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Original Research

YouTube™ is a feasible tool to disseminate educational toxicology videoconferences: The global educational toxicology uniting project (GETUP)

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ABSTRACT

Introduction: The Global Educational Toxicology Uniting Project (GETUP) has filled an important void in global education about poisoning management by linking countries with and without toxicology services through videoconferencing and educating primary health care doctors and other health professionals. However, time zone incompatibilities among geographically remote sites may mean some parties are unable to attend all videoconferences. Recorded video is one potential solution for asynchronous learning using GETUP case materials, but its utilization has not been adequately defined. We aimed to assess the feasibility of YouTube to disseminate recorded toxicology videoconferences and analyze its usage. **Methods:** We performed a review of nine recorded videoconferences recorded on Google Hangouts™ and stored on YouTube™ from March 2014 to August 2015. YouTube Analytics™ data were used to measure web traffic and viewer trends. **Results:** There were 204 views of the nine videoconferences during the study period. The main groups involved in making the recorded conferences included the Austin Toxicology Service, Victoria, Australia; Fresno Toxicology Service, California, USA and the emergency department, Suva, Fiji. The majority of views (59%) were by viewers in the 25-34 age bracket. Viewers were located in 20 countries over six continents. 33% (67 views) were from 18 states in the USA. Devices used to playback these conferences included a computer (93%), mobile phone (5.3%), tablet (1%), and unknown (0.7%). **Conclusion:** Recorded video available over the internet is feasible method to disseminate toxicology based educational videoconferences around the world and gather important information about how medical professionals tend to consume case-based toxicology educational contents.

KEY WORDS: Video, telemedicine, internet, teletoxicology

INTRODUCTION

The development of medical toxicology as a specialty is important to improving care of the poisoned patient. At present, medical toxicology education is lacking in some countries [1]. Limited or no access to poisons information and medical toxicology services further limits educational opportunities [2]. Often to gain relevant experience and knowledge, clinicians need to travel or attend conferences. This is not always feasible for some clinicians due to cost, resource and/or time limitations.

To meet the education gap posed by these limitations and to improve global medical toxicology education, the Global Educational Toxicology Uniting Project (GETUP) was created in 2013 to link countries with and without medical toxicology services through videoconferencing [3]. The main audience was first line medical care providers, especially emergency department doctors in developing countries. GETUP is structured around the organization of regular videoconferences attended by registered sites. Sessions are dedicated to discussing poisoning cases using readily available conferencing software. Discussions are typically centered around mechanisms of poisoning, rational testing and investigations, and treatment options in resource-limited areas. Since the institution of the project, multiple sites have formed conferencing groups to perform these regular case discussions. Despite the flexibility afforded by a decentralized conferencing schedule among partnered sites, some institutions may still be unavailable during conference times due to time zone differences, or competing commitments. Recorded video permits these conferences to be watched at a later time.

YouTube was formed in 2005 as a website based video sharing medium used to share various video content and

social media [4,5]. Given the significant potential for broad dissemination of medical content, various medical specialties are already examining the utility of YouTube as an educational and research tool. For example to assist with medication use during pregnancy or evaluate asthma education [6,7]. There is currently a need for more toxicology education, especially to countries and sites without poisons information. YouTube could potentially assist in helping disseminate toxicology-based conferences and educational content. This study aimed to assess the feasibility of YouTube to disseminate recorded GETUP videoconferences around the world and analyze the usage of them.

METHODS

This is a retrospective review of data recorded from GETUP videoconferences from March 2014 to August 2015, using YouTube Analytics™.

Conference Recording and Web Upload

Google Hangouts™ is a free videoconferencing application and has the ability to record sessions, which are uploaded to YouTube™ with customized access options. Conferences were performed mainly between the Austin Hospital Toxicology Service in Victoria, Australia; UCSF-Fresno Toxicology Service in California, USA; and the Colonial War Memorial Hospital in Suva, Fiji with other guest sites available to participate on occasion at the beginning of the month. Members of GETUP included mainly medical, poison control center and allied health staff [3]. After each session, the video was available on YouTube, and the recorded conferences were also made available via the American College of Medical Toxicology (ACMT) website (www.acmt.net/Media.html). Links to these videos (e.g., the URL link) were sent to members of GETUP (35 registered sites) [3] after each conference to share with colleagues or trainees. These videos remained "unlisted" in the YouTube search engine, therefore not available to the general public on searching the Internet for individual videos.

Data Tracking and Analysis

YouTube Analytics™ software, which is available for registered subscribers to the website, was used to gather data. Data were taken from March 2014 to September 2015. Viewer demographics (age and gender) were recorded from Google/YouTube™ accounts, but there is no identifiable information recorded. This method of analysis has not been done previously with toxicology conferences. Feasibility to disseminate videoconferences was primarily determined by recording viewer geography and number of views. The analytical software allows real-time analysis of viewer location and data can be analyzed by country of viewing origin. Secondary data collected information on devices used to watch conferences, traffic sources (method by which the viewer found the video) and view time.

