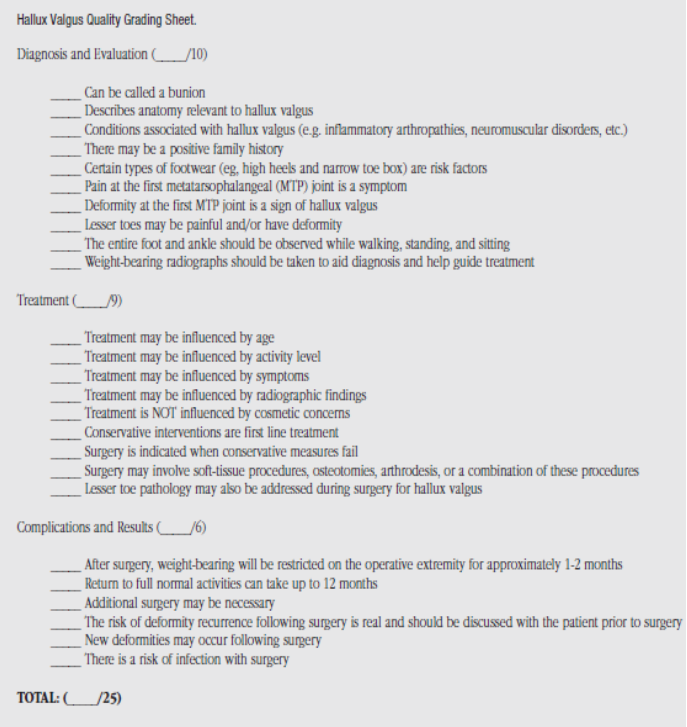
all related copyright information. 3) Disclosure needs specific and complete disclosure of website ownership, including financial and commercial ties and probable conflicts of interest. 4) Currency ensures dating of content during the initial upload and on subsequent updates. A score is awarded based on each of the met criteria, getting the scores ranging from 0 to 4, and 4 indicates better quality.

For this study, all videos were assessed by two independent observers with the grading system described by Tartaglione et al. to evaluate the accuracy, readability, and quality of online resources about Hallux Valgus. All videos were scored independently[17]. There were25 items in a quality grading sheet with the elements of diagnosis, treatment plan, anatomy, and complications for the hallux valgus (Figure 1). The quality of each website which was included in the study was evaluated by the reviewers. The two reviewers' quality scores were combined and averaged, leading to a mean quality score (at most 25 points) for each website. Consensus discussion was made to clarify discrepancies of the categories. The videos were evaluated using seven criteria for source and five standards for content.

Source-based categories included 1) physician (author or authors were group or individual physicians with no research or university group), 2) academic (authors or author affiliated with a research or university group), 3) non-physician (allied physiotherapists, health professionals, chiropractors, alternative medical providers, and occupational therapists), 4) medical (websites related to health), 5) trainer, 6) patient, and 7) commercial.

Content-based categories were 1) information about the disease, 2) surgical technique, 3) exercise training, 4) chiropractic treatment, and 5) advertisement.



Hallux Valgus Quality Grading Sheet.

Diagnosis and Evaluation (____/10)

____ Can be called a bunion
____ Describes anatomy relevant to hallux valgus
____ Conditions associated with hallux valgus (e.g. inflammatory arthropathies, neuromuscular disorders, etc.)
____ There may be a positive family history
____ Certain types of footwear (eg, high heels and narrow toe box) are risk factors
____ Pain at the first metatarsophalangeal (MTP) joint is a symptom
____ Deformity at the first MTP joint is a sign of hallux valgus
____ Lesser toes may be painful and/or have deformity
____ The entire foot and ankle should be observed while walking, standing, and sitting
____ Weight-bearing radiographs should be taken to aid diagnosis and help guide treatment

Treatment (____/9)

