

# The Quality of YouTube Content on Ulnar Collateral Ligament Injuries Is Low: A Systematic Review of Video Content



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**Purpose:** To provide an evaluation of the quality of diagnostic and treatment information regarding ulnar collateral ligament injuries on YouTube. **Methods:** YouTube was searched using the terms “ulnar collateral ligament,” “Tommy John surgery,” and “UCL surgery.” The first 100 results for each 3 terms were screened for inclusion. Each included video was graded based on its diagnostic and treatment content and assigned a quality assessment rating. Video characteristics such as duration, views, and “likes” were recorded and compared between video sources and quality assessment ratings. **Results:** A total of 120 videos were included in the final analysis. Only 17.5% provided very useful to excellent quality content. Only 3 videos (2.5%) provided excellent quality content; these were all physician-sponsored videos. These 3 videos only achieved an excellent score for diagnostic content; no video achieved an excellent score for treatment content. Most videos were scored as somewhat useful for both diagnostic (40%) and treatment (56.7%) content. Videos classified as somewhat useful had the highest number of average views (27,197), with a mean duration of 7 minutes 40 seconds. The most common video source was physician sponsored (32%), followed by educational (26%). Physician videos had the lowest number of views (5,842 views). **Conclusions:** The quality of ulnar collateral ligament–related information on YouTube is low. Differential diagnoses for related symptoms, accurate surgical indications, and thorough discussions of adverse outcomes were the most lacking information. Physician-sponsored and educational videos provided the highest-quality information but had the lowest number of average views. **Clinical Relevance:** Because most Internet users in the United States search for information regarding their medical issues online, it is important to understand the quality of available online medical information. Knowing this can help inform the necessary next steps to improve the quality and comprehensibility of online medical information.

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Ulnar collateral ligament (UCL) injury is a common injury among athletes, particularly those who partake in baseball, softball, gymnastics, and javelin throwing, as well as other throwing sports. The number of UCL reconstructive procedures performed from 1974 to 2015 in Major League Baseball players significantly increased yearly, and 25% of all professional Major League Baseball players have undergone at least 1 UCL

reconstruction.<sup>1-3</sup> Among all patients, the largest increase in UCL procedures has been observed in adolescents.<sup>4</sup> Erickson et al.<sup>5</sup> showed that between 2007 and 2011, UCL reconstruction was performed significantly more in patients aged 15 to 19 years. Another study showed that patients aged between 15 and 19 years are within the fastest-growing group of patients are undergoing UCL reconstruction rates at faster rates

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than all other age groups.<sup>6</sup> In addition to the increasing rate of surgical procedures, public awareness and perception of this injury are increasing and evolving. Ahmad et al.<sup>7</sup> found that 30% of coaches, 37% of parents, and 51% of high school athletes actually believe that UCL reconstruction is indicated as a performance-enhancing procedure in baseball players without elbow injury, in the absence of symptoms. More recently, 25% of television, print, Internet, and radio media professionals were found to believe that UCL reconstruction is primarily performed for athletic performance enhancement.<sup>8</sup> Such misguided beliefs are concerning given that “locker room misconceptions” have potentially contributed to the rise in UCL reconstructions in adolescent patients. It is thus paramount to understand where these perceptions may stem from.

It is likely that a substantial source of misinformation is available online through websites such as WebMD and Google (Alphabet) because patients are known to seek out easily accessible online information regarding their diagnoses, treatments, and recovery processes.<sup>9,10</sup> Social media platforms such as Instagram (Facebook), Twitter, and YouTube (Alphabet) have also recently become a common source of medical information on the Internet.<sup>11</sup> YouTube ([www.youtube.com](http://www.youtube.com)) is the most visited non-peer-reviewed online video-sharing platform used among adults and adolescents in the United States. About 95% of US adults aged between 18 and 29 years use YouTube, whereas 37% of millennials aged 18 to 34 years report binge watching YouTube daily.<sup>12</sup> YouTube has grown to be a source of medical knowledge for several reasons. Chiefly, online published medical information is often written above the recommended sixth-grade reading level, diverting many patients to seek out medical information in video format.<sup>13,14</sup> However, because YouTube is not peer reviewed, there is concern that the medical information presented on YouTube is of low accuracy and quality. Furthermore, there are very few content restrictions regarding what can be posted on the website: Videos containing illegal activity or people’s private information are restricted, but there is no requirement regarding the accuracy of information presented in videos. Conversely, medical information videos uploaded by entities associated with medical institutions may provide reliable and accurate information; however, the information in these videos may be presented at an educational level higher than the sixth-grade level.<sup>15</sup> This may affect the comprehensibility of the information presented.

