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RESEARCH ARTICLE

Exploring the optimal duration of video recording in a post-discharge eLearning platform for cardiac patients [version 1; peer review: 1 approved, 1 approved with reservations]

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Abstract

Background: On a post-discharge eLearning platform for patients with coronary artery disease, videos are used as the main educational media. Medical content takes a long time to be thoroughly explained, frequently exceeding the viewer's attention span. To find the optimal duration for such an educational video, we studied the retention of video watching.

Methods: In this study, 135 (88% male; age 62±9 years) patients with coronary artery disease actively used eLearning platform which included 60 video recordings with duration ranging from 21 sec to 303 sec. The videos were divided into two groups based on their duration (short < 100 sec and long > 100 sec). From the platform usage metadata, an average video retention rate was obtained as a ratio of video viewing time and total video duration for videos watched six times or more. Independent t-tests for mean values and f-test for variance were used to compare the groups.

Results: In total, 35 (18 short and 17 long) videos were included in the study and were viewed (mean ± SD) 22 ± 11 times. The mean duration of short videos was: 80 sec ± 14 sec and of long videos it was: 160 sec ± 51 sec. The retention rate in the short and long group was 0.99 ± 0.05 and 0.94 ± 0.19 respectively. Average values were not significantly different (P = 0.33), but variances were (P < 0.05).

Conclusions: This study shows that the effective attention span for a video recording of this kind, based on an eLearning set-up and local population, is up to 100 sec. Videos shorter than 100sec are mostly watched fully without a break. In contrast, longer videos are often rewound, and parts watched again or not watched to the full length at all.

Keywords

e-Learning, cardiac rehabilitation, coronary disease, video, tele-medicine

Open Peer Review

Approval Status

	1	2
version 1		
21 May 2019	view	view

1. **Drago Rudel** , MKS Electronic Systems Ltd., Ljubljana, Slovenia
2. **Horesh Dor-Haim**, The Hebrew University of Jerusalem, Jerusalem, Israel

Any reports and responses or comments on the article can be found at the end of the article.

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Author roles: Kirn B: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing

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Introduction

One issue surrounding recovery at home is poor utilization of instructions given to patients after being discharged from a clinic. It has been shown that patients and their families often experience information overload while at the clinic and often forget or misinterpret up to 85% of the instructions received^{1,2}.

To solve this problem, eLearning has been put forward as a novel mode of delivering instructions to patients³⁻⁶. In eLearning, reliable medically and scientifically sound videos are used to educate patients and their informal caregivers about the etiology, pathophysiology and treatment of their medical condition, doing so by addressing the following questions: “What has happened?”, “What can you do by yourself?” and “Who can help you?”. Video “lectures” given by doctors, nurses, physiotherapists, psychologists and dietitians are recorded and edited into topic-related modules. In addition, peer patients share best recovery practice and experiences. Selected videos are complemented by simple texts, a short quiz or illustrations.

Most educational information is conveyed to the patients and their informal caregivers in video format. Therefore, it is crucial that the design of these recordings is thought through and executed carefully. The video recordings are obtained in raw format from interviews and are then post-processed to concisely deliver the required medical content. Deciding the duration of the video recording presents a challenge. If a video is long enough to fully explain the complex medical condition, there is a risk that the patient skips the video or stops watching midway, given that the usage of eLearning platforms is based solely on personal motivation. The optimal video duration to fulfil both requirements, to fully convey the medical content while retaining viewer attention, however, is not known. The purpose of this study was to investigate the impact of video duration on cardiac patients’ viewing behavior.

Methods

Study background

Within the scope of a large randomized clinical study⁷ conducted in Jessa Hospital, Hasselt, Belgium and in collaboration with Primarius platform developers ClinicalTrials.gov registration

number [NCT02475967](#). Ethical approval was given by the Ethical Committee of Jessa Hospital, Hasselt, Belgium (approval number 15.82/CARDIO15.11) and all included patients provided written informed consent. The metadata provided by Viidea video streaming provider were analyzed. The analysis included 135 patients with coronary artery disease (88% male; age, 62±9 years) which actively used the provided post-discharge eLearning platform. Upon discharge, patients received a one-month access to a secure eLearning platform via a voucher containing anonymous personal login codes with which the contents were accessed, this way also assuring anonymity of the patients with respect to metadata acquisition. The patients used the eLearning platform at home and without supervision.

The content of the platform was composed of 20 topics, containing information about what has happened, what they can do by themselves and who can help them, presented from three perspectives—those of the clinician, patient and informal caregiver. Each topic contained three videos. In total there were 60 video recordings with duration ranging from 25 to 300 sec ([Figure 1](#)).

