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ORIGINAL RESEARCH

Alpha$_1$-antitrypsin Deficiency—Increased Knowledge and Diagnostic Testing after Viewing Short Instructional Video

Joanna L. Nolte, Ali Ataya, Hunter Merrill, Mikala Childs, and Mark Brantly

Department of Pulmonary, Critical Care, and Sleep Medicine, University of Florida, Gainesville, FL, USA

ABSTRACT

Many individuals with Alpha-1 Antitrypsin Deficiency (AATD) are unaware of their diagnosis. In the absence of an AATD diagnosis, irreversible damage continues, and incorrect care is provided. Research demonstrates low levels of knowledge about AATD among health care providers. To address this ongoing issue, a short educational video was developed for health care providers with the goal of increasing knowledge and testing for AATD. A five-question test on the video material was developed. Invitations to participate in the study were sent via email to providers at both public teaching hospitals and private practices across the country. Respondents completed three parts online: pre-test, video, and post-test. To confirm retention of knowledge gained, providers who completed all three were invited to take the same test 3–6 months later. There were 683 providers who responded, and 213 completed all three portions; 105 of those providers completed the 3–6-months of follow-up testing. The average pre-test score of the 213 providers was 54.6% (std. dev. = 26.2%). The average post-test score immediately following the video viewing was 74.7% (std. dev. = 27.7%). The average follow-up test score 3–6 months later was 63.2% (std. dev. = 22.0%). During the follow-up period, 11 providers reported testing for AATD for the first time. This short educational video demonstrated both immediate and sustained improvement in knowledge and an increase in testing for AATD. Short digital videos may provide an effective platform for the ongoing effort to identify individuals with AATD.

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Alpha-1 antitrypsin deficiency (A1ATD); education; knowledge; testing; video

Introduction

Alpha-1 antitrypsin deficiency (AATD), the most prevalent genetic condition associated with Chronic Obstructive Lung Disease (COPD), is thought to affect 3.4 million individuals worldwide (1). Many of these individuals have not been diagnosed. First identified by Laurell and Eriksson over 50 years ago, AATD education has become an integral component of medical school education, yet research demonstrates low levels of knowledge about AATD among health care providers (2,3). The medical community is failing to identify individuals with AATD (4–7); less than ten percent of the estimated 100,000 Americans with AATD have been diagnosed (4,8). The average time from onset of symptoms to diagnosis of AATD is more than 8 years (7), and affected individuals report seeing at least three physicians before their initial diagnosis (6,7). Official guidelines recommend testing all symptomatic adults with fixed airflow obstruction on pulmonary function tests (8). To address the ongoing need to improve knowledge and increase diagnostic testing, the study team developed a short instructional video.

Online medical education videos demonstrating clinical procedures are a growing genre (9–11). News reports have highlighted the changes medical schools have implemented to re-organize their curriculum, incorporating relevant patient cases and digital media. Previous AATD training videos have been between 1–3 hours in length. In 2008, Tubemogul self-published results of video analytics that measured how online videos are being viewed. The results indicated that half of the audience viewership is gone by the 60-second mark, with 10% of users clicking away from content after just 10 seconds.

Getting to the point quickly can be challenging in medicine. However, the use of online resources and portable technology such as tablets and mobile devices is becoming more ubiquitous in the medical field, allowing for quick access to educational resources (12–15). This led the investigators to believe that a short video could provide enough basic information to help the viewer feel comfortable testing for AATD, and result in the user referencing additional resources, such as the American Thoracic Society (ATS) guidelines (8), to further expand their knowledge and understanding of test results. The aim of this study is to determine whether a short educational video on AATD could provide an effective, well-received format for health care providers.

Methods

This was an observational study analysis of pre- and post-video testing aimed to determine if a short educational video on AATD leads to sustained retention of information and increased AATD testing after study participation. The study was approved by the Institutional Review Board of the University of Florida.

Participants included were health care providers at both public teaching hospitals and private practices across the United States. There was no restriction on participants' specialty of practice. Invitations to participate were sent via email

CONTACT Ali Ataya aliataya@gmail.com Department of Pulmonary, Critical Care, and Sleep Medicine, University of Florida, 1600 SW Archer Rd, M452, PO Box 100225, Gainesville, FL 32610, USA.

Table 1. List of questions in the online test.