YouTube also has grown to be a source of athletic knowledge and is a known platform where athletes can access technique videos and coaching tips. The recent rise in UCL reconstructive surgery in youth and professional baseball players, combined with the prevalent

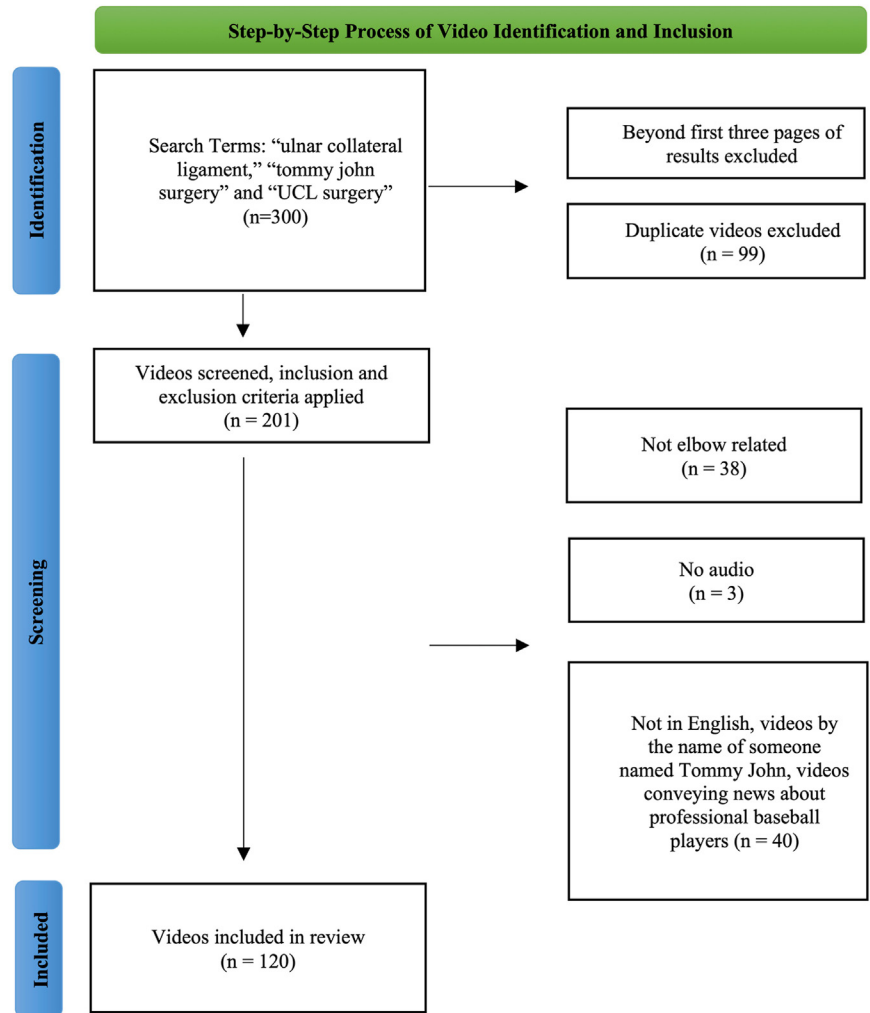
use of YouTube and online medical information, posits the possibility that patients with UCL injuries may be more likely to turn to YouTube and other online sources to learn more about their condition. The purpose of this study was to provide an evaluation of the quality of diagnostic and treatment information regarding UCL injuries on YouTube. We hypothesized that the overall quality of UCL-related information on YouTube would be low, either lacking in adequate comprehensive information or presented at a level of education higher than that of most patients.

## Methods

YouTube was searched between June 11 and June 13, 2022. A systematic review of the videos was performed similarly to the methodology established by MacLeod et al.<sup>15</sup> and further modified by Crutchfield et al.<sup>16</sup> (Fig 1). The YouTube platform was searched using the terms “ulnar collateral ligament,” “Tommy John surgery,” and “UCL surgery.” The first 100 results for each search term were reviewed. This number was chosen as the cutoff because of the default settings on YouTube, in which search results are ordered by relevance. Furthermore, because most users do not access videos beyond the third page, only videos within the first 3 pages (i.e., 100 videos) were included in the analysis.<sup>17</sup> The exclusion criteria included videos relating to the UCL of the thumb or relating to lateral UCL injuries, videos without audio, videos not in English, videos solely conveying the news of a professional baseball player’s recent UCL injury, and videos unrelated to UCL injuries that were uploaded by a person or entity with a username “Tommy John.” Any duplicate videos were removed.

Each video that met the inclusion criteria was reviewed independently by 2 authors (N.C. and A.W.R.). Recorded video characteristics included video length, date uploaded to YouTube, number of views, and number of likes. Dislikes were not recorded because YouTube discontinued the use of the dislike button in November 2021. The number of days online since upload and views per day (total views divided by days online) were calculated. Videos were categorized by source: educational, physician sponsored, technique, patient testimonial, and news. Any video that involved an explanation of UCL reconstruction from a nonphysician source was stratified as educational; examples include videos provided by other health-related professionals such as physician assistants and physical therapists. Videos that were presented by a physician, promoted by a medical institution, presented at a conference geared toward physicians, or presented on a platform whose primary audience is physicians (e.g., Orthobullets or podcasts such as “Nailed It Ortho”) were classified as physician sponsored. Any video that was a recording of UCL repair or reconstruction surgery performed by a surgeon, with audio, was included in

**Fig 1.** Step-by-step process of video identification and inclusion. (UCL, ulnar collateral ligament.)



the technique category. Patient testimonials were videos of patients providing their accounts of their injuries, diagnostic processes, and treatment methods. Videos that were distributed by an official news broadcast agency were categorized as news; also included in this group were any interviews with physicians conducted by broadcast teams.

