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Assessing the Educational Quality of Training Videos for Collection of a Nasopharyngeal Swab

Abstract

Introduction: The SARS-CoV-2 pandemic has forced healthcare systems to disseminate their training materials quickly and broadly, including instruction on identifying cases of infection through correct nasopharyngeal swabbing. Incorrect nasopharyngeal swabbing technique leads to substandard sampling, patient discomfort, and increased risk of complications. We set out to evaluate the quality of educational videos on the nasopharyngeal swab procedure.

Methods: Using video search engines, videos on nasopharyngeal swabbing were identified and distributed to two reviewers. The quality of videos was assessed using a scoring system that examined indications, contraindications, personal protective equipment use, swab depth, swab angle, and audiovisual quality. Descriptive statistics and Spearman's correlation coefficients were utilized to analyze video quality and its association with individual video characteristics.

Results: Videos received an average composite score of 5.4 (range: 0-10), with about half of all videos properly discussing and demonstrating the nasopharyngeal swab technique. Over 62% of reviews indicated that the reviewer would not recommend the video to a trainee, with the vast majority identifying improper swab technique as the main factor. There were no statistically significant associations between video score and publication date, number of views, and subscribers to the publisher.

Conclusion: Our study shows a glaring lack of quality educational videos on the nasopharyngeal swab procedure. Health care providers should be cautious when using educational videos to learn procedures as popularity may not be associated with accuracy.

Keywords

nasopharyngeal swab, training, education, videos, SARS-CoV-2, coronavirus

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None

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Introduction: The SARS-CoV-2 pandemic has forced healthcare systems to disseminate their training materials quickly and broadly, including instruction on identifying cases of infection through correct nasopharyngeal swabbing. Incorrect nasopharyngeal swabbing technique leads to substandard sampling, patient discomfort, and increased risk of complications. We set out to evaluate the quality of educational videos on the nasopharyngeal swab procedure.

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Results: Videos received an average composite score of 5.4 (range: 0 – 10), with about half of all videos properly discussing and demonstrating the nasopharyngeal swab technique. More than 62% of reviews indicated that the reviewer would not recommend the video to a trainee, with the vast majority identifying improper swab technique as the main factor. There were no statistically significant associations between video score and publication date, number of views, and subscribers to the publisher.

Conclusion: Our study shows a glaring lack of quality educational videos on the nasopharyngeal swab procedure. Healthcare providers should be cautious when using educational videos to learn procedures as popularity may not be associated with accuracy.

Introduction

The SARS-CoV-2 pandemic has introduced new challenges to the healthcare system. Considering the nearly 140 million cases and 3 million deaths between December 2019 and April 2021, the identification, monitoring, treatment, and prevention of SARS-CoV-2 infections are at the forefront of public health measures.¹ Polymerase chain reaction testing with nasopharyngeal swab samples

has assumed a prominent diagnostic role throughout the SARS-CoV-2 pandemic.² Hundreds of millions of nasopharyngeal sample collections continue to be performed across the U.S. with extensive ramifications on public health behavior and healthcare spending.^{3,4} A nasopharyngeal swab sample collection appears straightforward; however, if completed using incorrect angle or depth, this may lead to substandard sampling, patient discomfort, and increased risk of complications. False-negative results from improper sampling could potentially exacerbate public transmission.^{5,6}

Health officials identified deficits in nasopharyngeal swab training early in the pandemic at our academic medical center following a complication from improper swabbing technique. While developing training materials for our healthcare professionals, we turned to existing educational videos to rapidly disseminate proper procedures for nasopharyngeal swabs. However, our team identified multiple publicly available nasopharyngeal swab training videos that were inaccurate or omitted critical portions of the collection procedure. Erroneous educational videos on nasopharyngeal sample collection may have negative impact on mitigation of the SARS-CoV-2 pandemic. Ultimately, a team of otolaryngologists, nursing staff, and academic leaders created a new training video providing instruction on properly collecting a nasopharyngeal swab sample to detect SARS-CoV-2 infection for our community.⁷

The primary purpose of our study was to evaluate the quality of educational videos on the nasopharyngeal swab procedure. We hypothesized that many available training videos are low-quality, with many describing or demonstrating improper swabbing techniques. We also aimed to identify criteria necessary for quality training videos for healthcare workers and highlight the need for accurate nasopharyngeal swab training.

