iQiYi Video as a Source of Information on COVID-19 Vaccine: Content Analysis

Shanshan Zhao¹,*, Boquan Zhang¹, Xiaohong Chang¹

¹Department of pharmacy/Clinical trial institution office, China Emergency General Hospital, Beijing 100028, China

*Corresponding author: Shanshan Zhao; E-mail: dorvs@163.com

Running title:
Content analysis of COVID-19 vaccine related videos on iQiYi

Sources of support that require acknowledgment:
The authors received non-financial support from Science and Technology Development Center of Chinese Pharmaceutical Association (CMEI2021KPYJ00306) for the research, authorship, and/or publication of this article.

Declaration of conflicting interests:
The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ORCID ID:
Shanshan Zhao https://orcid.org/0000-0003-2462-5710.

Abbreviations:
COVID-19: Coronavirus disease 2019
CSS: COVID-19 Specific Score
GQS: Global Quality Scale
HON: Health on the Net
HONCode: Health on the Net Foundation Code of Conduct
WHO: World Health Organization
Abstract

Objective: This study aims to assess the contents of COVID-19 vaccine related videos available on iQiYi, which is a popular video website in mainland China.

Methods: The phrases “新型冠状病毒疫苗” (COVID-19 vaccine) and “新冠疫苗” (the abbreviation of “新型冠状病毒疫苗” according to Chinese habits) were searched separately on iQiYi on July 1, 2021. The 200 most popular videos of each search were screened. Video content and characteristics were identified, extracted and independently rated against Global Quality Scale (GQS), Health on the Net Foundation Code of Conduct (HONCode) and DISCERN principle by two authors.

Results: Ninety videos, with a total of 1165596 views, 14498 likes, and 1450 forwards as well as 95 comments at the time of data collection were included in the study. The channels, sources, topics and formats of the videos were diversified. The majority of videos received high scores on GQS and all the videos partly adhere to HONCode and DISCERN principle.

Conclusions: Overall quality of information on iQiYi regarding COVID-19 vaccines remains good. However, existing evaluation tools cannot reflect the complexity of video websites. New and more effective tools or standards should be developed to help people understand the modern landscape of health communication better.

Keywords: COVID-19; vaccine; social media; video website; public health
INTRODUCTION
Coronavirus disease 2019 (COVID-19, caused by the virus SARS-CoV-2) first broke out in Wuhan, China in December 2019.\(^1\) The number of the confirmed cases has continued to increase, causing damage to the society and the economy worldwide. Researchers around the globe are still working on the vaccine meanwhile prevention is the only measure to control the spread of COVID-19. Though there are various kinds of COVID-19 vaccine rolled out world-wide from December 2020 \(^2\), nearly all vaccines were developed, manufactured and applied in very short time. On the other hand, the spread of rumors and false information is also accelerating \(^3\)-\(^4\). For example, some people in remote rural areas in China were seduced to buy COVID-19 vaccine at the price of several hundreds of RMB, while in fact, Chinese government provide it to the public for free. Some people doubt the effectiveness and safety of the vaccine and hesitate to get vaccination, they question whether these vaccines have passed large-scale clinical trials. Because many vaccines take 10 to 15 years to reach the public, the World Health Organization (WHO) said it did not believe a credible vaccine would be available in less than 18 months \(^5\). But the timeline for COVID-19 vaccine was very different.

With the proliferation of mobile devices and the development of high-speed Internet, online video platforms have gained increasing popularity, making videos an ideal tactic for disseminating COVID-19 related information \(^6\). Although YouTube (http://www.youtube.com), which is a popular video website worldwide \(^7\), is inaccessible in mainland China for some reasons, many similar domestic video websites are very popular. One of these websites, iQiyi (http://www.iqiyi.com) has high visibility, with 350 million registered users and 3 million daily active users \(^8\). A prominent feature of iQiYi is that it has the function of whole network videos searching, which allows users to access into totally ten popular online video websites at the same time (iQiYi, Tencent, Sohu, Youku, Tudou, acfun, bilibili, ifeng, CCTV, and 1905). It is worth noting that all these platforms have both websites and smart-phone based APPs. Similar to YouTube, the uploaded videos, with different sources, lack of peer-review process and are likely to be of variable quality \(^9\).