Mainly descriptive data and proportions were used in the analysis. The ANOVA test was used to compare proportion between multiple groups. SPSS (V23, IBM, California, USA) was used as the statistics analytical software.

RESULTS

There were nine videoconferences recorded and posted to YouTube during the study period, which was advertised to 35 GETUP member sites. The videos were viewed 204 times, totaling 1194 min [Figure 1]. Video length ranged from 38 to 75 min. Average view duration ranged from 4 to 18 min per conference with a mean duration of 6 min per conference overall. A high number of views for each conference occurred shortly after each upload and accompanying announcements to the GETUP members noted by the spikes in data occurring in the 1st week of each month.

The audience of the conferences ranged from 20 different countries on 6 continents [Table 1]. The top countries viewing these videos were Australia 47% (96 views), USA 33% (67 views), and Fiji 3.9% (8 views). The views from the USA occurred in 18 different states. 83% of viewers were male. The majority of viewers were aged 25-34 (59%), followed by 35-44 (24%), 45-54 (9%), 18-24 (5%), 65+ (2%), and 55-64 (1%) years of age. The ability to "like" or "dislike" each video and provide comments using built-in YouTube feedback mechanisms were not utilized.

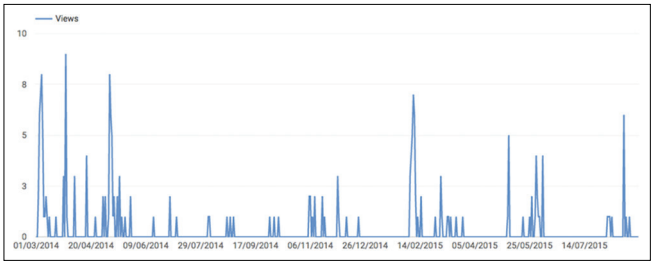

Figure 1: Number of YouTube views versus time (date)

Table 1: Number of views by country

Country	Views (%)
Australia	96 (47)
United States	67 (33)
*Fiji	8 (3.9)
United Kingdom	7 (3.4)
*Ecuador	5 (2.5)
*Papua New Guinea	3 (1.5)
Netherlands	2 (1.0)
*Nepal	2 (1.0)
*Haiti	2 (1.0)
Sri Lanka	2 (1.0)
Canada	1 (0.5)
*Jordon	1 (0.5)
Germany	1 (0.5)
*Solomon Islands	1 (0.5)
India	1 (0.5)
Saudi Arabia	1 (0.5)
Switzerland	1 (0.5)
Qatar	1 (0.5)
*Botswana	1 (0.5)
Malta	1 (0.5)

*Sites denoted by asterix are not known to have primary inpatient toxicology services

Various devices and web addresses were used to help view the conferences.

65% of views were directly from the ACMT webpage, whilst the other 35% of views were from a direct URL link. The most common devices used to view the conferences were: Desktop or laptop computer (93%) ($P < 0.0001$), mobile phone (5.3%), or tablet (1%). The device type was unknown in 0.7%. Viewers used the following operating systems: Macintosh (57%), Windows (34%), iOS (6%), Android (2%), and other (1%).

Case discussions included pharmaceutical, agrochemicals, and household poisonings [Table 2]. Pharmacology, pathophysiology, and management of poisonings were some of the areas covered in these discussions.

DISCUSSION

The global advent of the Internet, video recording and playback devices and social media have accelerated the ability of medical educators to share current informational content. Videos are an increasingly utilized resource for patient and health provider education[8]. Online content is a growing medical education tool, as it has the potential to provide an alternative or supplementary platform to the classroom or bedside teaching [9-11].

Table 2: Video content and associated average view time. Ranked by most to least viewed

Video poisoning case content	Average view time (min)	Number of views
Caustic ingestion	7	32
Intrathecal baclofen		
Tetrodotoxin poisoning		
Ethambutol poisoning		
Ricin poisoning		
Paraquat poisoning		
Irukandji syndrome	3.5	62
Lithium poisoning		
Valproate poisoning		
Modified release acetaminophen poisoning		
Body stuffer	8.5	24
Toxic leukoencephalopathy		
Tricyclic antidepressant poisoning		
Digoxin poisoning		
Potassium permanganate	16.5	16
Massive acetaminophen poisoning		
Stinging tree toxicity		
Orphenadrine poisoning		
Redback spider	6	24
Funnel web spider		
Toluene poisoning		
Stonefish envenomation		
Carbamazepine poisoning		
Multiple cardiac arrest scenario	7.5	10
Iatrogenic magnesium poisoning		
Formalin poisoning		
Use of cardiac bypass		
Nitrite poisoning	3.5	19
Organophosphates		
Phenytoin poisoning		
Serotonin toxicity		
Warfarin overdose	7.5	10
Lead poisoning		
Massive bee envenomation		
Toxic gas inhalation		
Salicylate toxicity	4	7
Dress syndrome		
Acetaminophen poisoning in pregnancy		
Monoamine oxidase inhibitor poisoning		

We gleaned several valuable insights when we analyzed the archived GETUP session viewership trends. As expected, a high number of views occurred after each conference weblink was announced or emailed. The level of viewership generally tapered off from this initial peak until the next video release.