Methods

Using Google, Bing, MSN, Yahoo, Ask, and AOL, search engines we queried the following search terms: nasopharyngeal swab; nasopharyngeal swab AND collection; nasopharyngeal swab AND demonstration; nasopharyngeal swab AND technique;

nasopharyngeal swab AND procedure; nasopharyngeal swab AND training; COVID AND swab; COVID AND test; Influenza AND swab; Influenza AND test; RSV AND swab; and RSV AND test. The first 100 videos from each search engine using the terms were examined. Videos unrelated to nasopharyngeal swab training along with duplicates were excluded from the final video list. Furthermore, the swab training video produced by the authors was excluded from scoring and analysis. Characteristics including publication date, number of views, and number of subscribers to the publisher were gathered for each video.

Before distributing videos, the authors created a video assessment form that listed key components of nasopharyngeal swab training. The authors identified ten key elements, including discussion of indications, discussion of contraindications, discussion of proper personal protective equipment (PPE) use, demonstration of appropriate PPE use, discussion of proper nasopharyngeal swab depth, demonstration of proper nasopharyngeal swab angle, overall audio quality, and overall video resolution quality (Table 1). Videos were distributed among 11 resident physicians and six faculty physicians in the Otolaryngology-Head & Neck Surgery department at the University of Nebraska Medical Center. Each video was evaluated by two individuals (faculty/resident or resident/resident combination). A binary score of either "1" or "0" was given based on the presence or

Table 1.
Video Assessment Form

Key Components	Points
Discussion of indications	1
Discussion of contraindications	1
Proper PPE discussion	1
Proper PPE demonstration	1
Proper NP swab depth discussion	1
Proper NP swab depth demonstration	1
Proper NP swab angle discussions	1
Proper NP swab angle demonstration	1
Adequate audio/language quality	1
Adequate video resolution quality	1
Total Points	10

absence of each of the ten key components. A composite score was given to each video with a maximum score of ten total points. The reported percentage of criteria met for each individual element is based upon the total aggregate of all reviews (i.e., all videos, with two reviews per video). The assessment form also asked evaluators if they would recommend the video to a trainee. If the video was not recommended, they were asked to select their reasoning. Evaluators were able to select multiple reasons for not recommending the video.

The composite score was calculated as an average of the two individual scores. A single measure of intra-class correlation (ICC) and associated 95% confidence interval (CI) was computed using a one-way random effects model using SPSS software, version 23 (IBM Corp., Armonk, NY) to determine reliability between evaluations of faculty and residents. Associations between video scores and video publication date, number of views, and subscribers were assessed using Spearman correlations (rs), utilizing SAS software version 9.4 (SAS Institute Inc., Cary, NC).

Results

A summary of video characteristics is provided in Table 2. A total of 53 videos were evaluated by reviewers, with 80% of videos receiving composite scores from faculty/resident combinations. The remaining 20% received composite scores from resident/resident combinations. The average composite score for the videos was 5.4 (range: 0-10). For the 53 total videos reviewed, scores between evaluators differed on average

by 1.3 (range: 0-5). There was a strong correlation between resident and faculty evaluation scores ($r_s = 0.74$, $p < 0.001$), and moderate reliability (ICC = 0.73 (95% CI: 0.55, 0.85)). Of the total evaluations, 38.7% were found to adequately discuss indications for a nasopharyngeal swab, while only 6.6% discussed contraindications. A proper discussion of PPE use was noted in nearly half of evaluations (46.2%), whereas proper demonstration of PPE use was observed in 58.5% of reviews. The accurate demonstration and discussion of nasopharyngeal swab depth and angle showed similar trends. Analysis revealed that 45.3% and 61.3% of evaluations discussed and demonstrated proper swab depth technique, respectively. Furthermore, just over half of evaluations (51.9%) indicated correct discussion of the nasopharyngeal swab angle technique, whereas 64.2% of reviews noted proper demonstration of swab angle. Satisfactory audio/language quality was noted in only 78.3% of reviews, while 93.4% were found to have adequate video resolution quality.