____ Treatment may be influenced by age
____ Treatment may be influenced by activity level
____ Treatment may be influenced by symptoms
____ Treatment may be influenced by radiographic findings
____ Treatment is NOT influenced by cosmetic concerns
____ Conservative interventions are first line treatment
____ Surgery is indicated when conservative measures fail
____ Surgery may involve soft-tissue procedures, osteotomies, arthrodesis, or a combination of these procedures
____ Lesser toe pathology may also be addressed during surgery for hallux valgus

Complications and Results (____/6)

____ After surgery, weight-bearing will be restricted on the operative extremity for approximately 1-2 months
____ Return to full normal activities can take up to 12 months
____ Additional surgery may be necessary
____ The risk of deformity recurrence following surgery is real and should be discussed with the patient prior to surgery
____ New deformities may occur following surgery
____ There is a risk of infection with surgery

**TOTAL: (____/25)**

**Figure 1:** Hallux valgus quality assessment scale described by Tartaglione et al.(16)

## Statistical Analysis

When the study findings were evaluated, IBM SPSS Statistics 22 for statistical analysis (SPSS IBM, Turkey) was used. To evaluate the study data, suitability of the parameters to the normal distribution was assessed with the Shapiro Wilks test. Besides the descriptive statistical methods (standard deviation, mean, frequency), the parameters not showing a normal distribution in the quantitative data were compared using the Kruskal Wallis test. Dunn's test was used to identify the group causing the difference. Spearman's rank correlation coefficient analysis was used to investigate the relationships between parameters not conforming to normal distribution. To determine the level of observer agreement, the

intraclass correlation coefficient (ICC), lower and upper limits were calculated. $p < 0.05$ level was statistically significant.

## RESULTS

After the videos meeting the exclusion criteria were removed, 64 videos were evaluated for the

study. The values examined in the study parameters and the video distribution by year are shown in Table 1. The sources of the videos include 26.6% non-physician, 26.6% physician, 21.9% medical, 12.5% academic, 6.3% commercial, 4.7% trainer and 1.6% patient (Figure 2). The contents of the videos represented 29.7% exercise, 28.1% surgical, 21.9% disease information, 14.1% chiropractor and 6.3% advertisements (Figure 3).

