

Original Article

Usefulness of YouTube™ videos in training patients for blood glucose self-monitoring in current coronavirus disease-19 pandemic

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ABSTRACT

Objectives: During the coronavirus disease-19 pandemic, due to restricted health-care access, patients may not get hands-on training for self-monitoring of blood glucose (SMBG) from physicians. YouTube™ is a popular video-sharing web platform that can be used as a source of information for SMBG. This study aimed to assess the usefulness of YouTube™ videos on SMBG.

Material and Methods: We searched the keywords “blood glucose self-monitoring,” “home blood glucose monitoring,” “blood glucose test,” and “blood sugar test” on YouTube™. The first 40 videos of each search were listed. After the two-stage screening, 49 videos were included for final data analysis. General characteristics and SMBG-specific characteristics (namely, strip handling, lancing device handling, measurement, and post-measurement action) were observed with pre-defined criteria having “yes” and “no” closed option. Data were tested statistically by the binomial test.

Results: Average duration of 49 videos was 244.20 ± 72.61 s and those were online since 35.14 ± 20.52 months on YouTube™. Information about strip handling was mostly deficient, major being checking the expiry date (16.33% videos had the information). The handling of the lancing device was correct in the majority of the videos except for the disinfection of the tip of the lancing device (6.12% videos had the information). The measurement procedure was also correct in the majority of the videos except for the instruction to dry the hands (38.78% videos had the information) after washing. The post-measurement logbook entry was found in 48.98% videos.

Conclusion: YouTube™ videos can be used as a potential source of information for patients’ education for SMBG. However, there are various levels of the incompleteness of the tutorials. Primary care physicians may suggest YouTube™ videos after exploring the videos and selecting the most appropriate one for their patients.

Keywords: Coronavirus disease-19, Blood glucose, eHealth, Social media, Diabetes mellitus, YouTube

INTRODUCTION

Blood glucose self-monitoring is the process of “Self-evaluation of whole blood glucose levels outside the clinical laboratory.”^[1] As this self-evaluation is done outside the clinic, the self-monitoring of blood glucose (SMBG) is also called home blood glucose monitoring.^[2] It is an excellent tool for adjustments of insulin dosage in patients suffering from diabetes mellitus.^[3,4] Although the SMBG has not been adopted in developing countries,^[5] it has the potential to reduce

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the comorbidities and reduce the cost of treatment in diabetes patients.^[6]

There is a difference in the accuracy of different glucose monitors.^[7,8] Hence, the doctors and patients should decide the most appropriate meter for them after reviewing the current literature.^[9] The next most important aspect is the proper usage of the glucose monitor. Faulty steps may give an erroneous result which may cause unnecessary hospital visits.^[10] In a country like India, doctors may not get adequate time to instruct the patient about the correct procedure of using the device.^[11] In current coronavirus disease-19 pandemic, there is restricted access of non-emergency health-care service. Hence, patients may not get opportunity to get a hands-on training from their doctors on how to conduct a session of SMBG.

YouTube™ is “a website where people can watch and share videos” online.^[12] Many educational institutions and individuals use it for the dissemination of information for public awareness. Due to the easy availability of smartphones and internet connection, people can easily watch YouTube™ video which is a rich collection of entertainment and educational videos.^[13,14] A major advantage of educational videos on YouTube™ is the scope for revision. A didactic lecture may end at a certain time and repetition may not be possible. In contrast, a video can be paused and replayed at any time according to the convenience of the viewer. Hence, it is a potential medium for educating people on a large scale. Millions of people can view an educational video which is never possible by direct training.^[15]

YouTube™ is a collection of dynamic user-generated content. Anyone can upload videos. Hence, the quality of the videos must be checked for its suitability for patients’ education. The previous studies have explored the usefulness of YouTube™ videos in different fields of specialization and found various levels of educational quality.^[16-21] The current literature lacks information about the usefulness of the YouTube™ videos for SMBG.

In this context, we designed this study to assess the usefulness of YouTube™ videos for the education of the patients for SMBG.

MATERIAL AND METHODS

Ethics

This study audited the videos uploaded on an open-access social media (public domain) by any individual or organization. The identity of the video, video contributor, and the name of the YouTube™ channel were kept confidential. We analyzed fully anonymized data. Hence, this study does not require any clearance from the Institutional Ethics Committee.