Each video was graded according to the scoring system previously described by MacLeod et al.<sup>15</sup> and used by Crutchfield et al.<sup>16</sup> (Appendix Table 1). Each video was evaluated for its diagnostic and treatment content and received a separate score for diagnostic content and treatment content. Both the diagnostic and treatment scoring criteria yielded a minimum score of 0 and a maximum score of 16 points. The diagnostic scoring list was used to evaluate a video's explanation of UCL injury, common symptoms and risk factors, physical examination findings, and diagnostic imaging methods. The treatment scoring list was used to assess a video's explanation of possible nonoperative and operative treatment routes for UCL injury, indications and

contraindications for surgery, various surgical procedures, rehabilitation process, prognosis, and potential complications. For both diagnostic and treatment scoring, 1 point was awarded for each question on the list that the video addressed.

Each video was numerically scored and then stratified into 5 quality groups based on its numeric score: not useful, 0 points; somewhat useful, 1 to 4 points; moderately useful, 5 to 8 points; very useful, 9 to 12 points; and excellent, 13 to 16 points. Any disagreement on the classification of a video was reconciled via discussion.

### Statistical Analysis

The Pearson correlation coefficient was calculated to assess for associations between video length, views, and likes, stratified by source and quality group. Categorical variables were reported as frequencies, and continuous variables were reported as means. One-way analyses of variance were used to compare continuous variables, with Bonferroni pair-wise *t* tests performed to assess for

**Table 1.** Video Characteristics and Source by Quality Assessment for Diagnostic Content

	Total	Quality Assessment					P Value
		Not Useful	Somewhat Useful	Moderately Useful	Very Useful	Excellent	
<b>Video characteristic</b>							
No. of videos (%)	120 (100)	35 (29.2)	48 (40)	27 (22.5)	7 (5.8)	3 (2.5)	
Mean duration	8 min 45 s	7 min 17 s	7 min 40 s	9 min 13 s	12 min 31 s	31 min 15 s	<.001*
Mean time online, d	1,321.5	1,268.7	1,404.5	1,161	1,762.4	958.3	.640
Mean views	17,917	11,189	27,197	14,333	9,180	584	.833
Mean views/d	12.7	14.5	15.2	9.1	4.6	1.3	.800
Mean likes	142.7	101.2	192.6	155	13.4	6	.567
<b>Video source</b>							
Educational	31	2	10	15	3	0	
Physician sponsored	38	6	18	9	3	3	
Technique	18	15	6	0	0	0	
Patient testimonial	21	11	5	2	0	0	
News	12	1	9	1	1	0	

\*Statistically significant ( $P < .05$ ).

any significant differences. The level of statistical significance was defined as  $P < .05$ . Statistical analyses were performed using Microsoft Excel, version 16.62.

## Results

### Pooled Results

The initial search yielded 300 videos, 180 of which were excluded, leaving 120 videos eligible for quality assessment of diagnostic and treatment content (Table 1). Video upload dates ranged from October 2, 2010, to June 10, 2022. The mean duration of all videos was 8 minutes 46 seconds, with a range of 46 seconds to 59 minutes 9 seconds. Most videos were physician sponsored (31.7%,  $n = 38$ ) (Fig 2).

### Analysis by Content Group

Diagnostic content results are summarized in Table 1. Most videos were scored as somewhat useful (40%,  $n = 48$ ). The Student  $t$  test revealed that videos scored as excellent were viewed statistically significantly less than videos scored as not useful ( $P = .002$ ), somewhat useful ( $P = .04$ ), and moderately useful ( $P = .002$ ). Videos scored as presenting somewhat useful diagnostic information had the highest average views (27,197), views per day (15.2), and percentage of views (43.5%); no statistically significant differences were found.

Treatment content results are summarized in Table 2. More than half of all videos fell into the somewhat useful category (56.7%,  $n = 68$ ). No video achieved an excellent score for treatment content. Similar to the findings for diagnostic content, videos with treatment content scored as somewhat useful had the highest average views (23,800), views per day (16.7), and percentage of views (47.7%); no statistically significant differences were found.

### Analysis by Source

Across educational, physician-sponsored, technique, patient testimonial, and news videos, the diagnostic content and treatment content were on average graded as somewhat useful (Tables 1 and 2). Regarding technique videos, the average diagnostic score was “not useful” (0.67), and this was statistically significant ( $P < .001$ ). Statistically significant differences in treatment scores were found between physician-sponsored videos and patient testimonials (4.4 and 1.4, respectively;  $P < .0001$ ) and between physician-sponsored videos and news videos (4.4 and 1.5, respectively;  $P < .0001$ ). News videos had the highest average views (40,510). Physician-sponsored videos had the highest mean duration (11 minutes 55 seconds). Neither of these differences was statistically significant. Three of the top 10 overall most viewed videos were technique videos (Table 3).