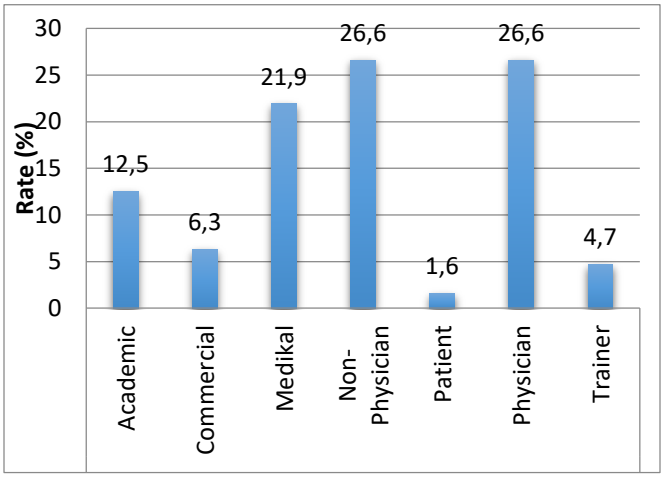



**Figure 2:** Categorical distribution of the videos based on source.

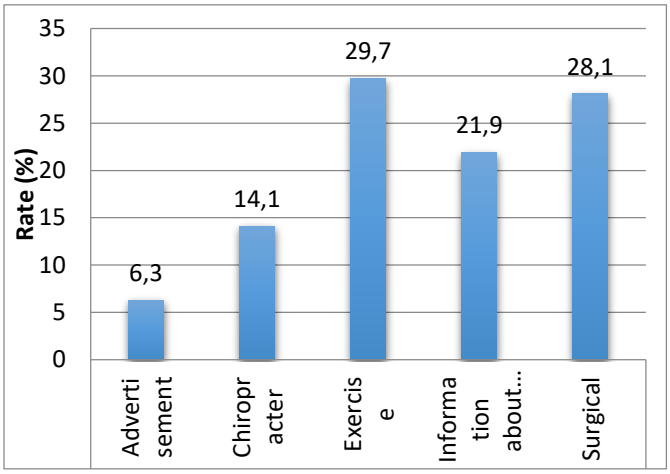



**Figure 3:** Categorical distribution of the videos based on content.

The highest number of uploads occurred in 2017, an upload rate was 15.6%, while the lowest number of uploaded videos was in 2008 and 2020, each with an upload rate of 1.6% (Table 1).

**Table I:** Minimum, maximum, mean, standard deviation and median n and percentage values for study parameters

| | Min-Max | Mean±SD | Median |
|---|---|---|---|
| GQS | 1-4 | 2,17±0,83 | 2 |
| HVS | 1-20 | 4,72±4,83 | 2 |
| Time | 47-3731 | 457,67±538,93 | 316 |
| Like | 53-164418 | 5278,27±20566,24 | 1543,5 |
| Dislike | 3-5766 | 295,23±740,97 | 115,5 |
| Like ratio | 72,1-97,8 | 90,5±6,18 | 92,2 |
| Number of comments | 0-8480 | 284,77±1056,02 | 101,5 |
| Number of views | 56438-14799537 | 665114,48±1837230,87 | 293504,4 |
| View ratio | 17,3-68200,7 | 1400,36±8501,58 | 182,3 |
| VPI | 15,3-65881 | 1336,77±8212,91 | 159 |
| Year *n,%* | | | |
| 2008 | 1 | 1,6 | |
| 2009 | 2 | 3,1 | |
| 2010 | 3 | 4,7 | |
| 2011 | 3 | 4,7 | |
| 2012 | 8 | 12,5 | |
| 2013 | 4 | 6,3 | |
| 2014 | 8 | 12,5 | |
| 2015 | 4 | 6,3 | |
| 2016 | 7 | 10,9 | |
| 2017 | 10 | 15,6 | |
| 2018 | 8 | 12,5 | |
| 2019 | 5 | 7,8 | |
| 2020 | 1 | 1,6 | |

VPI scores ranged from 15.3 to 65,881, with a mean of 1,336.77 ± 8,212.91 and a median of 159. No statistically significant difference was found between the VPI scores related to source (p> 0.05) (Table 4). A statistically significant difference was between the VPI scores in terms of the content (p: 0.001; p <0.05) (Table 5). As a result of post hoc evaluations made to determine the contents from which the significance originates, the VPI score for surgical content was significantly lower than those for disease information and exercise (p1: 0.016; p2: 0.001; p <0.05). No significant difference was among the other contents in the VPI scores (p> 0.05).

For the first observer, the Discern score varied between 1 and 4, with a mean of 1.5 ± 0.55 and a median of 1.3. For the second observer, the Discern score ranged between 1 and 4, with a mean of 1.6 ± 0.62 and a median of 1.4. The average Discern score was 1.55 ± 0.58, and the median was 1.35 (Table 2). No video gained a score above 4 out of a possible 5. The level of agreement between the two observers was 96.1% (Table 3). A statistically significant difference was found between the sources in the Discern scores (p: 0.031; p <0.05) (Table 4). As a result of the post hoc evaluations made to determine the sources of significance, the Discern score of the non-physician source was significantly lower than the physician and medical sources (p1: 0.004; p2: 0.036; p <0.05). No significant difference was between other Discern scores (p> 0.05). Although the Discern scores were close to significance between contents, there was no statistically significant difference (p> 0.05) (Table 5). Although the difference was not substantial, it was striking that the average Discern score for disease information was higher than those for other content.

