Use of YouTube by academic medical centres during the COVID-19 pandemic: an observational study in Taiwan

Yen-Ling Kuo, Ching-Heng Lin, Ya-Yu Wang, Gow-Jen Shieh, Wei-Min Chu

ABSTRACT

Objectives YouTube has been of immense importance in conveying essential information on COVID-19 and promoting the latest healthcare policies during the outbreak. However, there have been few studies that have focused on how healthcare organisations have used YouTube to communicate with the public and increase their awareness during the pandemic, as well as its effectiveness.

Design A nationwide observational study.

Settings We analysed official YouTube videos posted by the Ministry of Health and Welfare and the Taiwan Centers for Disease Control (TCDC).

Results We analysed official YouTube channels from 17 academic medical centres, involving a total of 943 videos. We found a relationship between the quantity of YouTube videos uploaded by the TCDC and the trend of confirmed cases (Pearson’s correlation coefficient was 0.25, p=0.02). Data from private hospitals revealed that they posted more COVID-19 videos (103 vs 56) when compared with public hospitals. In addition, multivariate linear regression showed that the number of ‘views’ correlated significantly with an increased number of videos.

Conclusions This nationwide observational study, performed in Taiwan, demonstrates well the trend and effectiveness of academic medical centres in promoting sound healthcare advice regarding COVID-19 through YouTube due to the channel’s easy accessibility and usability.

OBJECTIVES

Since the first case of COVID-19 was discovered in December 2019, the pandemic which originated from Wuhan, China, has continuously affected most of the countries in the world and changed healthcare systems entirely. Up until May 2022, COVID-19 has caused over 500 million people to become infected worldwide, with six million of them dying.

During the early times of the pandemic and the implementation of social distancing, social media platforms took on a bigger role than at any previous time in the history of humankind. For both healthcare professionals and healthcare organisations, social media has been a valuable tool for more than a decade due to its advantages of increasing health literacy of people, connecting with populations at risk particularly when they are quarantined, and improving health outcomes. Facebook, Twitter and Instagram have all been widely used throughout the world during the COVID-19 pandemic, with previous studies having revealed their extensive use by different healthcare organisations, while also outlining the effectiveness of social media’s ability to reach the world’s population.

Among all social media outlets, YouTube is emerging as a powerful force by gaining more users, and thus receiving a lot of attention. Due to its nature of offering video-based material involving sound and emotions, it has become more attractive than other social media outlets which only provide words and/or pictures. Although multiple social
media now use video content to attract more users, YouTube is still special for conveying message mainly by videos. Previous research analysing different social media discovers that Facebook and YouTube were used more for intervention purposes to change health behaviour. In addition, YouTube is now the leading video-sharing platform in the world since it was bought over by Google, so the search gives priority to YouTube videos. YouTube has demonstrated itself as a useful tool for spreading valuable information on health concerns, as well as initiating health campaigns. A past study revealed that most US state health departments are using YouTube to disseminate health messages. However, its reliability has become a concern as multiple, unidentifiable sources of unsubstantiated information continue to be posted on its site. A previous study concerning YouTube and men’s health revealed that videos which have been created by physicians and healthcare organisations are more reliable. Another study also mentioned that evidence-based videos do exist on YouTube channels and have the potential to be effective instruments in supporting the public in making sound healthcare decisions.

In this current time of COVID-19, the role of YouTube has been elevated, as the platform has become an increasingly important source of medical information regarding the pandemic. YouTube is now being used as a tool to disseminate information on such things as vaccinations, education regarding social distancing and handwashing, as well as the symptoms, treatments and outcomes surrounding the virus that everyone should be well aware of. However, a previous study has demonstrated that over one-quarter of the most viewed YouTube videos regarding COVID-19 contained misleading information, which reached millions of viewers worldwide. This statistic shows the importance of the source of information seen on YouTube during the COVID-19 pandemic.

Of all the countries throughout the world fighting COVID-19, Taiwan has become well known for its small number of cases and extremely low fatality rate with its relatively low-stringency environment. Taiwan’s success in the handling of the virus was made through its proactive measures, big data analysis, new technology and effective communication between government, healthcare organisations and the public. A strong public healthcare system and comprehensive contact tracing programme also helped to mitigate the COVID-19 pandemic. In addition, social media has also played an important role in Taiwan towards evolving public behaviour and attitudes, particularly through Facebook and YouTube.