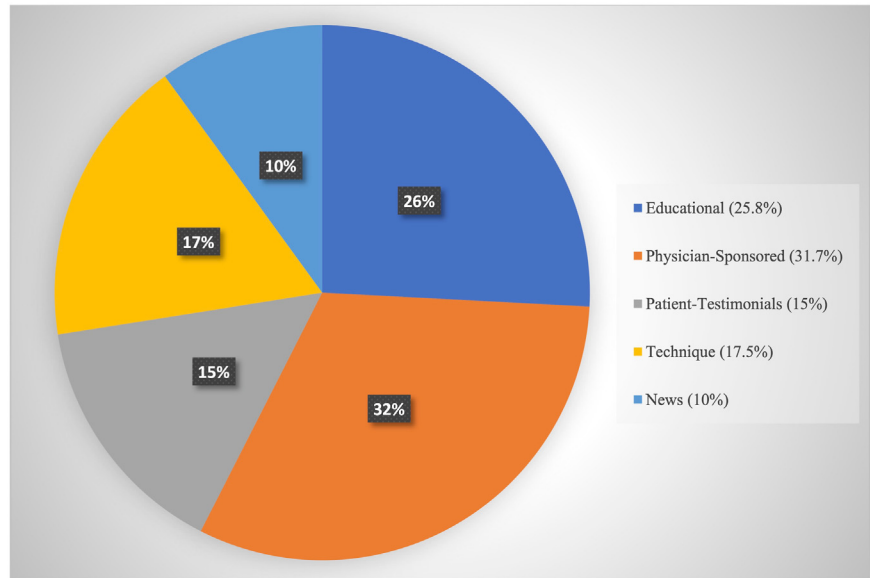
### Analysis by Quality Assessment Rating

Most videos included for analysis were rated as somewhat useful (Fig 3). The highest-scoring videos for diagnostic content and treatment content are listed in Tables 4 and 5, respectively. Video length was found to vary substantially by quality rating: Videos rated as excellent for diagnostic content and very useful for treatment content were significantly longer than videos in all other categories ( $P < .001$  for both). “Excellent” videos had the longest mean duration (31 minutes 15 seconds) but the lowest number of average views (584); however, they also had the shortest average number of days online (958.2), although this was not statistically significant.

## Discussion

The most important finding of this study was that individuals who search YouTube for information on UCL injuries will likely encounter videos of low-quality

**Fig 2.** Breakdown of ulnar collateral ligament content on YouTube by quality source.



content in both the diagnostic and treatment realms. Only 17.5% of videos provided very useful to excellent quality content, and only 2.5% provided excellent quality content. No video achieved an excellent score for treatment content. Most videos were scored as somewhat useful for both diagnostic (40%) and treatment (56.7%) content. Videos deemed somewhat useful had the highest number of average views (27,197), with a mean duration of 7 minutes 40 seconds.

Regarding diagnostic content, the videos assessed in this study generally provided good descriptions of the symptoms of and risk factors for UCL injuries but did not delve into physical examination findings or imaging studies. It is interesting to note that although one would expect all videos to define UCL injury, only 75% of videos explicitly provided a definition of UCL injury.

Furthermore, the differential diagnoses of medial elbow pain, such as medial epicondylitis, medial collateral ligament sprain, ulnar nerve injury, or fracture, were rarely addressed. Failing to adequately explain what UCL injury is and how to differentiate between the different diagnoses could potentially lead patients astray and cause them to falsely self-diagnose and self-treat. Regarding treatment content, most videos provided adequate information regarding various forms of nonoperative treatment, descriptions of UCL reconstruction, and postoperative recovery plans such as physical therapy, strength training, return-to-throwing programs, and return to full activity. Performance after surgery was frequently addressed, typically with the explanation that players can expect to return to full activity and performance if they adhere to the intense rehabilitation process. An interesting finding was that 7

**Table 2.** Video Characteristics and Source by Quality Assessment for Treatment Content

	Total	Quality Assessment					P Value
		Not Useful	Somewhat Useful	Moderately Useful	Very Useful	Excellent	
<b>Video characteristic</b>							
No. of videos (%)	120 (100)	26 (21.7)	68 (56.7)	15 (12.5)	11 (9.2)	0 (0)	
Mean duration	8 min 45 s	7 min 17 s	7 min 40 s	9 min 13 s	12 min 31 s		<.001*
Mean time online, d	1,321.5	1,338.3	1,337.6	1,426.9	1,042.9		.826
Mean views	17,917	13,897	23,800	9,228	2,906		.575
Mean views/d	12.7	10.3	16.7	6.9	2.2		.378
Mean likes	142.7	102.2	200.1	50.1	11.3		.357
<b>Video source</b>							
Educational	31	10	15	3	3		
Physician sponsored	38	5	18	7	8		
Technique	18	0	17	4	0		
Patient testimonial	21	9	8	1	0		
News	12	2	10	0	0		