1. Alpha-1 Antitrypsin Deficiency is a genetic disorder that can lead to: (choose all that apply)
Heart failure Chronic Obstructive Pulmonary Disease (COPD) Osteoporosis Cirrhosis
2. Normal Alpha-1 Antitrypsin is a protein made mainly in the _____ and works as a natural anti-inflammatory and antiproteinase to protect the _____.
lungs/liver muscle/heart liver/lungs bone/skin
3. Normal Alpha-1 Antitrypsin Pi type is:
MZ MS MM ZZ
4. In individuals with Alpha-1 Antitrypsin Deficiency, the two most common deficient Pi types, are (choose 2):
MZ ZZ SZ MS
5. The World Health Organization (WHO) and American Thoracic Society (ATS) recommend testing anyone with_____ for Alpha-1 Antitrypsin Deficiency:
Chronic Obstructive Pulmonary Disease Emphysema Bronchiectasis Chronic bronchitis Asthma that is incompletely reversible after treatment Chronic liver disease Unexplained liver disease in infants and children The skin condition panniculitis All of the above

to residents, fellows, attending physicians, nurse practitioners, and physician assistants. Students (medical/nurse practitioners/physician assistants) and nurses were excluded from participation.

The investigators developed a short, instructional video of less than two minutes in duration, addressing organ systems affected by AATD, alleles for both normal and deficient individuals, and diagnostic testing. An online test with five questions (Table 1) was developed using the Research Electronic Data Capture (REDcap) database to gather baseline knowledge and previous experience testing for AATD. The same test was given immediately after watching the video. To determine the acceptance and effectiveness of a video educational intervention, participants were invited to take a follow-up test 3–6 months later. Respondents were provided a link to the REDCap database where they could complete the three parts: pre-test, video, and post-test online. Providers who completed all three parts and watched the video in its entirety were provided a $5 gift certificate (for coffee). They were invited to take the same test 3–6 months after first participation.

The primary outcome of this study was to determine if the information gained from a short educational video on AATD was sustained on follow-up testing. Secondary outcome was to determine if the same educational video leads to an increased testing for AATD after study participation. Data collected included participants level of practice, practice setting, and specialty. Variables analyzed include testing scores before and after watching the video and on follow-up.

A sample size of 200 participants was estimated to be needed to demonstrate clinical significance and exclude sample bias. *T*-tests of paired differences were used to test for significant changes in average pre-test, post-test, and follow-up scores of participants. All analyses were performed with R version 3.2.5.

Table 2. Breakdown of the participants in the study.

Enrollment:	Number	Number
Medical providers who completed video	213	
Follow-up participants 3–6 month		105
Type of provider:		
Attending physician	45	28
Fellow physician	45	18
Nurse practitioner or physician's assistant	51	28
Resident physician	72	31
Practice setting:		
Public teaching hospital:	130	75
University of Florida	112	65
Vanderbilt University	4	4
Florida State University	3	0
Cleveland Clinic	3	0
University of Minnesota	3	2
University of Iowa	2	1
University of California Los Angeles	1	0
Saint Georges University	1	0
University of South Florida	1	1
Private setting or veterans affairs:	83	30
Specialty:		
Internal medicine	86	51
Specialty not specified	59	20
Pulmonary medicine	31	16
Family medicine	12	3
Neurology	7	3
Surgery	6	3
Hospitalist medicine	3	2
Emergency medicine	3	2
Anesthesia	2	1
Cardiology	1	1
Pediatric primary care	1	1
Ophthalmology	1	1
Psychology	1	1

Results

A total of 683 providers responded, and 213 completed all three portions, including watching the video in its entirety. Four hundred seventy records were deleted due to incomplete responses. Of the 213 who were included in the study, 105 participated in the 3–6 month follow-up test. A breakdown of the participants in the study is provided in Table 2.

Previous experience testing for AATD was reported in 47% of the 213 providers on the pre-test. Of the 105 who participated in the follow-up test, 63 had not previously administered AATD diagnostic tests. Within the 3–6 months following the post-test, eleven of the 63 providers who had not previously given AATD diagnostic tests performed an AATD diagnostic test.