Type and settings

This is an observational study in which we analyzed online video contents. The videos were searched on YouTube™ (www.youtube.com) by pre-defined keywords from a fresh Google account on a cookie and history cleared internet browser (Firefox 74.0). For this study, we used a personal computer (Asus VivoBook Max X541N) and a personal internet connection. Institutional resources were not used. Sorting of the videos was done on June 15, 2020. After making the list of videos by applying inclusion and exclusion criteria, the web links of the videos were saved for further analysis.

Search strategy and selection of videos

After searching Medical Subject Headings, we made a list of five phrases as search keywords. The keywords are “blood glucose self-monitoring,” “home blood glucose monitoring,” “blood glucose test,” and “blood sugar test.” With default settings of YouTube™, the first 40 videos for each search were included initially. Then, the videos were screened with pre-defined exclusion criteria (namely, videos showing as advertisement by Google, videos which are a part of a training series, videos with duration >10 min, and repetition of same video) [Figure 1, initial screening]. Eighty-six videos

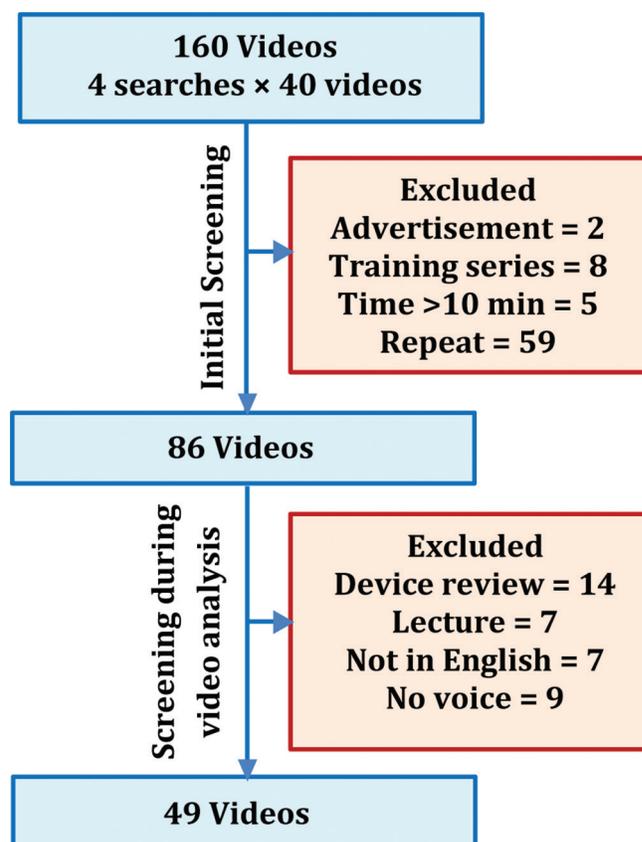


Figure 1: Flowchart of the selection of videos

were selected after the initial screening. Then, the video content analysis was started with the criteria, as shown in Table 1.^[22] During this part, the videos were screened with another set of exclusion criteria (namely, videos with review of a device, videos having didactic lecture, videos which are not in English, and videos without instruction voice) [Figure 1, screening during video analysis]. Finally, 49 videos were kept for data analysis.

Data collection

The link of the individual video was opened and the detail about the video was recorded in a pre-defined form. The form was divided into two parts. The first part records data on general information such as the word count of title, duration of the video, time since upload, the gender of the instructor, availability of the video transcript, and links for buying the glucose monitors. Data about likes, dislikes, and comments were recorded but not reported as many of the video owners have disabled the option to like, dislike, or comment on the video. The second part contains data on handling strips, lancing device, measurement proper, and post-measurement actions [Table 1].

Statistical analysis

Data were presented in numbers, percentage, mean, and standard deviation with range. The binomial test was used to compare the distribution in “yes” and “no” with an expected 50% distribution in both. $P < 0.05$ was considered statistically significant. We used Microsoft Excel 2010 for database creation and GraphPad Prism 6.01 (GraphPad Software, CA, USA) for statistical analysis.

RESULTS

A total of 49 videos were analyzed after excluding 111 videos from the initial list. The average duration of the videos was 244.20 ± 72.61 s which is approximately 4 ± 1.2 min. The videos were online on YouTube™ for 35.14 ± 20.52 months. Descriptive statistics of general characteristics are shown in Table 2. The majority of the videos had a female voice instruction (73.47%). Only 8.16% of videos had a transcript along with the video. A link for buying a glucose meter was provided in 12.24% of the videos.