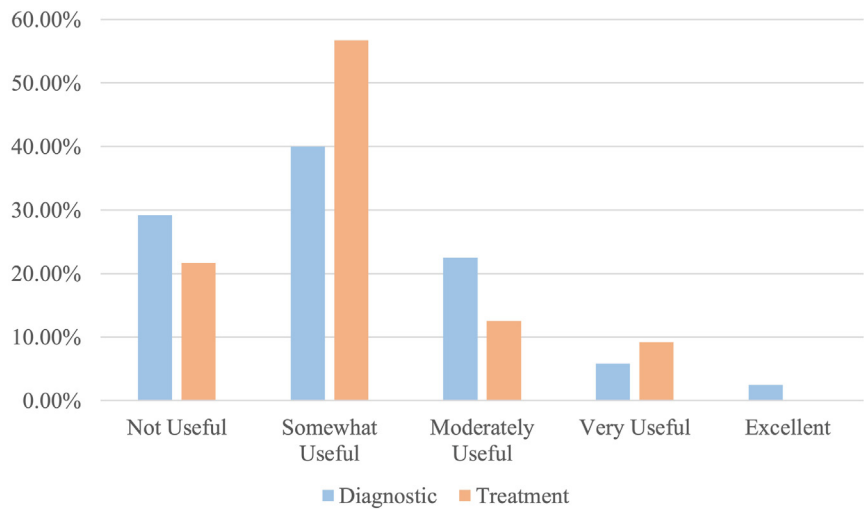
\*Statistically significant ( $P < .05$ ).

**Table 3.** Top 10 Most Viewed Videos

No. of Views	No. of Likes	Video Title	URL	Source	Diagnostic	Treatment
504, 595	1,400	Elbow Ulnar Collateral Ligament (Tommy John) Surgery – Dr. Randy S. Schwartzberg	<a href="https://www.youtube.com/watch?v=DWthdoj8Lws">https://www.youtube.com/watch?v=DWthdoj8Lws</a>	Technique	Somewhat useful	Somewhat useful
295,775	1,900	Tommy John For Teens: Why Kids Get Major League Surgery   TODAY	<a href="https://www.youtube.com/watch?v=aE0ExKT3zzo">https://www.youtube.com/watch?v=aE0ExKT3zzo</a>	News	Somewhat useful	Somewhat useful
124,261	699	UCL Surgery – 3D Reconstruction	<a href="https://www.youtube.com/watch?v=6u0umafLue0">https://www.youtube.com/watch?v=6u0umafLue0</a>	Technique	Somewhat useful	Somewhat useful
123,491	1,500	Ligaments of the Elbow Stability of the Elbow – Everything You Need To Know – Dr. Nabil Ebraheim	<a href="https://www.youtube.com/watch?v=KMvKqoPbXTI">https://www.youtube.com/watch?v=KMvKqoPbXTI</a>	Educational	Moderately useful	Somewhat useful
79,552	3,331	Dr. James Andrews on the Rise of Tommy John Surgery	<a href="https://www.youtube.com/watch?v=utqT9EgRUtw">https://www.youtube.com/watch?v=utqT9EgRUtw</a>	News	Somewhat useful	Somewhat useful
68,285	390	Miami Marlins' Jose Fernandez on His Journey Back From Tommy John Surgery	<a href="https://www.youtube.com/watch?v=jJ7ILrU-qI">https://www.youtube.com/watch?v=jJ7ILrU-qI</a>	Patient testimonial	Not useful	Not useful
67,501	301	Tommy John Surgery (Ulnar Collateral Ligament Reconstruction)	<a href="https://www.youtube.com/watch?v=hG9G9Smu1xM">https://www.youtube.com/watch?v=hG9G9Smu1xM</a>	Technique	Not useful	Moderately useful
64,627	117	Ulnar Collateral Ligament Tear Rehabilitation	<a href="https://www.youtube.com/watch?v=V91L60pN8m0">https://www.youtube.com/watch?v=V91L60pN8m0</a>	Patient testimonial	Somewhat useful	Not useful
52,862	423	Modified Milking Maneuver   Medial/ Ulnar Collateral Ligament Injury	<a href="https://www.youtube.com/watch?v=SwigwaZxBXE">https://www.youtube.com/watch?v=SwigwaZxBXE</a>	Educational	Somewhat useful	Not useful
50,537	443	UCL Injury of the Elbow: Signs, Symptoms and Mechanism of Injury	<a href="https://www.youtube.com/watch?v=winYjwn_PZs">https://www.youtube.com/watch?v=winYjwn_PZs</a>	Physician sponsored	Moderately useful	Somewhat useful

URL, Uniform Resource Locator.