The use of video websites as a source of information on COVID-19 vaccine in mainland China has never been evaluated. Thus, this study aimed at understanding the characteristics of the viral iQiYi COVID-19 vaccine videos and assessing their contents.
METHODS

Search strategy
Using the whole network search function of iQiYi, iQiYi was systematically searched on July 1, 2021 for videos containing relevant information about COVID-19 vaccine. The keywords used included “新型冠状病毒疫苗”, which means COVID-19 vaccine, and “新冠疫苗”, which is the abbreviation of “新型冠状病毒疫苗” according to Chinese habits. The inclusion criteria were: (1) in Chinese language; (2) available on July 1, 2021; (3) related to COVID-19 vaccine in content. The exclusion criteria were: (1) duplicate videos, in part or as a whole; (2) videos that were only related to COVID-19 but not COVID-19 vaccine; (3) non COVID-19 vaccine popular science videos, such as those related to military, economics and politics.
We used iQiYi’s sorting option-popularity, which is one of the three available sorting options (relevance, upload date, popularity). The first 5 pages (20 videos/page×5 pages=100 videos) of each search result were filtered in consideration that users do not exceed the first 5 pages of a search result.
All the videos meeting the inclusion criteria were downloaded and saved, and characteristics such as titles, channels, topics, sources, formats, length, upload date, number of uploader subscribers, total number of views, number of likes, number of forwards, number of comments were extracted and saved for backup. Since the uploader of the video is not necessarily the producer of the video, we rigorously classified the source of the videos by content. If a video contained more than 1 topic, then each topic was separately listed. Two reviewers (Zhang and Chang) independently watched and assessed each video. Any disagreements were resolved by consensus.

Classification and scoring of videos
For the variables like length, number of days since uploaded, number of uploader subscribers, number of views, number of likes, and number of forwards, number of comments, videos were sorted and calculated, and for the variables like channels, sources, topics, and formats, videos were classified and counted.
The overall quality of the videos was evaluated with the 5-grade Global Quality Scale (GQS) standard. The GQS is tool for evaluating Internet resources. According to the total score, a video receiving excellent and good quality is considered to be of high quality, moderate quality is considered intermediate quality, and generally poor and poor quality is regarded as
Reliability and credibility of video content was assessed by modified Health on the Net Foundation Code of Conduct (HONCode)\(^1\). The HONCode is the code of conduct of the non-profit Health On the Net (HON) Foundation and is applicable to voluntary health/medical websites. It was launched in 1995 and has developed into the most common and trustworthy code for health/medical websites\(^2\). Evaluation involves assessing for authoritative, complementary, privacy, attribution, justifiability, transparency, financial disclosure, and advertising policy.

Quality and reliability of video content (i.e. integrity, comprehensibility, relevance, depth and accuracy of information provided) was evaluated according to DISCERN criteria, which were previously used to evaluate the quality of health information on YouTube\(^3\). DISCERN assesses quality and reliability by grading 8 items (concerning aims, bias, relevance etc.), each item is scored on a scale of 1 to 5: 1 is “poor” and 5 is “excellent” quality. The higher the score, the better the information\(^4\).

**Statistical analysis**

Statistical analysis was performed using SPSS 22.0 (IBM Corporation). A descriptive analysis was used to describe the basic characteristics of the COVID-19 vaccine information on iQiYi. Categorical variables were stated as number of videos and percentage (%). Numerical variables were reported as median with minimum and maximum value.

**Ethical approval**

This study did not require approval by the institutional review board because it involved the use of public access data only.

**RESULTS**

**Collected data**

The search for the two terms yielded 1383000 videos in total (“新型冠状病毒疫苗”-715000 videos, “新冠疫苗”-668000 videos). The first 100 eligible videos in each category were recorded. Videos that were duplicated were recorded once. In total, 138 videos met our inclusion criteria. After excluding 48 non-related videos, totally 90 videos met inclusion criteria and were analyzed. Figure 1 represents the search process.
Summary and characteristics of videos

Summary of the videos, including length, the number of days since the video was uploaded, the number of uploader subscribers, video popularity and engagement (number of views, number of likes, number of forwards, number of comments) were recorded (Table 1). The missing information about the videos due to privacy policy or other reasons was not included in the study. The 90 reviewed videos were uploaded between the dates December 19, 2020 and June 25, 2021. The minimum length of the videos was 0:24 and the maximum length of the videos was 15:01. The total number of uploader subscribers, views, likes, forwards and comments of all the videos was 7173246, 1165596, 14498, 1450, and 95 respectively.