SMBG-specific information in the videos is shown in Table 3. Instruction for the handling of strips of the glucose monitor was grossly deficient in the majority of the videos. Checking the expiry date was not included in 83.67% of the videos. Proper placement of the lancets was shown in majority of the videos (85.71%). However, the disinfection of the tip of the lancing device was found only in 6.12% of the videos. Measurement proper was found to be present in the majority of the videos, but instruction for drying the finger after washing was only present in 38.78% of the videos. Approximately 50% of the videos did not instruct to keep the blood glucose level recorded on a logbook.

DISCUSSION

Strip handling

We found that the majority of the videos have no proper instruction on handling the strips. The strips should be handled with clean and dry hands. If it is handled by a wet hand, there may be moisture-related damage to the strips.^[10] It

Table 1: Checklist for analyzing the video content.

Category	Domain	Items	Yes	No
Handing strips	I/S	Checks expiry date of the glucose meter strip		
	I/S	Handles strips with clean and dry hands		
	I	Strips are for single usage		
	I/S	Keeps the lid of the strip bottle closed immediately		
Handling lancing device	I	Lancets are for single usage		
	I+S	Places the lancet in lancing device		
	I+S	Shows the steps for adjusting depth of penetration		
	I+S	Shows a firm contact of lancing device tip on the desired puncture site (e.g., finger)		
Measurement proper	I/S	Cleans the tip of lancing device after use		
	I/S	Washes or clean hands or fingers		
	I/S	Makes the puncture site dry		
	I+S	Milking of the finger		
	I/S	Makes an adequate blood drop		
Post-measurement action	I+S	Applies blood on the strip		
	I/S	Disposes lancet properly		
	I+S	Obtains reading from the meter		
	I/S	Records the reading on a log book		

I: Instructs, S: Shows, I+S: Both instructs and shows, I/S: Either instructs or shows

is also important to instruct the patient about proper storage of the strip. The strip container should be immediately closed to prevent moisture-related damage.^[23] One of the most important parts is checking the expiry date of the strips which is grossly deficit in videos. Although the videos show handling a single strip, it should be instructed that the strip is for single use. This may seem to be common knowledge to some people; however, people with a wide range of intelligence access the videos and there may be confusion if the instruction about “single use” is not provided.

Lancing device handling

Almost all the glucose monitors are supplied with a lancing device. There may be a different type of mechanics of operation of the lancing device. However, the principle is almost similar in all the lancets. More than 50% of videos instruct about the single use of the lancet. Placing the lancet on the particular slot is available in the majority of the

videos. The selection of pricking depth and maintaining a firm contact of the tip of the lancing device on the puncture site is available in approximately 50% of the videos. This is important as the thickness of the skin may differ among individuals.^[24] The firm contact ensures that the pricking lancet has penetrated the desired length for an adequate puncture. As this tip of the pricking device comes in contact with fingertips or any other puncture sites, there are chances of contamination by body fluids. Hence, after each usage, it is better to clean or disinfect the tip.^[25] This is addressed by only 6.12% of the videos.

Measurement proper

Before making the puncture, the hands should be washed with mild soap and water. Although this has been instructed or shown in the majority of the videos, instruction about drying the hands after the wash is absent in many videos. When the puncture alone is not sufficient to form a fair amount of blood drop, a mild milking is suggested and this does not alter the reading significantly.^[26] Instruction about it was present in the majority of the videos along with showing the proper method of placing an adequate amount of blood on the test strip. Available glucose monitors now provide capillary suction-based strips which on touching on the blood drop suck the required amount of blood by capillary action. If there is a large drop of blood and the strip is stained with the excess blood, it would not affect the result. In addition, the device is not easily soiled by the blood. However, some meters like Accu-Chek Active may be contaminated by blood when a large drop is placed on the test strip.^[27] If that occurs,

Table 2: General characteristics of the videos.

	Mean	SD	Minimum	Maximum
Word count of title (n)	8.69	3.47	5	18
Duration (s)	244.20	72.61	111	403
Views (n)	177,122.37	286,011.88	1	1,069,347
Time since upload (months)	35.14	20.52	3	83

n: Number, SD: Standard deviation

Table 3: Characteristics of the video content.