**Fig 3.** Quality assessment rating of ulnar collateral ligament injury–related videos on YouTube. Videos were evaluated for diagnostic content and treatment content separately and scored on a scale from 0 (worst) to 16 (best). The majority of videos were found to be somewhat useful (quality assessment rating of 1-4 points) for both diagnostic (40%) and treatment (56.7%) content.



videos in total referenced the public misperception that Tommy John surgery can be performed in asymptomatic patients to improve their throwing technique and strength; these videos further clarified that this is an inaccurate indication for UCL surgery. However, overall surgical indications and contraindications were often omitted. Furthermore, although nearly all technique videos mentioned the potential for ulnar or medial antebrachial cutaneous nerve injury, other potential complications such as elbow stiffness were far less frequently mentioned. Retear rates and reoperation rates were mentioned in 4 videos and 6 videos, respectively. Such information can help to mentally prepare patients for the possibility that their operations are not guaranteed to provide them with perfect results.

The most common video source was physician sponsored (32%), followed by educational (26%). Physician-sponsored videos were found to be significantly superior to technique and patient testimonial videos in terms of educational content. However, physician-sponsored videos were also less likely to be watched than other sources, such as patient testimonials, technique videos, or news videos. The only 3 videos that achieved an excellent score were physician-sponsored videos, yet their mean duration was 31 minutes 15 seconds, or roughly the length of a typical television show. Videos deemed somewhat useful had the highest number of average views, with a mean duration of 7 minutes 40 seconds. Previous studies have shown that the human attention span is likely to start drifting at the 4-minute mark of a video and to plummet after the 6-minute mark.<sup>18</sup> Other studies have argued that videos should be kept to under 10 minutes to maximize attention span.<sup>19</sup> Whatever the optimal video length may be, our study indicates that patients may be more likely to watch shorter videos, given the inverse relation between video duration and video

views. Of note, “not useful” videos were the only category to show an average duration close to the 4-minute mark (4 minutes 54 seconds). Although physician-sponsored videos may offer the best-quality information to patients, finding a way to shorten such videos may be an effective way to increase viewership among patients.

All technique videos were recordings of a surgical technique from the first incision to closure, with overhead audio from the performing surgeon detailing the steps of the operation. More than two-thirds of the technique videos received a diagnostic score of 0, and half received a treatment score of 2. The purpose of such videos is likely to educate other surgeons on the steps of various UCL surgical techniques. It is interesting to note that 2 of the top 3 overall most viewed videos were technique videos (Table 3). One explanation is that a patient may be naturally curious and wish to know exactly what happened to his or her body during the operation. Another explanation is that orthopaedic surgeons, like athletes looking up technique videos, may be turning to YouTube in search of surgical technique tips and thus potentially heavily skewing the viewership of technique videos. In a survey of 3,300 orthopaedic surgery residents, both YouTube and VuMedi were found to be popular among residents in all age groups, with YouTube more likely to be used by postgraduate year 1 residents and VuMedi more likely to be used by postgraduate year 2 to year 5 residents.<sup>20</sup> The use of these video platforms as a learning tool is representative of a larger phenomenon in which surgeons and trainees are increasingly obtaining medical information and surgical knowledge available on the Internet to learn about and make decisions regarding orthopaedic injuries and procedures.

Although overall found to be of low quality in terms of diagnostic and treatment content, patient

**Table 4.** Top 10 Diagnostic Score Videos

Diagnostic Score	Source	Video Title	URL	No. of Views	Treatment Score
16	Physician sponsored	Elbow UCL Injuries w/ Dr. Erickson	<a href="https://www.youtube.com/watch?v=api9lUsD0go">https://www.youtube.com/watch?v=api9lUsD0go</a>	86	10
13	Physician sponsored	What Are the Treatment Options for UCL Tears of the Elbow in Athletes?	<a href="https://www.youtube.com/watch?v=RSjNyKLeZM8">https://www.youtube.com/watch?v=RSjNyKLeZM8</a>	1,500	10
13	Physician sponsored	Medial Ulnar Collateral Ligament Injury Exam Review – Christopher S. Ahmad, MD	<a href="https://www.youtube.com/watch?v=KrksJYvDmWQ">https://www.youtube.com/watch?v=KrksJYvDmWQ</a>	166	11
11	Physician sponsored	Ulnar Collateral Ligament Injuries of the Elbow – Timothy Kremcheck, MD	<a href="https://www.youtube.com/watch?v=JlXOJmrwKqE">https://www.youtube.com/watch?v=JlXOJmrwKqE</a>	566	9
10	News	Staying in the Game: Throwing Injuries and Tommy John Surgery	<a href="https://www.youtube.com/watch?v=j5UdmVY6P_g">https://www.youtube.com/watch?v=j5UdmVY6P_g</a>	47,078	1
9	Educational	Ulnar Collateral Ligament (UCL) Dx, Tx, Sx	<a href="https://www.youtube.com/watch?v=CpgmJehb7fQ">https://www.youtube.com/watch?v=CpgmJehb7fQ</a>	6,794	6
9	Educational	Ulnar Collateral Ligament Sprain	<a href="https://www.youtube.com/watch?v=pog0wKnDC4Y">https://www.youtube.com/watch?v=pog0wKnDC4Y</a>	5,102	2
9	Physician sponsored	UCL Repair With Internal Brace Augmentation	<a href="https://www.youtube.com/watch?v=zW1oYXw7ODQ">https://www.youtube.com/watch?v=zW1oYXw7ODQ</a>	4,393	6
9	Physician sponsored	Understanding Tommy John – Children’s Book Animation Video	<a href="https://www.youtube.com/watch?v=traB4rJ6vG8">https://www.youtube.com/watch?v=traB4rJ6vG8</a>	319	4
8	Patient testimonial	Tommy John Surgery at 16: My Story	<a href="https://www.youtube.com/watch?v=L2cJ0Q_6gp4">https://www.youtube.com/watch?v=L2cJ0Q_6gp4</a>	1,549	2