**Table II:** Minimum, maximum, mean, standard deviation and median values of Discern and JAMA scores

| | Min-Max | Mean±SD | Median |
|---|---|---|---|
| Discern reviewer 1 | 1-4 | 1,5±0,55 | 1,3 |
| Discern reviewer 2 | 1-4 | 1,6±0,62 | 1,4 |
| Discern score | 1-4 | 1,55±0,58 | 1,35 |
| JAMA reviewer 1 | 1-3 | 1,34±0,54 | 1 |
| JAMA reviewer 2 | 1-3 | 1,44±0,56 | 1 |
| JAMA score | 1-3 | 1,39±0,48 | 1,5 |

**Table III:** Level of agreement of inter-observer Discern and JAMA scores

| | | %95 CI | | |
|---|---|---|---|---|
| | ICC | Lower | Upper | p |
| Discern score | 0,961 | 0,937 | 0,976 | 0,000* |
| JAMA score | 0,791 | 0,638 | 0,853 | 0,000* |

GQS scores varied between 1 and 4, with an average of 2.17 ± 0.83 and a median of 2. A statistically significant difference was found between the GQS scores for the source (p: 0.021; p <0.05) (Table 4). As a result of the post hoc evaluations to determine the sources of significance, the GQS score for commercial source was significantly lower than those for the academic, medical and physician sources (p1: 0.026; p2: 0.043; p3: 0.030; p <0.05). The GQS score for the non-physician source was significantly lower than those for academic, medical, and physician sources (p1: 0.022; p2: 0.033; p3: 0.016; p <0.05). No significant difference was found between the GQS scores for other sources (p> 0.05).

**Table IV:** Evaluation of scores by source

| Source | Discern | JAMA | GQS | HVS | VPI |
|---|---|---|---|---|---|
| | Mean±D (media) | Mean SD (median) | Mean±SD(median) | Mean±SD (median) | Mean±SD (median) |
| Academic | 1,63±0,48 (1,4) | 1,5±0,38 (1,5) | 2,63±0,92 (2) | 7,75±7,72 (3,5) | 214,6±174,32 (170,1) |
| Commercial | 1,26±0,16 (1,2) | 1,63±0,48 (1,8) | 1,5±0,58 (1,5) | 3,75±2,75 (3,5) | 89,43±30,58 (84,9) |
| Medical | 1,76±0,64 (1,5) | 1,36±0,57 (1) | 2,36±0,74 (2) | 5,07±3,6 (5) | 503,45±693,73 (189,2) |
| Non-Physician | 1,28±0,22 (1,3) | 1,21±0,36 (1) | 1,76±0,44 (2) | 2,06±1,2 (2) | 400,89±748,02 (194,5) |
| Physician | 1,76±0,8 (1,4) | 1,53±0,54 (1,5) | 2,47±1,01 (2) | 6,53±5,85 (4) | 192,3±211,62 (147,5) |
| Trainer | 1,22±0,15 (1,3) | 1,33±0,29 (1,5) | 1,67±0,58 (2) | 1,33±0,58 (1) | 22045,57±37962,62 (166,8) |
| P | 0,031* | 0,196 | 0,021* | 0,014* | 0,373 |

*Kruskal Wallis Test *p<0.05 Since "Patient" source is n = 1, it has been excluded from the analysis.*

**Table V:** Evaluation of scores by content

| Category | Discern | JAMA | GQS | HVS | VPI |
|---|---|---|---|---|---|
| | Mean±SD (median) | Mean±SD (median) | Mean±SD (median) | Mean±SD (median) | Mean±SD (median) |
| Advertisement | 1,26±0,16 (1,2) | 1,63±0,48 (1,75) | 1,5±0,58 (1,5) | 3,75±2,75 (3,5) | 89,43±30,58 (84,9) |
| Chiropracter | 1,29±0,23 (1,25) | 1,22±0,36 (1) | 1,67±0,5 (2) | 2,11±0,93 (2) | 7448,03±21912,44 (136,4) |
| Exercise | 1,38±0,29 (1,35) | 1,24±0,35 (1) | 2,05±0,62 (2) | 2,95±2,39 (2) | 362,89±290,2 (323) |
| Information about disease | 2,05±0,87 (1,9) | 1,64±0,66 (1,5) | 2,79±0,89 (3) | 9,57±6,12 (8) | 658,54±991,81 (207,5) |
| Surgical | 1,54±0,52 (1,35) | 1,39±0,4 (1,5) | 2,22±0,88 (2) | 4,33±4,81 (2) | 113,82±105,84 (63,7) |
| p | 0,078 | 0,134 | 0,005* | 0,004* | 0,001* |