Dissemination of video content to multiple countries was feasible throughout the study. The ability of individuals to readily access the internet and free video archives such as YouTube likely contributed to this feasibility. However, the majority of views were made by developed countries with access to toxicology services. This may be the result of poor quality data streams in developing countries, lack of dedicated time assigned for primary health carers to watch videoconferences, need for more countries without toxicology service recruitment to the project, preference for real-time videoconferencing or a combination of all factors. With more time, an improvement in a number of these factors is expected.

In this study, the majority of viewers were males. This coincides with larger web trends, as male YouTube viewers outrank female viewers across all age categories on YouTube in general [12]. The majority of GETUP video viewers were young to middle-aged adults, which may have implications for the types of content and styles that work best for this demographic. Alternatively, the age distribution may reflect the working life cycle of individuals within the health professions, excluding those at the extremes of age. These demographic trends are helpful in future planning to maximize use of GETUP's resources and manpower to fulfill gaps in toxicology education.

The average view time was under 10 min per video, even though all of the available recordings were considerably longer. This duration is consistent with previous data on educational video viewer habits, which favor brief videos [13]. To increase the number of views and fulfill the potential offered by recorded lessons, it may make more sense to separate a larger video into shorter segments or subdivide each session into a single case-length link. Another option would be to create more graphic and text annotations to better capture the audience's attention, or combine the viewing with more active learning exercises such as worksheets. Achieving learning points from shorter, more dynamic educational presentations is an active pursuit across many educational disciplines, as reflected in innovations such as PechaKucha and Ignite, which place time limits on live lectures in an effort to captivate the audience's attention [14,15]. This must be counterbalanced with the need to present a potentially complex topic or case completely, and address clinical controversies or nuances at the same time.

The ability to watch video is now available on a range of devices. From our study, the preferential device was still the laptop or desktop computer. This might relate to the availability of these videos being via webpage or URL links to webpages rather than searchable in the YouTube database, hence not readily available for the YouTube application ("app") for portable devices. However, given that there are approximately 1.75 billion smartphone users worldwide in 2014 [16], and 98.9% of UK doctors [17], for example, have access to a smartphone and mobile apps, the use of a tablet or smartphone device can mean that, like podcasts, video conferences can be consumed "on the go" or in a variety of non-office settings. Numerous audiences in different countries are able to be reached and are not restricted to viewing at certain times, via certain devices or in particular avenues.

Limitations

While recorded video sessions such as those from GETUP provide an opportunity for teaching health-care professionals in resource-limited settings, there are some limitations to this approach. Limited Internet connectivity, unreliable connections, or other technical challenges may interfere with efficient or productive engagement online. These limitations apply to live sessions as well as websites such as YouTube, which stream videos and could be overcome by a model of downloading the session to a device before viewing. However, downloading content takes time as well as device memory, which may limit the utility of this approach in the long-term. In some settings, there may be a significant cost to downloading content. Internet connectivity is a major priority for global entities such as Google™ and FaceBook™, both of which have dedicated significant resources to providing "free internet" to resource-limited countries. It is expected that as global Internet infrastructure matures through these and similar initiatives, sharing of video contents will be easier.

Another limitation is that that recorded sessions impair the ability to interact and contribute to these conferences in real-time. The use of a comments section, as with YouTube™, can help overcome this barrier somewhat as it provides a script of online conversations by viewers. This mechanism of immediate feedback was underutilized. It is also unknown if viewers were watching in a group, alone or which part of the video they were watching. Direct feedback via email or survey mechanism may be another method to gauge user opinion and determine useful content. Similarly, it is difficult to gauge usefulness from physically attending medical conferences unless feedback or assessment such as pre- and post-session questionnaires are employed and evaluated. As with podcasts and other media offerings under the banner of "Free Open Access Medical Education," the use of videos is probably best done in combination with other, more engaging active modes of learning, many of which are also being trialed in the current, rapidly changing media landscape [18].

One of the primary challenges in education is the ability to deliver it. Recorded medical toxicology based conferences disseminated via the Internet remains a novel and efficient way to disperse educational content. Not delivering any educational material to areas that manage poisoned patients and need it would, in our opinion, offer a far worse result. Future research should be aimed to evaluate and test user knowledge pre and post watching conference content.

CONCLUSION

YouTube is a feasible resource for recording and dispersing educational, medical toxicology based videoconferences with multinational participants around the world. There are ongoing challenges to delivering and receiving medical toxicology education in resource-poor countries around the world. This is especially evident in areas with no medical toxicology services, who may additionally be hampered with other barriers such as time zone differences limiting real-time information sharing. The potential effectiveness of this media resource as a learning tool, therefore, merits further evaluation.

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