URL, Uniform Resource Locator.

**Table 5.** Top 10 Treatment Score Videos

Treatment Score	Source	Video Title	URL	No. of Views	Diagnostic Score
11	Physician sponsored	Medial Ulnar Collateral Ligament Injury Exam Review – Christopher S. Ahmad, MD	<a href="https://www.youtube.com/watch?v=KrksJYvDmWQ">https://www.youtube.com/watch?v=KrksJYvDmWQ</a>	166	13
11	Physician sponsored	KEYNOTE: Ulnar Collateral Ligament Injuries of the Elbow – Felix Savoie, III, MD	<a href="https://www.youtube.com/watch?v=tE9FKIlpOGA">https://www.youtube.com/watch?v=tE9FKIlpOGA</a>	52	6
11	Physician sponsored	UCL Repair and Augmentation With Collagen Coated Fiber Tape Internal Brace in Overhead Throwers	<a href="https://www.youtube.com/watch?v=CJAAhbazlV0">https://www.youtube.com/watch?v=CJAAhbazlV0</a>	204	2
10	Physician sponsored	Elbow UCL Injuries w/ Dr. Erickson	<a href="https://www.youtube.com/watch?v=api9lUsD0go">https://www.youtube.com/watch?v=api9lUsD0go</a>	86	16
10	Physician sponsored	What Are the Treatment Options for UCL Tears of the Elbow in Athletes?	<a href="https://www.youtube.com/watch?v=RSjNyKLeZM8">https://www.youtube.com/watch?v=RSjNyKLeZM8</a>	1,500	13
10	Physician sponsored	UCL Reconstruction – Andrews Sports Medicine & Orthopaedic Center	<a href="https://www.youtube.com/watch?v=5Za-nl105tY">https://www.youtube.com/watch?v=5Za-nl105tY</a>	28,338	7
10	Educational	Tommy John Surgery UCL Reconstruction   Elbow Ulnar Collateral Ligament Animation	<a href="https://www.youtube.com/watch?v=T-Qaeg_7thg">https://www.youtube.com/watch?v=T-Qaeg_7thg</a>	149	6
10	Educational	UCL Injury Treatment, Tommy John Surgery & Non-Operative Options [Vid. #2 in Series]	<a href="https://www.youtube.com/watch?v=uIRpa-75c94">https://www.youtube.com/watch?v=uIRpa-75c94</a>	475	5
10	Physician sponsored	UCL Reconstruction / Repair (Tommy John Surgery) With Dr. Erickson of Rothman Orthopaedics New York	<a href="https://www.youtube.com/watch?v=J44QHaOi0nQ">https://www.youtube.com/watch?v=J44QHaOi0nQ</a>	332	3
9	Physician sponsored	Ulnar Collateral Ligament Injuries of the Elbow – Timothy Kremcheck, MD	<a href="https://www.youtube.com/watch?v=JlXOJmrwKqE">https://www.youtube.com/watch?v=JlXOJmrwKqE</a>	566	11

URL, Uniform Resource Locator.



testimonials were found to be of high quality in enlightening what truly matters to patients who sustain UCL injuries. There was a nearly universal prevalent focus on mental health after Tommy John surgery discussed in patient testimonial videos. Patient testimonials were exclusively made by athletes recounting their experiences with UCL injury, surgery, and recovery. Some videos explored the fear of re-tear that many players may experience when returning to sports participation and having to move past that anxiety. The psychological impact that sporting injuries have on athletes is well-known: Persistent frustration, depression, and fear have been associated with worse outcomes after rehabilitation and decreased return to sport.<sup>21,22</sup> In a study of 22 athletes who had undergone primary UCL reconstruction performed by a single surgeon, personality traits such as optimism, self-efficacy, and self-motivation were found to be predictive of return to sport and rehabilitative compliance.<sup>23</sup> The emphasis on the psychological and emotional burden of UCL injuries in patient testimonial videos should not be ignored. It could suggest that the experience of missed play, loss of fitness, potential career derailment, and fear of reinjury leave a profound long-term effect on athletes. It could also suggest that athletes are just as likely to turn to YouTube to find emotional support as they are to find information on their injury. Therefore, even though patient testimonial videos were found to provide little useful diagnostic or treatment content, this does not mean that surgeons cannot learn from the content included in such videos. This also suggests the need for future studies investigating the effects of UCL injury on patients' mental health.