The categories of channels were provided by iQiYi. Nearly half of the videos were from health channel (44 videos, 48.89%), then came the news channel (35 videos, 38.89%). There were separately 2 videos (2.22%) from maternal and child channel and military channel. Subsequently, the channels of economics, original, life, entertainment, and public welfare totally have 5 videos, with only one on each channel. The channels of two videos were not mentioned (2.22%).

Among the 90 videos, 40 (44.44%) were from media organization (The logo or QR code of the media organization was usually displayed at the end of the videos). The source of medical professional individual ranked second, with 23 videos (25.56%). Twelve videos (13.33%) came from TV (The logo of the TV station was always displayed in one corner of the video pictures). Similarly, private individual/layperson posted 12 videos (13.33%). The source of the rest video could not be inferred from the content.

The topics of the videos mainly covered precautions, adverse drug reaction, mechanism, vaccination procedure, national vaccination policy, and research and development. Most videos only contained 1 or 2 topic categories. In all the categories, precautions ranked top (69 videos, 66.35%), which were notification about the interaction and contraindication of the vaccine. Adverse drug reaction is another major concern, potential side effects including lethargy, dizziness, fatigue, nausea, rash and fever of COVID-19 vaccine were introduced in 10 videos (9.62%). Nine videos (8.65%) addressed vaccine science and mechanisms, as well as the different varieties of vaccines in application. Following ranked vaccination procedure (7 videos, 6.73%) and national vaccination policy (6 videos, 5.77%). These two kinds of videos told people where and how to get vaccinated. For the research and development issue,
there were 3 videos (2.88%) talked about the manufacture process and clinical trial of COVID-19 vaccine.

Videos were divided into the following seven types based on format parameters: presentation (34 videos, 37.79%), news report (22 videos, 24.44%), interview (12 videos, 13.33%), video clip (10 videos, 11.11%), animation with voice explanation (8 videos, 8.89%), short play (actors’ performance) (2 videos, 2.22%), animation with text explanation (2 videos, 2.22%).

The results are shown in Figure 2.

**Quality, reliability and credibility**

For the GQS score, more than 4/5 of all the videos (75 videos, 83.34%) had high quality. 14 videos (15.56%) were of intermediate quality, with only 1 video (1.11%) was classified as low quality (Table 2).

The percentages of videos adhering with each HONCode principle are shown in Table 3. In general, 77 (85.56%) videos clearly stated whether the information came from a qualified medical professional or not. The information provided in 85 (94.44%) videos were meant to support the patient’s self-management. Additionally, 54 (60.00%) videos satisfied “attribution” criteria. Videos scored poorly regarding justifiability (7 videos, 7.77%). Fifty-five (61.11%) videos provide the viewers with contact information. Thirteen (14.44%) videos mentioned financial disclosure. Six videos (6.67%) included advertisement which were clearly differentiable to the viewers. The screened COVID-19 vaccine videos on iQiYi took no account of privacy.

Videos attained median overall DISCERN score as 32 with the range from 16 to 36. In applying the DISCERN criteria to the videos assessment, as for “clear aims”, “achieve aims”, “relevant”, “unbiased”, there were separately 86 videos, 84 videos, 85 videos, and 85 videos were rated as 5, meaning that the videos stated what topics the videos were meant to cover and they met the purpose. A bit more than 50% of videos can identify and specify their sources of information (49 videos were rated as 5) and when the information reported in the publication was generated (46 videos were rated as 5). About half of the videos (46 videos were rated as 5) acknowledged areas of uncertainty, like what measures should be taken if vaccinated women found to be pregnant shortly afterwards, or the interaction between COVID-19 vaccine and other vaccines such as Human Papillomavirus (HPV) vaccine. No
videos provided additional sources of support and information. The results are shown in figure 3.

DISCUSSION
In this era of globalization, it may be difficult to prevent the spread of COVID-19, but the most effective way to prevent panic among the people is the provision of correct and timely information to meet public needs from a scientific point of view. Ensuring the quality, reliability and credibility of health information, protecting the rights of the individual to freedom of expression and opinion, and avoiding false information, in particular in public health emergency are very important. COVID-19 vaccine was approved to be put into use as early as in the second half of 2020. When they were first available to the public, people had many questions about them. People doubt how can COVID-19 vaccine be developed and manufactured in such a short time, what was the effectiveness, safety or even price of the vaccine. People want to know where and how to get vaccinated, as well as who are eligible to be vaccinated. Chinese video websites iQiYi provide a different medium to disseminate COVID-19 vaccine information to the public. This video-based information source can help the public get better understanding. Vaccination campaigns often focus on raising public awareness of the efficacy and safety of vaccines.