Academic medical centres in Taiwan serve as healthcare institutions having multiple functions, including diagnosis and treatments of disease, advanced research regarding pathogens and underlying mechanisms, and medical education for the younger generation of healthcare professionals. Medical centres in Taiwan also provide the highest level of medical care as accredited by the Joint Commission of Taiwan (JCT), under the supervision of the Ministry of Health and Welfare of Taiwan (MOHW). However, along with clinical services, research and education, medical centres are also responsible for conveying the proper health information to the public, including what they post on platforms such as Facebook or YouTube.

There has yet been no study which has focused on how healthcare organisations have used YouTube to communicate with the public and increase their awareness. Only one review was carried out to evaluate the quality of YouTube videos related to home exercises during lockdown and the results showed that the quality of YouTube videos recommending exercises during lockdown is low. Therefore, our research questions are as follows: (1) What topic of COVID-19 related video is more popular and attractive? (2) What length should the video be in order to have more views? (3) How are video posts used by health authorities during a pandemic like COVID-19? (4) Is there a difference usage of YouTube videos between departments of the government and medical centres? To answer these questions, we conducted this study by using a nationwide observational study design involving the use of YouTube data taken from academic medical centres in Taiwan during the COVID-19 pandemic.

METHODS

Data sources
We conducted a nationwide observational study of all YouTube (YouTube, San Mateo, California, USA) video posts taken from official accounts linked to all the medical centres in Taiwan during the period December 2019 to August 2021. For comparison between COVID-19 YouTube videos from the relative departments of government and nationwide medical centres, we also surveyed all YouTube video posts placed by the MOHW and the Taiwan Centers for Disease Control (TCDC).

Study group identification and data extraction
We first checked the official names of all the medical centres in Taiwan from the JCT website and discovered that at the end of 2019, there were a total of 19 in Taiwan. All YouTube video posts placed by the 19 medical centres, MOHW and TCDC were examined and reviewed by a branding team from Taichung Veterans General Hospital (TCVGH). The team was established in 2016 and is led by the superintendent of the hospital. The team searched all the official YouTube accounts of the medical centres during the study period by using the names of the hospitals or abbreviations of the names. If the medical centre did not have an official YouTube account, it was excluded from the study. Medical centres would also be recorded as to whether they were a public or private hospital, as well as their location in Taiwan. According to the regulation of YouTube, channels with over 100 000 subscribers can apply the verification. All the official accounts of medical centres in Taiwan do not have such number of subscribers, thus they are not verified yet. Our modified focus group reviewed all the videos to make sure that they did not come from false accounts.
Research variables

All YouTube video posts were classified into being either COVID-19-related or non-COVID-19-related videos. A modified focus group reviewed all the videos and initially divided them into 14 unique themes according to their content characteristics. These 14 themes were then classified into 5 groups for analysis. We sorted the videos into the five groups based on genre of the content, including policy of TCDC, news/press conference, event/academic conference of hospitals, education and others. The category of ‘others’ included videos such as ceremony documentation, thank you notes, introduction of doctors, services or departments in the hospitals, etc. Each group of videos was then confirmed and decided on by a modified focus group. A senior leader of our team was appointed as the ‘gatekeeper’ of our classifications and she would review all videos and their categories to ensure that no classification bias occurred. Videos regarding COVID-19 were classified as COVID-19 videos, other video with no content related to COVID-19 were classified as non-COVID-19-related videos. For example, videos regarding nasogastric tube feeding or precision medicine introduction were categorised as non-COVID-19-related videos. Data regarding each COVID-19 video were also recorded as follows: date of post, headline, length of video (seconds), number of ‘likes’, number of views and date of search. In addition, from our previous work, there was a relationship between cumulative COVID-19 Facebook posts per week from medical centres and confirmed cases per week, therefore, to analyse the relationship between YouTube video posts and COVID-19 cases, the number of confirmed cases of COVID-19 was recorded after being taken from public data made available by the TCDC. We also categorised all medical centres into different regions and whether they were in the public/private sector. The resources in public hospitals and private hospitals are very different in Taiwan. The public hospitals receive relatively fewer resources despite bearing a heavier burden than the private hospitals. Therefore, it is important to have better use of social media to promote the hospital itself for public hospitals. That is the reason we separated all medical centres into public or private classifications.