Only 40 of the 106 reviews (37.7%) indicated that they would recommend a given video to a trainee. Of the 66 (62.3%) evaluations that did not recommend the video, 81% specified that they would not recommend the training video due to improper education on the nasopharyngeal swab technique. Over 57% of reviewers cited improper education on indications and/or contraindications of the nasopharyngeal swab procedure. Nine evaluations (13.6%) noted that they would not recommend the video due to inadequate audiovisual quality. Another nine evaluations pointed out that the video was hard to follow.

The average length of each training video was 3 minutes and 48 seconds (range: 0:14, 18:57), with the average number of views per video being 50,821 (range: 17, 1,162,204). There was no statistically significant association between average rating and publication date ($r_s = 0.21$, $p = 0.14$). Additionally, there was no statistically significant correlation between the average rating and the total number of views ($r_s = 0.09$, $p = 0.55$). Finally, Spearman correlation analyses did not reveal a significant association between average score and number of subscribers to the video publisher ($r_s = 0.14$, $p = 0.35$).

Discussion

We aimed to evaluate the quality of training videos for the nasopharyngeal swab procedure and identify critical criteria which healthcare workers and institutions may use to assess the efficacy of swab instructional videos. Our study shows a glaring amount of inaccurate or omitted information in publicly available training videos on collecting a nasopharyngeal swab. Over one-third of training videos did not describe or demonstrate proper depth or angle of the nasopharyngeal swab, a key component of correct sample collection. Furthermore, nearly two-thirds of the evaluations indicated that reviewers would not recommend a given educational video to a trainee. These results shed light on the dilemma of modern teaching methods and the accessibility of non-peer-reviewed educational resources.

Given the SARS-CoV-2 pandemic, the nasopharyngeal swab has been at the forefront of diagnostic testing. While nasopharyngeal swabs are widely used to diagnose other respiratory viruses, their use has skyrocketed, with nearly 200 million tests being performed since the beginning of the pandemic. Proper collection of nasopharyngeal swab samples is paramount for the accurate detection of upper respiratory tract infections.⁸ Without appropriate training, the procedure can be conceptually tricky, resulting in improper swab depth or swab angle and an erroneous sample.⁹

As a new generation of healthcare providers trains to enter the workforce, modernized teaching methods are being employed by educators to improve retention and preparation.¹⁰ The use of educational videos in medicine has grown tremendously alongside the advent of video-related search engines.¹¹⁻¹³ Furthermore, the expansion of social media into medical education has facilitated the distribution of such information.¹⁴ Now more than ever, healthcare providers and

Table 2.
Summary of video characteristics

Total number of videos, n	53
Average length of videos, minutes:seconds	3:48
Average number of views, n	50,821
Average score, 0-10	5.4
Individual components evaluations (n=106)	
Indications, % met criteria	38.7
Contraindications, % met criteria	6.6
PPE discussion, % met criteria	46.2
PPE demonstration, % met criteria	58.5
Swab depth discussion, % met criteria	45.3
Swab depth demonstration, % met criteria	61.3
Swab angle discussion, % met criteria	51.9
Swab angle demonstration, % met criteria	64.2
Audio/language quality, % met criteria	78.3
Video resolution quality, % met criteria	93.4
Not recommended to trainee, %	62.3
Reasons video not recommended (n=66)	
Improper education on indications and/or contraindications, %	57.6
Improper education on technique, %	81.8
Inadequate audiovisual quality, %	13.6
Hard to follow, %	13.6
Other	13.6