The average pre-test score of the 213 providers was 54.6% (std. dev. = 26.2%). The average post-test score immediately

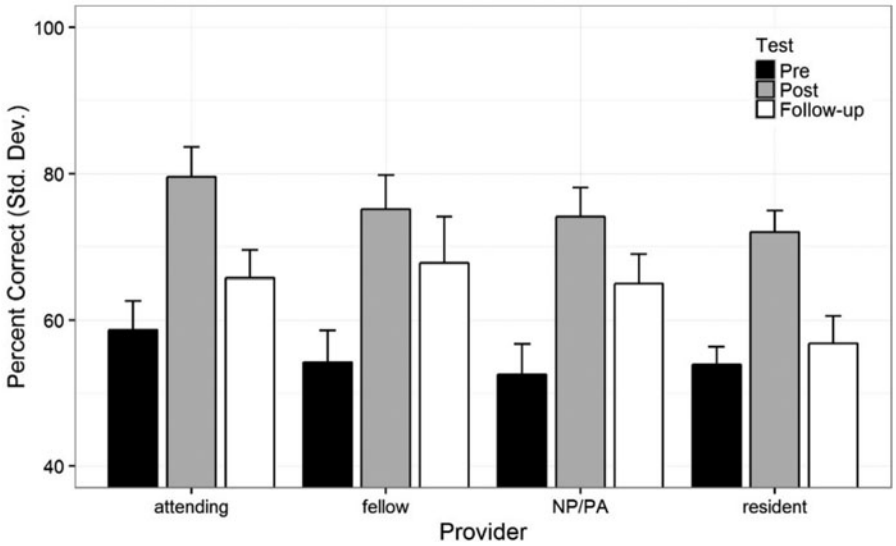

Figure 1. Boxplot showing the results of the pre, post, and follow-up tests according to the different providers (NP/PA: nurse practitioner/physician assistant).

following the video viewing was 74.7% (std. dev. = 27.7%). The average follow-up test score 3–6 months later was 63.2% (std. dev. = 22.0%). Average test scores stratified by provider type are given in Figure 1.

Statistical analysis

T-tests of paired differences were used to identify significant changes in average pre-test, post-test, and follow-up scores of participants. Test scores significantly ($p < 0.001$) increased on average from pre- to post-test by 20 percentage points (std. err. = 1.74). Average test scores significantly ($p < 0.001$) decreased from post-test to follow-up by 18 percentage points (std. err. = 2.49). Average test scores significantly ($p = 0.039$) increased from pre-test to follow-up by 5 percentage points (std. err. = 2.67), indicating that knowledge gained from the video was sustained 3–6 months later. The change in scores according to the different providers is provided in Table 3.

Discussion

Current evidence supports early recognition and diagnosis of AATD. This is due to a combination of: 1) AATD being an inherited disorder with family members being at risk of having AATD and developing associated disease; 2) the diagnosis of AATD can positively influence smoking behaviors (16,17); 3) the detection of AATD can affect occupational choice due to dust exposure being associated with deteriorating clinical condition (18); 4) specific drug therapies for AATD are available for individuals with emphysema due to the disease (8); and 5) the official ATS guidelines endorse testing for AATD with detailed descriptions of care for this population (8). Strategies used to improve knowledge and detection included campaigns using media, targeted publications (19,20), grand round presentations, national meetings, and Web-based instructional programs (21). Various detection studies using both population-based and targeted detection studies have been implemented in the past (4). Attempts to increase ease of testing include distributing free test kits for AATD and free, confidential home-based testing (22,23). Given the evidence that AATD is under-recognized despite the available resources to perform testing, it is imperative that improved strategies for increasing detection be identified.

Viewing this short video on AATD was associated with immediate and sustained improvement in knowledge and an increase in testing. Short digital videos may provide an effective platform for the ongoing effort to identify individuals with AATD.

Table 3. The change in scores according to the different participants (NP/PA: nurse practitioner/physician assistant).

	Sample size		Average score difference (*p*-value)		
Group	video	follow-up	pre- to post-video	post- to follow-up	pre- to follow-up
Participants	213	105	20.1 (<0.001)	−18.1 (<0.001)	4.76 (0.038)
Attending	45	28	20.9 (<0.001)	−15.8 (<0.001)	2.1 (0.333)
Fellow	45	18	20.9 (<0.001)	−22.4 (<0.001)	8.2 (0.002)
NP/PA	51	28	21.6 (<0.001)	−14.5 (<0.001)	10.0 (0.012)
Resident	72	31	18.1 (<0.001)	−19.1 (<0.001)	2.1 (0.249)

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Declaration of interest

Dr. Mark Brantly is co-owner of an AAT genetics diagnostic company. All other authors have no disclosures.

ORCID

Ali Ataya http://orcid.org/0000-0001-8505-1680

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