Statistical analysis

We used the $\chi^2$ test of independence to test relationships of the categorical variables, with the Kolmogorov-Smirnov test being used for normality. The Mann-Whitney U and Kruskal-Wallis tests were used to examine variables between/among the different groups if the data were non-parametric. Dunn’s test was performed subsequently to pinpoint those with any statistical significance. Pearson correlation coefficients were used to analyse trends of the cumulative COVID-19 videos and cumulative confirmed cases. Multivariate linear regression was used to analyse the determinants of video views. All data were analysed by using SPSS (V.22.0, IBM).

Patient and public involvement

No patient was involved in the design or conduct of the study. We planned to disseminate the results of the study by YouTube videos or podcasts after publication to involve the public.

RESULTS

All YouTube video posts from 17 academic medical centres during the period between 1 December 2019 and 31 August 2021 were analysed. Table 1 shows the scale of the surveyed medical centres during the research period and their YouTube official account status. In mid-2021, there were 19 medical centres in Taiwan, and among all these centres, 6 were public hospitals, while the others were private. There is only one public medical centre in central region of Taiwan, with three private medical centres. TCVGH is the only government medical centre providing medical services to the public. Of all medical centres, only two medical centres had not established an official YouTube account. Thus, we analysed a total of 17 medical centres and their YouTube video posts from official YouTube accounts during the COVID-19 pandemic. Changhua Christian Hospital held the most COVID-19-related videos (38 videos, 23.9%) among all medical centres.

Table 2 reveals the trend and distribution of COVID-19-related videos and their categories, along with the non-COVID-19 videos. A total of 943 videos were analysed during the study period. There were no COVID-19 videos in or prior to the December 2019 outbreak, which occurred at the end of 2019 in Wuhan, China. Most COVID-19 videos were posted at the onset of the outbreak. From January to August 2020, 93 videos were uploaded in the span of 8 months. Another peak of COVID-19 video postings was seen during May to August 2021, the number of which was 44. Within the five categories of COVID-19 videos at the beginning of the pandemic, most were policy of TCDC related (42.9%), yet as the outbreak continued during May to August, videos centred on health education had become the main focus of all COVID-19-related videos (38.6%). From September to December 2020 and January to April 2021, most COVID-19 videos were regarding news/press conferences (75.0% and 50.1%, respectively). In May to August 2021, when confirmed cases surged, videos about health education and news/press conferences became the majority (36.4% and 25.0%, respectively). The distribution of COVID-19-related videos among the different time categories was significantly different (p<0.001, figure 1).

Online supplemental table 1 exhibits the engagement of all COVID-19 videos, including views per video, ‘likes’ per video and length (seconds) of each video. There was no statistical significance seen in the number of COVID-19 videos, views per video, ‘likes’ per video, or length (seconds) of each video between private and public hospitals. Regarding the different regions of Taiwan, the medical centres in the central and east regions received...
<table>
<thead>
<tr>
<th>Region, ownership and name of hospital</th>
<th>Hospital scale*</th>
<th>Creation dates of YouTube channel†</th>
<th>No of YouTube channel subscribers†</th>
<th>No of YouTube video total views†</th>
<th>No of COVID-19 YouTube videos n (%)</th>
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<td><strong>Northern, public</strong></td>
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<td>Chang Gung Memorial Hospital, Linkou</td>
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<td>27 June 2012</td>
<td>665</td>
<td>301 975</td>
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<td>Cathay General Hospital‡</td>
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<td>China Medical University Hospital</td>
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<tr>
<td>Chi Mei Medical Centre</td>
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<td>0 (-)</td>
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<td><strong>Eastern, private</strong></td>
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<td>Hualien Tzu Chi Hospital</td>
<td>971</td>
<td>8 November 2019</td>
<td>810</td>
<td>101 361</td>
<td>3 (1.9)</td>
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</table>

*The data source is taken from the official website of the hospital. Accessed date: 19 August 2021.
†The data source is taken from the YouTube of the hospital. Accessed date: 19 August 2021.
‡The official YouTube does not found.
significantly more ‘likes’ (6 in average), while the eastern regional hospitals had the significantly longest videos (369 s in average).

Figure 2 shows the cumulative COVID-19 videos per week from all academic medical centres, TCDC and MOHW, and their growth during the research period, along with the confirmed weekly cases of COVID-19 in Taiwan. We found a relation between the quantity of YouTube videos uploaded by the TCDC and the trend of confirmed cases (Pearson’s correlation coefficient was 0.25, p=0.02). However, no correlation was detected between the videos posted from the medical centres or the MOHW, with regard to confirmed cases (Pearson’s correlation coefficient 0.14, p=0.19 and 0.08, p=0.49, respectively). For most of the time study period, the TCDC had the most COVID-19-related videos.