Several authors have evaluated the characteristics of YouTube videos providing information about COVID-19 vaccines. As far as we know, this is the first study to assess the content and quality of COVID-19 vaccine related videos on iQiYi. The results revealed that most screened videos were of good quality, and these videos partly conformed to HONCode and DISCERN principle.

Length of the videos and audience engagement measures like number of likes were important factors for iQiYi videos to be popular. The duration of the videos was not long. Most of the videos only last for several minutes. It was the consideration that people don't have the time and patience to see a long sermon. The videos examined gained a total of nearly 1.2 million views. The data illustrate videos about COVID-19 vaccine on iQiYi were extremely hot. The likes on the videos will spread oral propaganda which ultimately leads to more views. However, the engagement of the public was not too much. Though videos were viewed by tens of thousands of times, the number of likes, forwards and comments were relatively low. Not too many people shared the videos on their social media account, let alone leave some
words under the videos. This may due to the limited function of the video websites. iQiYi didn’t rate the videos and the audiences’ engagement was non-compulsory. The only incentive for the viewers to engage in interaction with the videos were the videos themselves. For the uploader, they seldom respond to the viewers’ comments actively and promptly.

Most of the included videos were classified into health channel by iQiYi. Media organizations rely on their subscribers to keep going so they put great effort, money and time to the make attractive original videos. Video websites were used as one of their major platforms to transmit information. This study showed that media organization played a big part in video spread of COVID-19 vaccine related information.

It seems video website is a powerful and useful tool for medical professionals like physicians, pharmacists, nurses, and even dietitians. More and more of them realized that it is one of their responsibilities to convey the correct information about COVID-19 to the public. They set up personal accounts on video websites to promote medical knowledge and seize the opportunity to improve the popularity of themselves. Given the fact that Chinese doctors often work overtime and experience energy deficiencies, they are really enthusiastic about science popularization. Some of them already became online celebrity doctors and had a large population of fans. For example, doctor Wenhong Zhang, who was very famous in China for his rich knowledge, humorous language, and wise judgement, were always invited to give speech in various occasions and was awarded many honors and awards.

Since it is not necessary to have professional equipment, software, or skills to produce videos, warm-hearted non-professional people can easily share their personal experience on the video platform. Some of them introduced or reemphasized the national or local vaccination policy, others of them recorded their own vaccination process to show public the procedure and feeling. This indicated that individuals do not only want to be passively educated and informed about COVID-19 vaccine information but they actively take part in sharing their knowledge and experience to others. This result could indicate that videos published by medical professional individuals commonly serves a higher educational goal, while videos published by layperson mainly serves a higher social purpose.

Many useful information about COVID-19 vaccine is available on iQiYi. Precautions and interactions were the most concerned topic about COVID-19 vaccine. At present time,
Chinese government called on the public to be vaccinated. This was obligatory and was promoted to political duty in some local areas. Since getting vaccination means making contribution to the country, people are actively dedicated to get vaccinated for their country. Special population, for example, people with comorbidities like diabetes, hypertension, and malignant tumor, or pregnant or lactating women need to know if it is appropriate for them to have the vaccine. General population was eager to get the knowledge of the interaction and contraindication between COVID-19 vaccine and food, medications, and other vaccines. The above-mentioned concerns were discussed in the screened videos. Among the topic ranks, research and development were the least cared, maybe for the reason that vaccine development process, although expressed in a clear and approachable manner, was still complicated and obscure to non-professionals. Since COVID-19 vaccine was already in the clinical application stage worldwide, the research and development process were not the focus of attention anymore.