Category	Item	Yes	No	P (two tailed)
		n (%)	n (%)	
Handling strip	Handle with dry hand	14 (28.57)	35 (71.43)	0.004*
	Check expiry date	8 (16.33)	41 (83.67)	<0.0001*
	Single use	16 (32.65)	33 (67.35)	0.01*
	Proper storage	11 (22.45)	38 (77.55)	0.0001*
Handling lancing device	Single use	28 (57.14)	21 (42.86)	0.39
	Proper placement	42 (85.71)	7 (14.29)	<0.0001*
	Adjustment of prick depth	29 (59.18)	20 (40.82)	0.25
	Firm contact with finger	20 (40.82)	29 (59.18)	0.25
	Cleaning tip of lancing device	3 (6.12)	46 (93.88)	<0.0001*
Measurement proper	Wash hand	32 (65.31)	17 (34.69)	0.04*
	Dry hand	19 (38.78)	30 (61.22)	0.15
	Mild milking	39 (79.59)	10 (20.41)	<0.0001*
	Adequate drop formation	31 (63.27)	18 (36.73)	0.08
	Proper placement of blood on strip	43 (87.56)	6 (12.24)	<0.0001*
Post-measurement action	Proper disposal	28 (57.14)	21 (42.86)	0.39
	Taking reading	44 (89.8)	5 (10.2)	<0.0001*
	Maintaining log book	24 (48.98)	25 (51.02)	>0.99

*Statistically significant P value (two tailed) of binomial test, n: Number of observation

the meters should be cleaned immediately by wiping with an alcohol swab.

Post-measurement action

Checking the reading of blood glucose is available in almost all the videos. However, proper disposal of the lancet after the measuring was not addressed in 42.86% of the videos. Showing the method of proper disposal is an important component as the sharp lancet may prick someone else if not properly disposed of. At least a voice instruction should be there in the video. The purpose of SMBG is to track glucose levels over time. Hence, maintaining a logbook and entry of reading immediately after the measurement is suggested. Half of the videos either showed it or instructed it.

Underlying reason of the finding

The incompleteness of the videos may be due to multiple factors. Many of the videos are made to show how the device works. A fair number of the videos are also made for the promotion of a particular glucose monitor. Product review, unboxing, and how-to videos are some of the commonly watched types of videos.^[28] As YouTube™ videos are contributed by its users, anybody can use this platform to show her/his videos. Hence, completeness in terms of proper steps for SMBG may not be found. However, many of the videos are made by an individual doctor, medical student, pharmacist, or nurse along with the medical or educational institutions. These videos are fairly accurate and complete in nature.

Implication

The best method of educating patients about SMBG is to show the steps first and then to do the test in front of the instructor once. In this method, the patient first knows what the steps are and then shows the capability of doing the same. If any deficiency is found in showing the act, the doctor may suggest immediate rectification. This may be done by the physician's assistant too if they are well trained for SMBG. However, a developing country like India is running with a shortage of doctors. Hence, a busy physician may not get adequate time to show the proper steps for SMBG. They may sort out the most suitable videos from YouTube™ for patients' education. They may also think of making videos themselves according to the local language, frequently used meters in that area, and the educational level of their patients. Primary care physicians may consider putting the link in the form of a quick response code of the video on their clinic for their smart patients.

Novelty and limitation of the study

We assessed the content of YouTube™ videos as per the specific criteria of SMBG. This is a pre-defined objective

method of evaluation. The global quality scale that is frequently used in similar studies is a subjective evaluation which may show intraobserver and interobserver variation in the score.^[29,30] In our study, a single observer rated the video with objective criteria. Hence, we presume that it had minimized the bias in the result. We used a new Google account and a fresh internet browser to reduce any suggestions based on browsing history and cookies.

We included 40 videos from each search result page and excluded video which is >10 min duration. We excluded the videos other than English as we could not assess those videos. We used the default settings of the website (search by relevance). Furthermore, YouTube™ is not a static collection of videos but dynamic user-contributed content. Hence, the usefulness of the videos may change within minutes if a huge number of videos are uploaded by other contributors.

CONCLUSION

There are a fair number of videos on YouTube™ containing instruction on SMBG. These videos can be used for the dissemination of information among the patients. A busy physician, who is not capable of showing the steps of SMBG, can suggest watching videos on YouTube™. However, currently available videos have various levels of incompleteness. Hence, the usefulness of the video depends on the selection of the most appropriate one from the large collection of videos. Primary care physicians may watch some of the videos from YouTube™ and suggest the most suitable one for her/his patient.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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