Videos

The videos were divided into two groups based on their duration. The short group included videos with duration <100 sec and the long group included videos with duration >100 sec. The video retention rate was defined as the ratio between video viewing time and total video duration. In addition, videos were divided into group featuring doctors and videos featuring peer-patients. Only videos that were watched six times or more were included in the analysis.

Statistical analysis

Independent t-tests for mean values and f-test for variance were used (Microsoft Excel 2016) to compare retention rates between the short videos and long videos groups. The differences in retention rate between the videos featuring doctors and videos featuring peer-patients were also determined.

Results

Characteristics of videos watched

Out of 60 available videos 35 were watched six times or more and were thus included in the analysis. They were viewed on

Figure 1. Duration of each of all 60 recorded videos.

average 22 ± 11 times (Figure 2). Of the analyzed videos, 22 featured peer-patients and the rest (13 videos) featured (para-) medical professionals. With respect to their duration, 18 videos were classified as short, with an average duration of $80 \text{ sec} \pm 14 \text{ sec}$, and 17 were classified as long, with an average duration of $160 \text{ sec} \pm 51 \text{ sec}$ (Figure 2). Individual results for each video are available as *Underlying data*⁸.

Retention rates

In Figure 3 the retention rate of video watching is shown for each video with respect to its duration. A clear difference in the spread of retention rate is visible around the video duration length of 100 sec. The videos shorter than 100 sec have retention rate around 100%, ranging from 107% for shorter videos (60 sec) and decreasing towards 88% as videos duration increases towards 100 sec. The videos longer than 100 sec have a wide range of retention rates, ranging from 60% to 133% without any clear trend. The average retention rate of the short and long videos group was 0.99 ± 0.05 and 0.94 ± 0.19 , respectively. Mean values were not significantly different ($P = 0.33$), but variances were significantly different ($P < 0.05$).

The timeline of meta data acquired from watching 4 different types of videos is shown in Figure 4. We found no significant

difference ($P=0.7$) when comparing the retention of watching videos featuring patients (0.97 ± 0.14) to those featuring (para-)medical caregivers (0.95 ± 0.12).

Discussion

This study showed that videos which are shorter than 100 seconds are typically watched by patients without pause, while the videos longer than 100 seconds either stopped watching prematurely or frequently rewound and watched again. This finding is further supported by a clearly expressed negative slope of retention rate within the short video group. As expected, the longer the videos in this group the lower the retention rate. The study included 35 video recordings out of 60 available to the patients which indicates that some topics are not as interesting for the patients as it was anticipated. Out of the 35 analyzed videos, two-thirds were featuring peer-patients and one-third the (para-)medical professionals. This difference shows the large interest of patients in peer-patient experiences, at least at the initial decision level, when deciding whether to watch the video or not.

The duration of the video is undoubtedly linked to the attractiveness of the content, the explanation provided by the featured interviewee and on the difficulty of the topic being discussed.

Figure 2. Number of views with respect to video duration for videos included in the study. The videos with duration from 54 sec to those up to and including 99 sec were part of the short video group and videos with duration of 100 sec to 303 sec were part of the long videos group. The short videos group was composed of 12 videos featuring peer-patients and 6 videos featuring (para-) medical professionals. They were viewed from 8 to 56 times.

Figure 3. Retention rate of watching video recordings as a function of video duration. Note that retention rate for videos that are shorter than 100 sec is around 100% and slowly decreases as duration is increased up to and over 100 sec, while the retention rate for longer videos (duration > 100sec) shows much larger variation. Large variation is a result of premature ending of a video watching and rewinding with repeated watching.

Figure 4. Meta data acquired from watching 4 different types of videos: short featuring doctor (**A**), long featuring doctor (**B**), short featuring patient (**C**) and long featuring patient (**D**). The legend label “present” shows watching the video in one go (dark green), “watching” shows cumulative amount of watching including replaying (red), and “replaying” indicates the amount of replaying the video (light green).

The main result of this study should be an increase in the awareness in the eLearning content creator community that videos as a main means of conveying information and educating should be carefully designed, because the natural attention span of most patients is up to 100 seconds.

Data availability

Underlying data

Figshare: Exploring the optimal duration of video recording in a post-discharge e-learning platform for cardiac patients. <https://doi.org/10.6084/m9.figshare.8115866>⁸.

This project contains a spreadsheet featuring raw data on video watching and retention in CSV format.

Underlying data are available under the terms of the [Creative Commons Zero “No rights reserved” data waiver](#) (CC0 1.0 Public domain dedication).