The forms of videos were versatile. The carefully designed and produced news reports, interviews, animations, short plays etc. were vivid, interesting and easy to understand. Presentation or personal speech is the most used format, just because it is simple and does not need many resources to produce. These kinds of personal speech were portraited as a person’s chest and head or a big face occupying part of the screen. This was intuitive and educational but a bit lack flexibility. After all, only high-quality eye-catching videos appeal to the viewers.

iQiyi is not a medical professional website. This video website is all inclusive. Though censorship for video website exists, the video content is subject to review for gambling, pornography, violence or other illegal content, there is no standard for the professional review of the videos. Health information provided on iQiYi is mainly targeted to non-expert people, which further increases the need to ensure that viewers are provided with accurate information. At present, tools used for evaluating videos are limited in scope. While the current available tool COVID-19 Specific Score (CSS) evaluates COVID-19 information, it addresses topics regarding the pandemic itself such as the coronavirus' epidemiology and transmission, thus it cannot be applied to information on COVID-19 vaccines. There is currently no quality assessment tool for COVID-19 vaccines videos.

The GQS score of the videos were relatively high, maybe due to the reason that the included videos ranked top on the list based on popularity. If the videos were not well made, they would not be welcomed by the viewers.
Though a majority of the videos were rated as good quality based on GQS score, most videos only achieved part adherence to HONCode and DISCERN principles. After all, HONCode and DISCERN principles are evaluation tools for health websites, not for video websites specifically. Although these tools are currently the best available tools, they may not be able to capture the complexities of iQiYi videos, but are better suited for text media. One of the most frequently missing quality indicators in iQiYi videos is referencing of information provided. Thus, these videos were unable to fulfil both HONCode principles (e.g. attribution and transparency) and DISCERN reliability indicators (e.g. clear sources of information) and were unable to attain high scores. This may be due to the lack of a standardized method for referencing data sources in videos and frequent sharing of opinions or experience in these videos rather than sharing of evidence-based information. This is a major constraint in all videos, and producers of future videos should have regularly verifiable sources for the presentation of evidence-based information. Advertisement was included in several TV videos. It is clear advertisement supported funding for the TV station to make these TV programs, which were usually health education programs aiming at teaching people how to live long. All the videos were not concerned with privacy of patients, probably because these videos were not for treatment education purposes, there were no patients in these videos, hence, the privacy principle was not applicable here. The screened videos ranked top on the popularity list, it seems that these videos were well received by the public, however, the interaction between uploaders and viewers were limited e.g. the comments of the videos were scarce. The evaluation tools used in this study were not involved in rating how well the videos were received and interpreted by the general public. Therefore, evaluation of understandability and actionability of the videos are important aspects needed to be considered.

Since available tools cannot fully reflect the characteristics and completeness of versatile videos or containing surplus or not applicable items, it is urgent to develop appropriate tools or set new standard for video website platforms to evaluate health information, in order to better capture the way information is disseminated and public interaction with them. People around the world are increasingly using the Internet to collect information about COVID-19 vaccine. Since anything relate to COVID-19 on the video platform would be hot, multilateral efforts are required among the public, government and websites, to maximize the potential of video-based information and to minimize the amount of misleading or useless information.
This study has several limitations. First, effective and appropriate tools or standards should be developed to help people understand the modern video-based health information better. Second, the videos were sorted by popularity. The sorting criteria can influence the search results. Third, iQiYi search results are dynamic, and will change as more new videos are uploaded and old videos are withdrawn. Therefore, this cross-sectional study comprised a snapshot of information on COVID-19 vaccine at a certain time. Furthermore, we do not know how different the results would be, if more video samples were taken. Fourth, short video platforms with high popularity in recent years like Tiktok were not in the whole network search scope of iQiYi, hence, they were not included in this study.

CONCLUSIONS

In conclusion, our study played a key role in understanding as iQiYi described the COVID-19 vaccine. The COVID-19 vaccine videos from iQiYi show significant differences in sources and content. It is urgent to explore practical tools for video websites assessment. And it needs joint efforts to transfer correct and effective health information to people.
References

1. Wrigley Kelly, N. E.; Murray, K. E.; McCarthy, C.; O'Shea, D. B., An objective analysis of quality and readability of online information on COVID-19. Health Technol (Berl) 2021, 1-7.

2. Scott McLachlan, M. O., Kudakwashe Dube, Patience Chiketero, Yvonne Choi.; Fenton, N., Analysis of COVID-19 vaccine death reports from the Vaccine Adverse Events Reporting System (VAERS) Database Interim: Results and Analysis. 2021.

3. Cuan-Baltazar, J. Y.; Munoz-Perez, M. J.; Robledo-Vega, C.; Perez-Zepeda, M. F.; Soto-Vega, E., Misinformation of COVID-19 on the Internet: Infodemiology Study. JMIR Public Health Surveill 2020, 6 (2), e18444.