*Kruskal Wallis Test *p<0.05*

A statistically significant difference was between the GQS scores for content (p: 0.005; p <0.05) (Table 5). As a result of the post hoc evaluations to determine from which contents the significance originated, the GQS score for disease information was significantly higher than those for the

advertisement and chiropractor categories (p1: 0.040; p2: 0.011; p <0.05). No significant difference was between the GQS scores for the other content categories (p> 0.05).

For the first observer, the JAMA scores varied between 1 and 3, with a mean of 1.34 ± 0.54 and a median of 1. For the second observer, the JAMA scores ranged between 1 and 3, with a mean of 1.44 ± 0.56 and a median of 1. The average JAMA score was 1.39 ± 0.48, and the median was 1.5 (Table 2). The level of agreement between the two observers was 79.1% (Table 3). There was no statistically significant difference between the JAMA scores for the source (p> 0.05) (Table 4). No statistically significant difference was between the JAMA scores in terms of content (p> 0.05) (Table 5).

The HVS scores reflected the videos' relevance to hallux valgus in a range from 1 to 20, with a mean of 4.72 ± 4.83 and a median of 2. A statistically significant difference was found between the HVS scores for the source (p: 0.014; p <0.05) (Table 4). As a result of the post hoc evaluations to determine the sources of significance, the HVS score for the non-physician source was significantly lower than those for academic, medical and physician sources (p1: 0.011; p2: 0.021; p3: 0.006; p <0.05). The HVS score of the trainer resource was significantly lower than those for academic, medical, and physician sources (p1: 0.022; p2: 0.041; p3: 0.024; p <0.05). No significant difference was found between the HVS scores for other sources (p> 0.05). A statistically significant difference was found between the HVS scores for contents (p: 0.004; p <0.05) (Table 5). Based on the post hoc evaluations to determine categories from which the significance originated, the HVS score for disease information was significantly higher than those for the chiropractor and exercise categories (p1: 0.013; p2: 0.006; p <0.05). No significant difference was found between the other HVS scores for contents (p> 0.05).

## DISCUSSION

Our hypothesis in the present study is that the content on Youtube related to hallux valgus is not of sufficient quality at the stage of diagnosis and treatment for patients. The primary reason for presenting this hypothesis in this study was that the number of patients searching the internet and, as a result, applying to our outpatient clinic significantly increased. One of the common types of search methods is searching the image. Since there was an easy access to information, YouTube is a social network that attracts people's attention[19]. Since YouTube is a platform not peer-reviewed, patients and physicians should know the different sources of health information and the information variable quality. The YouTube platform can have an impact on patients' diagnosis and treatment of healthcare problems. In other words, misleading or low quality information on YouTube can adversely affect both practitioners and patients[20]. The trend for patients and medical educators to turn to YouTube to learn and teach medical conditions is increasing. On the other hand, the correlation between the content quality and patient involvement has not been proven[19]. The recent increase in the number of studies examining YouTube content quality has a limited effect on orthopaedics, and only a few orthopaedic procedures or diagnoses are studied.