Our study has several strengths. First, our sample size (120 videos) was larger than the sample sizes of many other studies assessing the educational quality of YouTube regarding various orthopaedic injuries.<sup>17,24,25</sup> The larger sample size allowed for a more robust assessment of video characteristics between quality and source groups. Second, including "Tommy John surgery" as a search term resulted in nearly all patient testimonials and news-related videos. Although patient testimonials were found to be of low quality in terms of diagnostic and treatment content, they are arguably the most important videos to assess because they provide insight into what truly matters to patients. Including such videos in our review also revealed the emphasis UCL-injury patients place on mental health after surgery.

### Limitations

There were some limitations to our study. Our scoring criteria benefited thorough videos that adequately captured all aspects of UCL injuries. Videos that presented thorough and accurate knowledge in one domain but otherwise lacked information on other

aspects of UCL injuries were scored low. For example, a video that achieved full marks for the rehabilitation section in the assessment of treatment content but that failed to address surgical indications, contraindications, and complications would have been scored low despite the accurate information presented in 1 section. Another limitation lies in YouTube. The platform is constantly changing, adding and removing videos. The search algorithm is not the same for each user: Users in different time zones and geographical locations may receive different search results than other users. Individual search history is also used in the YouTube algorithm and thus can skew any individual search results. As a result, the videos assessed in this study can differ from videos procured from a search of the same search terms by another user. Furthermore, there is no way to determine how long each viewer watches each YouTube video. Although the number of views is easy to find on YouTube, this number does not provide any information on whether all viewers watch the video to completion. The total view number also does not reflect whether all views of that particular video were from different viewers, or viewers who viewed the video multiple times. Finally, this study's results are specific to YouTube and cannot be extrapolated to other online video platforms or social media sites.

### Conclusions

The quality of UCL-related information on YouTube is low. Differential diagnoses for related symptoms, accurate surgical indications, and thorough discussions of adverse outcomes were the most lacking information. Physician-sponsored and educational videos provided the highest-quality information but had the lowest number of average views.

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**Appendix Table 1.** Quality Assessment Scoring Criteria Used to Evaluate Diagnostic and Treatment Content of UCL-Related YouTube Videos

	Criteria
Diagnostic content	
Explanation (2 points)	<ul style="list-style-type: none"> <li>• Discussion of UCL pathology (UCL tear, valgus instability, and/or Tommy John injury)</li> <li>• Discussion of differential diagnosis of elbow pain</li> </ul>
History (5 points)	<ul style="list-style-type: none"> <li>• Location of elbow pain</li> <li>• High-risk sport (baseball, softball, javelin throwing, gymnastics, or wrestling)</li> <li>• Provoking factors (pain with throwing or pain with other specific activity)</li> <li>• Loss of throwing speed or accuracy</li> <li>• Risk factors related to overuse injury (innings pitched, numbers of teams played for, showcases, and so on)</li> </ul>
Physical examination (6 points)	<ul style="list-style-type: none"> <li>• Elbow range of motion (passive and active, as well as loss of elbow extension)</li> <li>• Moving valgus stress test</li> <li>• Milking maneuver</li> <li>• Presence of ulnar nerve symptoms</li> <li>• Hip range of motion</li> <li>• Shoulder range of motion</li> </ul>
Diagnostic imaging (2 points)	<ul style="list-style-type: none"> <li>• Radiographic findings</li> <li>• Advanced imaging (MRI, CT, and/or US)</li> </ul>
Treatment content	
Presurgical (3 points)	<ul style="list-style-type: none"> <li>• Nonoperative treatment (activity modification, PT, hip and core strengthening, flexor-pronator strength program, return-to-throwing program, and/or PRP injection)</li> <li>• Surgical indications</li> <li>• Surgical contraindications</li> </ul>
Surgical procedure (2 points)	<ul style="list-style-type: none"> <li>• UCL repair (indications and contraindications)</li> <li>• UCL reconstruction (indications, contraindications, graft choice, and technique)</li> </ul>
Rehabilitation (2 points)	<ul style="list-style-type: none"> <li>• Period of protected weight bearing, range of motion, and bracing</li> <li>• PT</li> </ul>
Outcomes and return to play (3 points)	<ul style="list-style-type: none"> <li>• Total time to return to full activity</li> <li>• Time to initiate throwing program</li> <li>• Time to initiate return-to-mound program</li> </ul>
Complications (6 points)	<ul style="list-style-type: none"> <li>• Nerve injury (ulnar nerve or MACN)</li> <li>• Elbow stiffness</li> <li>• Ulnar or medial epicondylar fracture</li> <li>• Success rate</li> <li>• Retear rate</li> <li>• Reoperation rate</li> </ul>

CT, computed tomography; MACN, medial antebrachial cutaneous nerve; MRI, magnetic resonance imaging; PRP, platelet-rich plasma; PT, physical therapy; UCL, ulnar collateral ligament; US, ultrasound.