4. Bastani, P.; Bahrami, M. A., COVID-19 Related Misinformation on Social Media: A Qualitative Study from Iran. J Med Internet Res 2020.

5. Grenfell, R. D., T Here’s why the WHO says a coronavirus vaccine is 18 months away. https://theconversation.com/heres-why-the-who-says-a-coronavirus-vaccine-is-18-months-away-131213 (accessed 2021-9-10).

6. He, C.; Liu, H.; He, L.; Lu, T.; Li, B., More collaboration, less seriousness: Investigating new strategies for promoting youth engagement in government-generated videos during the COVID-19 pandemic in China. Comput Human Behav 2022, 126, 107019.

7. Li, M.; Yan, S.; Yang, D.; Li, B.; Cui, W., YouTube as a source of information on food poisoning. BMC Public Health 2019, 19 (1), 952.

8. iQiYi http://developer.game.iqiyi.com/account/login (accessed 9-28).

9. Keelan, J.; Pavri-Garcia, V.; Tomlinson, G.; Wilson, K., YouTube as a source of information on immunization: a content analysis. JAMA 2007, 298 (21), 2482-4.

10. Morahan-Martin, J. M., How internet users find, evaluate, and use online health information: a cross-cultural review. Cyberpsychol Behav 2004, 7 (5), 497-510.

11. Bernard, A.; Langille, M.; Hughes, S.; Rose, C.; Leddin, D.; Veldhuyzen van Zanten, S., A systematic review of patient inflammatory bowel disease information resources on the World Wide Web. Am J Gastroenterol 2007, 102 (9), 2070-7.

12. Rausch Osthoff, A. K.; Niedermann, K.; Braun, J.; Adams, J.; Brodin, N.; Dagfinrud, H.; Duruoz, T.; Esbensen, B. A.; Gunther, K. P.; Hurkmans, E.; Juhl, C. B.; Kennedy, N.; Kiltz,
U.; Knittle, K.; Nurmohamed, M.; Pais, S.; Severijns, G.; Swinnen, T. W.; Pitsillidou, I. A.; Warburton, L.; Yankov, Z.; Vliet Vlieland, T. P. M., 2018 EULAR recommendations for physical activity in people with inflammatory arthritis and osteoarthritis. Ann Rheum Dis 2018, 77 (9), 1251-1260.

13. Goobie, G. C.; Guler, S. A.; Johannson, K. A.; Fisher, J. H.; Ryerson, C. J., YouTube Videos as a Source of Misinformation on Idiopathic Pulmonary Fibrosis. Ann Am Thorac Soc 2019, 16 (5), 572-579.

14. Boyer, C.; Selby, M.; Scherrer, J. R.; Appel, R. D., The Health On the Net Code of Conduct for medical and health Websites. Comput Biol Med 1998, 28 (5), 603-10.

15. Singh, A. G.; Singh, S.; Singh, P. P., YouTube for information on rheumatoid arthritis—a wakeup call? J Rheumatol 2012, 39 (5), 899-903.

16. Charnock, D.; Shepperd, S.; Needham, G.; Gann, R., DISCERN: an instrument for judging the quality of written consumer health information on treatment choices. J Epidemiol Community Health 1999, 53 (2), 105-11.

17. The, L., COVID-19: fighting panic with information. Lancet 2020, 395 (10224), 537.

18. Staff, A. A Timeline of COVID-19 Developments in 2020. https://www.ajmc.com/view/a-timeline-of-covid19-developments-in-2020 (accessed 2021-09-17).

19. Bonnevie, E.; Rosenberg, S. D.; Kummeth, C.; Goldberg, J.; Wartella, E.; Smyser, J., Using social media influencers to increase knowledge and positive attitudes toward the flu vaccine. PLoS One 2020, 15 (10), e0240828.

20. Patel, H.; Jeve, Y. B.; Sherman, S. M.; Moss, E. L., Knowledge of human papillomavirus and the human papillomavirus vaccine in European adolescents: a systematic review. Sex Transm Infect 2016, 92 (6), 474-9.

21. Ahmad, T.; Murad, M. A.; Baig, M.; Hui, J., Research trends in COVID-19 vaccine: a bibliometric analysis. Hum Vaccin Immunother 2021, 1-6.