This is the first study which evaluates the quality, usability, and accuracy of hallux valgus-specific YouTube videos. In this study, we found that YouTube videos containing the words "hallux valgus" and "bunion" were of low quality based on Discern, GQS, JAMA and HVS scores. Previous research suggests that low-quality medical information obtained on YouTube harms the relationship between a doctor and his/her patients[20]. Based on many publications

evaluating the quality of videos on various orthopaedic diseases, we concluded that the videos' accuracy and quality were low[21–27].

Desai et al. stated that despite the accurate and reliable information offered by the academic videos, the lowest number of users preferred YouTube. Furthermore, they suggested that educational videos are viewed less than videos of low quality[19]. When the sources of the videos evaluated in this study were examined, we found that the Discern, GQS, JAMA and HVS scores for the academic and physician-sourced videos were higher than other sources. We found that VPI was higher in the trainer category, although we did not see a significant difference. Similarly, when the video categories were evaluated, the VPI of the surgical videos was found to be significantly lower than the other categories. However, the Discern, GQS, JAMA and HVS scores for the videos in the category of disease information were higher than those for the other video categories.

In this study, when the relationship between the Discern, GQS, JAMA and HVS scores were evaluated, there was a positive and significant relationship between them (Table 6, Figures 4 and 5). This relationship ultimately demonstrated that the scoring used for hallux valgus was directly proportional to the video's quality and the issues a video should cover when providing information about hallux valgus (Table 6).

**Table VI:** Evaluation of correlation between Discern, JAMA, GQS, HVS and VPI scores

| | | Discern score | Jama score | GQS | HVS |
|---|---|---|---|---|---|
| Jama score | r | *0,418* | - | - | - |
| | p | *0,001** | - | - | - |
| GQS | r | *0,741* | *0,422* | - | - |
| | p | *0,000** | *0,001** | - | - |
| HVS | r | *0,700* | *0,438* | *0,721* | - |
| | p | *0,000** | *0,000** | *0,000** | - |
| VPI | r | 0,025 | -0,081 | -0,002 | 0,072 |
| | p | 0,842 | 0,524 | 0,985 | 0,574 |