Table 3 shows the factors associated with video views through multivariate linear regression. After adjusting for confounding factors, long length videos were associated with more ‘views’, compared with short length videos (estimate 10 800, 95% CI 6968.0 to 14 632.0). Moreover, more ‘likes’ were positively correlated to more ‘views’ (estimate 41.1, 95% CI 38.8 to 43.5).

**DISCUSSION**

**Principal results**

To the best of our knowledge, this is the first nationwide study which has explored how academic medical centres, the TCDC and MOHW in Taiwan have used YouTube as a tool for communication regarding pandemic risk, as well as a platform to increase the public’s health literacy.
after the outbreak of COVID-19. The main results are as follows:

1. The amount of YouTube videos about COVID-19, particularly those from the TCDC, increased as public awareness raised from its level at the beginning of the pandemic.
2. Along the timeline of the outbreak, various categories of COVID-19 videos were provided by medical centres for public viewing on YouTube.
3. Medical centres in different regions displayed different strategies when providing video posts on YouTube.

Although a previous study has demonstrated the relationship between video posts from social media and infectious disease outbreak, there has been few research which focused on the videos uploaded by medical centres. Our study was the first to compare the differences between the YouTube videos produced by public medical centres and private ones. Also, there have been no previous studies which aimed at the divergence on YouTube videos from academic health institutions located in different regions. We found that medical centres from different regions and having different types of ownership implement varying strategies when using

<table>
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<tr>
<th>Table 3</th>
<th>The linear regression exploring determinants of COVID-19 YouTube video views by nationwide medical centres</th>
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<tbody>
<tr>
<td>Variable</td>
<td>Estimate</td>
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<tr>
<td>Intercept</td>
<td>687.01</td>
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<tr>
<td>Likes</td>
<td>41.13</td>
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<td>Length (ref: short)</td>
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<td>Intermediate</td>
<td>1042.95</td>
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<tr>
<td>Long</td>
<td>10 800</td>
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<tr>
<td>Type of hospital (ref: public hospital)</td>
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<td>Private hospital</td>
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<td>Category of YouTube videos (ref: others)</td>
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<td>Health education</td>
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<td>Policy promotion</td>
<td>10.73</td>
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<tr>
<td>Seminar/activity</td>
<td>−178.99</td>
</tr>
</tbody>
</table>

*p<0.001.
video posts as a method of communication, with the percentage of video posts pertaining to COVID-19 being in the range of 0%–23.9%.

As figure 2 illustrates, the number of COVID-19-related videos from the TCDC is associated with that of reported cases, indicating that the TCDC has been attached to the changes seen in the outbreaks. We have also discovered that the fewest posts were those related to seminar/activity, although this category did gain the highest number of ‘views’ and ‘likes’ per video. We hypothesise that most of the audience watching this genre were healthcare workers. It is significant to determine which features attract more viewers. Therefore, we believe that the results of our study would provide inspiration for hospitals and government agencies to distribute prompt and accurate information throughout the course of a pandemic.

Comparison with prior work
Social media has been known to be an effective tool for disseminating key information during the COVID-19 pandemic.29 COVID-19 videos emerged on YouTube with the outbreak of the pandemic, providing a variety of valuable information to their audience. However, the quality and reliability of the clips produced by the many diverse sources can be ambiguous.30 31 Previous studies have concluded that those videos produced by professionals achieved significantly higher quality and reliability standards.29 32 As a consequence, we have aimed to analyse the YouTube videos created by academic health institutions, the TCDC and MOHW.

Parahoi et al analysed 349 COVID-19-related videos uploaded to YouTube in early 2020, in both English and Hindi languages, and coming from all types of resources.18 They then went on to categorise the videos by contributor, duration, content and reception (views/likes/dislikes/comments). Only 12.61% of their sample were provided by either government or healthcare professionals. Similar to our study, the duration of most of those videos were shorter than 10 min. However, in contrast to our results, their short videos (≤10 min) attracted the most viewers and had the greatest impact. This finding shows that audiences may be more interested in longer videos which are published by medical professionals but favour shorter ones coming from other sources. From our data, we were unable to verify the viewers’ occupation or preferences. It will be both very interesting and important to understand the characteristics of all the different viewers and their different video preferences in order to have a better promotion strategy for any future studies.