Extended data

The videos used in this study can be accessed free of charge for research purpose on the eLearning platform for a limited duration. Please contact the author (borut.kirn@mf.uni-lj.si) to receive access codes to this material.

Grant information

The author(s) declared that no grants were involved in supporting this work.

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Open Peer Review

Current Peer Review Status:

Version 1

Reviewer Report 13 August 2020

<https://doi.org/10.5256/f1000research.20917.r67714>

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Horesh Dor-Haim

O2 Health Center, The Hebrew University of Jerusalem, Jerusalem, Israel

This study explores the optimal duration of video recording in a post-discharge eLearning platform for cardiac patients. The purpose of the study is important in order to understand the attention span of patients, providing digital educational media for secondary prevention of CVD. The scope of the study and the aim is very simple and limited to test patients' retention. The videos were divided into two groups based on their duration. The short group included videos with duration <100 sec and the long group included videos with duration >100 sec. The video retention rate was defined as the ratio between video viewing time and total video duration. Results showed mean values were not significantly different in retention rate, however, the variance was higher in the long video clip group.

1. The aim and the study are clear, however, the methodology and results analysis are not as so. Increase in retention rate is the primary goal and the null hypothesis, however, it's not demonstrated in the results. Please consolidate the means to show increased retention. If variance in retention is the primary end point, please clarify it or other methods to test video retention.
2. Statistical analysis should be reconsidered, using more than two groups with 100 sec cut off (e.g. short/intermediate/long).
3. Fig 4 is not clear. Provide more data about the procedures in the methods.
4. The authors' conclusion is that videos shorter than 100sec are mostly watched fully without a break. In contrast, longer videos are often rewind, and parts watched again or not watched to the full length at all. Please provide relevant data such as number of brakes and relays.

The study end point and conclusion, exploring the optimal duration of video would be much more solid if authors would have provided a pre/post questioner to test patients' understanding and knowledge.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

No

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Partly

Are the conclusions drawn adequately supported by the results?

No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Cardiovascular medicine, exercise physiology and digital health technology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 21 October 2019

<https://doi.org/10.5256/f1000research.20917.r48885>

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Drago Rudel

Director and R&D project manager, MKS Electronic Systems Ltd., Ljubljana, Slovenia

Background: On a post-discharge eLearning platform for patients with coronary artery disease, videos are used as the main educational media. Medical content takes a long time to be thoroughly explained, frequently exceeding the viewer's attention span. To find the optimal duration for such an educational video, we studied the retention of video watching.

Comment: The background clearly highlights the addressed challenge.

Methods: In this study, 135 (88% male; age 62±9 years) patients with coronary artery disease actively used eLearning platform which included 60 video recordings with duration ranging from 21 sec to 303 sec. The videos were divided into two groups based on their duration (short < 100

sec and long > 100 sec). From the platform usage metadata, an average video retention rate was obtained as a ratio of video viewing time and total video duration for videos watched six times or more. Independent t-tests for mean values and f-test for variance were used to compare the groups.

Comment: The methodology is clearly set and appropriate for the type of research.

Results: In total, 35 (18 short and 17 long) videos were included in the study and were viewed (mean $\pm$ SD) 22 ± 11 times. The mean duration of short videos was: 80 sec $\pm$ 14 sec and of long videos it was: 160 sec $\pm$ 51 sec. The retention rate in the short and long group was 0.99 ± 0.05 and 0.94 ± 0.19 respectively. Average values were not significantly different ($P = 0.33$), but variances were ($P < 0.05$).

Comment: The results are clear and derive from the implemented methodology.

Conclusions: This study shows that the effective attention span for a video recording of this kind, based on an eLearning set-up and local population, is up to 100 sec. Videos shorter than 100sec are mostly watched fully without a break. In contrast, longer videos are often rewound, and parts watched again or not watched to the full length at all.

Comment: The conclusion is relevant to the findings.

General comments:

The purpose of this study was to investigate the impact of educational video duration on cardiac patients' viewing behaviour. The paper is novel in addressing the optimal video recording duration used at educational eLearning platforms. Its conclusion is simple and clear: the videos used by patients in different therapies should be less than 1 minute long in duration. It is encouraging that a scientific approach is used to assess efficiency and effectiveness of the novel ICT based tools that will be broadly used in the near future for therapeutic purposes in different areas of medicine.

Technical corrections needed:

The first sentence in the *Methods* is not clear (Study background »Within the scope of a large randomized clinical study....«). Consider revision.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

I cannot comment. A qualified statistician is required.

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Teehealth and telerehabilitation services

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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