*Spearman Rho Correlation Analysis *p<0.05*

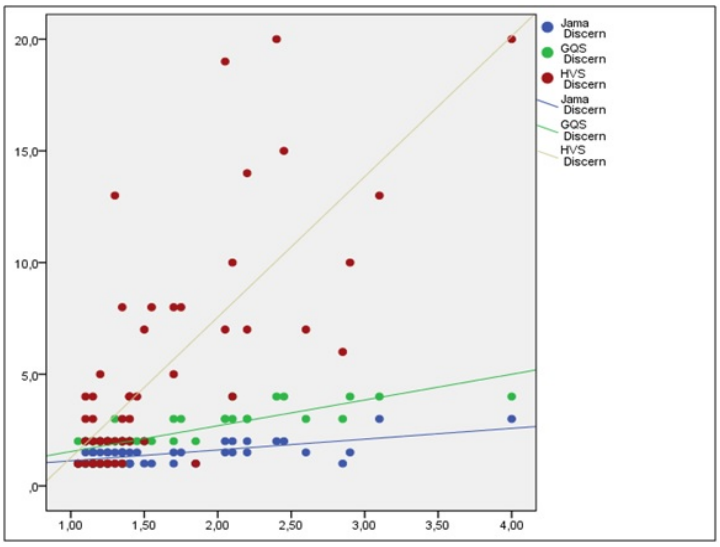



**Figure 4:** Distribution of Discern score with respect to other scores

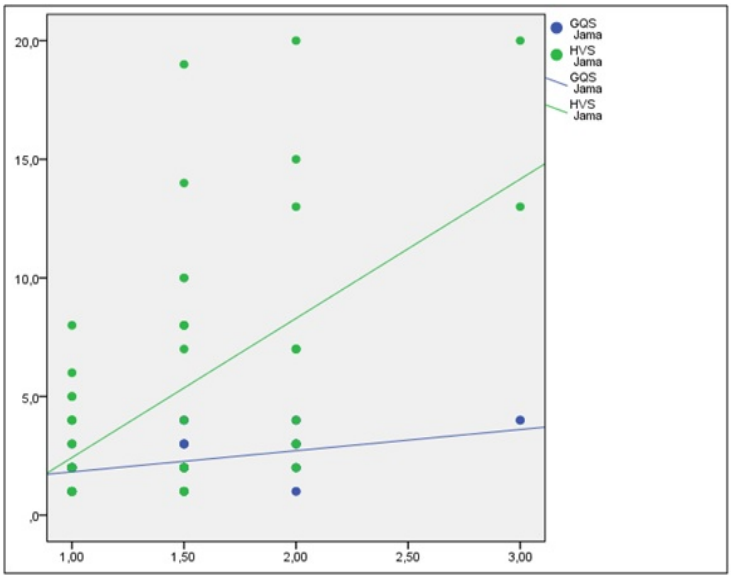



**Figure 5:** Distribution of JAMA score with respect to other scores

There were several limitations to our study. The 50 videos most frequently viewed when the keywords "hallux valgus" and "bunion" were searched on YouTube were included in the study. While this may appear to be a significant limitation, this study's purpose was to analyse analyze the most-viewed videos on for information from the researcher's perspective, not evaluate all the information which was provided on YouTube about hallux valgus. Most

of the internet users view only with the first two pages of search results[28]. Thus, only the top listed 50 videos were included in the study.

Second, YouTube as a dynamic sharing platform is built on a search algorithm that can show geolocational patterns; there may be gradual change in the search results due to the increasing number of videos. In this study, no anonymous search was conducted to prevent the effect of geolocation and browsing history. In addition, due to capturing of these data on a single day, it gives only a snapshot of the information accessible at a specific time. The internet is a common source of information through which individuals can constantly remove media from or upload it on open source forums such as YouTube leading to flow of quality and quantity and continual ebb[29,30].

Third, only videos accessed directly on YouTube in response to the keywords "hallux valgus" and "bunion" were included in the study. Access to other medical websites via external links were not included in our analysis.

Patients should be directed to video sites easily accessible, do not overwhelm the user with medical terminology, and provide accurate and reliable medical information to their users, without misleading information and commercial abuse. Our results show that even there are inadequate physicians' videos in terms of quality and teaching. Therefore, trusted health organisations organizations and professional associations should provide educational videos that meet all JAMA criteria for the relevant disease, have Discern and GQS scores of 4 above, and do not adversely impact the relationship between clinician and patient.

These videos essentially contain accurate, sufficient, and understandable information on the pathophysiology, natural course, aetiology etiologyw2, and treatment alternatives for the disease, and potential complications and results. One should translate the content into the target country's language, and the physicians informed about those websites. If necessary, they should be reviewed by professionals on the subject and then presented to the patients. Clinicians should direct patients to the appropriate websites and help prepare and promote optimal medical videos. They are aware of the difficulties of treating self-taught patients.

## CONCLUSIONS

Medicine is a science that has been in constant contact with people from the beginning of history to the present, regardless of its subject. YouTube is an essential source of information used by the hallux valgus cohort; however, the quality of the information presented is often low. We believe that the accuracy and quality of the information gained from our social media platform had the opportunity to review and evaluate is crucial for society's health. Orthopaedic physicians should be prepared to alleviate fears or misunderstandings arising from any misinformation and recommend more qualified and scientifically-approved videos. Finally, we should remember that doctors' recommendations on accurate, quality information sources to patients will increase doctor-patient trust; minimize the need to counter misleading or incorrect information during treatment

**Ethics Committee Approval:** Ethics committee approval was not obtained because our article does not have any human and animal studies, and it is a study evaluating the information given by the public youtube channel on hallux valgus disease.

**Declaration of Conflicting Interests:** The authors declare that they have no conflict of interest.

**Financial Disclosure:** No financial support was received.

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