Shukla classified 93 YouTube videos related to the COVID-19 outbreak as the type of video they were (news, Television shows, educational and documentary).33 Approximately, 44.1% of those videos were educational and 32.3% were news updates related to COVID-19. They also analysed the features related to ‘views’ and learnt that the amount of ‘likes’ and comments were connected to more ‘views’, which is similar to our findings. Thus, it seems that ‘likes’ of each video are highly correlated to video views. We believe that future studies are warranted in order to explore the strategy for increasing the number of ‘like’ responses given of each video among the different healthcare institutions, including academic medical centres.

Limitations
There are several limitations to this study. First, we only collected data originating from YouTube videos uploaded by nationwide medical centres, without analysing videos on other social media platforms, such as Facebook, Twitter, Instagram and LINE. However, YouTube does remain the major social media outlet which the Taiwanese people are most familiar with. In addition, we have analysed Facebook material posted by medical centres in Taiwan during the COVID-19 pandemic in our previous work.26 Second, this study was a cross-sectional study. As the pandemic remains ongoing, the content of COVID-19-related videos changes. All the data we collected were dynamic and could have changed by the time the research team accessed the posts. Third, we only enrolled official YouTube accounts of the hospitals entered in the analysis. However, some departments within those medical centres had their own official YouTube accounts. For example, the Department of Cardiology at MacKay Memorial Hospital has its own YouTube channel. Nevertheless, most of their posts focus on cardiology concerns rather than COVID-19. Fourth, classification errors could happen as there can be different types of content contained in one video. To lower the effect this type of error may cause, a senior division leader was appointed as ‘gatekeeper’, reviewing the process of classification. Fifth, certain data were not made publicly available, such as length of time browsing each video and the increasing number of subscribers after each video had been uploaded. That data would have been helpful for better understanding the true effectiveness of the strategy surrounding the videos. Therefore, further research is warranted in order to better comprehend the relationship between the characteristics of uploaded videos and the preferences of the audience.

Implications and recommendations
From our results, the most inspiring finding is that longer YouTube videos are with more views. This is very different considering short videos like TikTok dominate social media platform recently. We think this difference comes from that the target audience of medical centres may differ from the public, perhaps with more healthcare professionals or citizens with higher health literacy. Further research is warranted to understand viewers’ characteristics for YouTube videos of medical centres.

YouTube video has been the mainstream social medical for people nearly all over the world and it also becomes a useful tool for spreading idea of health promotions. There are certain pros and cons to this phenomenon. On the bright side, the information regarding health promotion and health literacy are more easily disseminated by any
certified healthcare professionals, and the effectiveness can be calculated from the ‘likes’, ‘views’, even number of sharing per videos. However, on the other hand, this easily used tool may become a source of fake news or fake ideas, which could be harmful to viewer’s health behaviour or health literacy growth. We suggested that officers of academic medical centres and health departments of the government should use the YouTube channel more actively to spread authorised health information, with routine review of their statistical numbers, such as the relationship between length of videos and number of ‘views’ to improve the efficacy and effectiveness to achieve desirable health outcome of viewers. Moreover, although we did not analyse the outcome of non-COVID-19-related videos, our results showed non-COVID-19-related videos remained high during COVID-19 pandemic. It shows that routine health promotion and health knowledge are still required and necessary during the pandemic. Further research should be focused on the non-COVID-19-related contents in social media and their effectiveness during the pandemic.

CONCLUSION

This nationwide observational study has demonstrated the use of YouTube by all academic medical centres in Taiwan and the platform’s engagement efficacy. As the pandemic continues to develop and transition, it remains crucial for medical personnel worldwide to share their experiences surrounding disease control and prevention. This study, therefore, may provide great inspiration for medical facilities to disseminate correct and updated knowledge about COVID-19 through the production of informative videos.

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Contributors

Each author's individual contributions: W-MC planned the study. W-MC and G-JS conducted a survey with data collection. Y-LK completed the analyses, made interpretation of the data and drafted the content. C-HL assisted with the statistical analysis and revised the content. Y-WL assisted with the study design and revised the content. W-MC submitted the study and he was responsible for the overall content as the guarantor.

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Competing interests

None declared.

Patient and public involvement

Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication

Not applicable.

Provenance and peer review

Not commissioned; externally peer reviewed.

Data availability statement

Data are available on reasonable request. The datasets generated and/or analysed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Supplemental material

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