22. Marwah, H. K.; Carlson, K.; Rosseau, N. A.; Chretien, K. C.; Kind, T.; Jackson, H. T., Videos, Views, and Vaccines: Evaluating the Quality of COVID-19 Communications on YouTube. Disaster Med Public Health Prep 2021, 1-24.

23. Wu, H.; Liu, L.; Wang, Y.; Gao, F.; Zhao, X.; Wang, L., Factors associated with burnout
among Chinese hospital doctors: a cross-sectional study. *BMC Public Health* **2013**, *13*, 786.

24. Nagpal, S. J.; Karimianpour, A.; Mukhija, D.; Mohan, D.; Brateanu, A., YouTube videos as a source of medical information during the Ebola hemorrhagic fever epidemic. *Springerplus* **2015**, *4*, 457.

25. Tan, R. Y.; Pua, A. E.; Wong, L. L.; Yap, K. Y., Assessing the quality of COVID-19 vaccine videos on video-sharing platforms. *Explor Res Clin Soc Pharm* **2021**, *2*, 100035.

26. Li, H. O.; Bailey, A.; Huynh, D.; Chan, J., YouTube as a source of information on COVID-19: a pandemic of misinformation? *BMJ Glob Health* **2020**, *5* (5), e002604.
Figure 1 Search process flow diagram
Figure 2 Characteristics of included videos. (Top left: Channels. Top right: Sources. Bottom left: Topics. Bottom right: Formats.)
Figure 3 DISCERN score of included videos (score: 1  2  3  4  5)
| Characteristics               | Number of available videos (%) | Median (Min, Max) | Total          |
|------------------------------|--------------------------------|-------------------|---------------|
| Length (minute: second)       | 90 (100.00)                    | 1:43 (0:24, 15:01)|               |
| Number of days since uploaded | 88 (97.78)                     | 77 (18,485)       |               |
| Number of uploader subscribers| 78 (86.67)                     | 2494 (1,1485000)  | 7173246       |
| Number of views               | 56 (62.22)                     | 1522 (1,750000)   | 1165596       |
| Number of likes               | 75 (83.33)                     | 5 (1, 11000)      | 14498         |
| Number of forwards            | 46 (51.11)                     | 3 (1, 554)        | 1450          |
| Number of comments            | 6 (6.67)                       | 5 (1, 51)         | 95            |
Table 2 GQS score of included videos.

| Global Quality Scale                                                                 | Number of videos (%) |
|--------------------------------------------------------------------------------------|----------------------|
| Poor quality, poor flow, most information missing, not helpful for patients           | 0 (0)                |
| Generally poor, some information given but of limited use to patients                | 1 (1.11)             |
| Moderate quality, some important information is adequately discussed                 | 14 (15.55)           |
| Good quality good flow, most relevant information is covered, useful for patient     | 6 (6.67)             |
| Excellent quality and excellent flow, very useful for patients                        | 69 (76.67)           |
| Total                                                                                | 90 (100)             |
| HONCode principle | HONCode description                                                                                                                                                                                                 | Number of videos in compliance (%) |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Authoritative     | Any medical or health advice given in the video must come from a qualified health professional unless it is clearly stated that the information does not come from a qualified health source.                               | 77 (85.56%)                      |
| Complementary     | The information provided in the video must be designed to support the patient’s self-management, but it is not meant to replace the patient-physician relationship.                                                      | 85 (94.44%)                      |
| Privacy           | The information in the video maintains the right to confidentiality and respect of the individual patient featured.                                                                                                   | 0 (0%)                           |
| Attribution       | Each video contains references to source data on information presented or contains a specific HTML link to source information.                                                                                   | 54 (60.00%)                      |
| Justifiability     | Each video containing claims on the benefits or performance of specific skills/behaviors, interventions, treatments, products, etc., must be supported by evidence through references or HTML links.             | 7 (7.77%)                        |
| Transparency      | The video must provide the viewer with contact information, or a URL to more information.                                                                                                                              | 55 (61.11%)                      |
| Financial disclosure | Any individual or organization that contributes funds, services or material                                                                                                                                              | 13 (14.44%)                      |
in the posted video must be clearly identified in the video or video
description.

Advertising policy

If advertisement supports funding to the video or the video’s developers, it must be clearly stated. Included advertising must be clearly differentiable to the viewer: There should be a clear difference between the advertising material and the educational material in the video.