students have easy access to necessary educational information in multiple forms. However, care must be taken to ensure that improved availability does not come at the expense of quality educational content. The intended audience for these educational videos ranges from patient to provider, resulting in varied information and detail of instruction. Additionally, as demonstrated by the current study, a lack of peer-review leads to the publication of inadequate or incorrect information in healthcare educational videos.¹⁵ For example, a 2019 study by Derakhshan et al. assessed the quality of YouTube videos teaching facelift surgery for surgical learners and found that almost all videos lacked appropriate discussion of the procedure.¹⁶ Our study demonstrates that the availability of audiovisual medical information does not equate to quality.

Our results demonstrated that many available educational videos on the nasopharyngeal swab drastically lack appropriate information. Most glaringly, only about half of the videos properly discussed correct nasopharyngeal swab angle and depth. While more videos demonstrated appropriate swab angle and swab depth than discussed proper technique, over one-third of videos still failed to show correct angle and depth. While discussing all aspects of the procedure is meaningful, discussion and demonstration of swabbing technique are the most essential for adequate nasopharyngeal sampling. Discussion of indications and contraindications to the procedure was also frequently omitted. Notably, a large majority of evaluators did not recommend their assigned video to a trainee, with the bulk of evaluators identifying incorrect swab technique as the primary reason.

Video search engine algorithms utilize dates, views, and publisher information to provide users with relevant videos. Our study showed that the quality of educational videos, as defined by their composite score, was independent of these variables. We did not find any improvement in the overall scores of training videos that were more recently published or were viewed more frequently. Furthermore, publisher popularity (as determined by number of subscribers) was not associated with video score. These data suggest that search engine algorithms are a poor substitute for the peer review process to which many other sources of educational information are subjected. Learners should be aware that more popular videos do not necessarily provide accurate or complete information.

Each video was evaluated by either a faculty-resident or resident-resident combination to reduce potential bias and data skewing. Although there is the possibility for differences in scoring based on training level, our study showed that faculty and resident scores demonstrated moderate agreement. These results, alongside low score differences between evaluators, lend strength to our findings.

A potential limitation of this study includes a lack of a validated scoring system for evaluating video quality. Additionally, the training needs of individual learners are not ubiquitous, and the necessary components of a compelling training video may be different between individuals. Proposed critical criteria not associated with swab technique, such as discussion of indications or contraindications, may be of variable utility to learners depending on their role. The proper use of PPE may be implied or may not be an intended aim of the video. Videos that addressed nasopharyngeal swab depth and angle without discussing non-technique criteria may score the same as a video that addressed these non-technique-related criteria and omitted swab technique. However, the authors believe that a thorough understanding of the pre-procedural and safety aspects of the nasopharyngeal swab is essential and should be addressed as part of procedure education.

Further studies examining links between educational video quality and source type, including academic versus non-academic publishers, could help guide educational videos for numerous procedures beyond nasopharyngeal swabbing. A validated scoring system for evaluating video quality would be useful for both teachers and learners to ensure high-quality information is being distributed. Additionally, research examining how ancillary staff performing procedures utilize educational resources may help tailor appropriate video content.

The SARS-CoV-2 pandemic has augmented the need for accurate nasopharyngeal swab sampling. Despite the relative simplicity of the procedure, pitfalls, including improper swab angle and inadequate swab depth, can result in poor sample quality and injury. We have evaluated the quality of educational videos on the nasopharyngeal swab procedure and found significant shortcomings in most identified videos. Our study calls attention to the need for accurate training videos and guidance in appropriate video selection. Institutions performing nasopharyngeal swabs should account for the inadequacies of the currently available resources and carefully select high-quality training material.

Appropriate education of proper technique in nasopharyngeal swabbing could help mitigate the further spread of SARS-CoV-2. Beyond the current pandemic, ensuring quality training resources for healthcare procedures may facilitate better health outcomes overall.

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