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YouTube as an information source for pediatric adenotonsillectomy and ear tube surgery

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ABSTRACT

Objectives: Assess the overall quality of information on adenotonsillectomy and ear tube surgery presented on YouTube (www.youtube.com) from the perspective of a parent or patient searching for information on surgery.
Methods: The YouTube website was systematically searched on select dates with a formal search strategy to identify videos pertaining to pediatric adenotonsillectomy and ear tube surgery. Only videos with at least 5 (ear tube surgery) or 10 (adenotonsillectomy) views per day were included. Each video was viewed and scored by two independent scorers. Videos were categorized by goal and scored for video/audio quality, accuracy, comprehensiveness, and procedure-specific content. Study design: Cross-sectional study. Setting: Public domain website.
Results: Fifty-five videos were scored for adenotonsillectomy and forty-seven for ear tube surgery. The most common category was educational (65.3%) followed by testimonial (28.4%), and news program (9.8%). Testimonials were more common for adenotonsillectomy than ear tube surgery (41.8% vs. 12.8%, $p = 0.001$). Testimonials had a significantly lower mean accuracy (2.23 vs. 2.62, $p = 0.02$), comprehensiveness (1.71 vs. 2.22, $p = 0.007$), and TA specific content (0.64 vs. 1.69, $p = 0.001$) score than educational type videos. Only six videos (5.9%) received high scores in both video/audio quality and accuracy/comprehensiveness of content. There was no significant association between the accuracy and comprehensive score and views, posted "likes", posted "dislikes", and likes/dislikes ratio. There was an association between "likes" and mean video quality (Spearman's rho = 0.262, $p = 0.008$).
Conclusion: Parents/patients searching YouTube for information on pediatric adenotonsillectomy and ear tube surgery will generally encounter low quality information with testimonials being common but of significantly lower quality. Viewer perceived quality ("likes") did not correlate to formally scored content quality.

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1. Introduction

The internet is a valuable source of medical information, but the quality of the information is difficult to determine. The quality of otolaryngology information was recently assessed and found to vary considerably [1,2]. Parents with children that have common otolaryngologic health problems regularly search for and utilize the internet to enhance their understanding of child's condition [3]. While physicians remain the most important source of information in guiding a parent's decisions, the influence of information found on the internet clearly exists. In one study, 78% of parents reported that the information they found on the internet had an impact upon the decision to have an ENT surgical procedure performed on their children [4]. The third most popular website in the world, YouTube, is a source of user-uploaded video content [5]. Several studies have assessed the quality or usefulness of videos on YouTube for various specialties [6–10]. However, only two have addressed how the use of YouTube may affect patient care in otolaryngology to teach the Epley maneuver [7] as well as its usefulness as a source of information in pediatric tonsillectomy [11]. While previous studies have focused on evaluating sites that are either encyclopedic or medical in focus, the current study has sought to determine whether YouTube is a good information source for parents (or patients) seeking to learn about their child's otolaryngologic surgery.

Adenotonsillectomy (TA) and ear tube surgery (BMTT) are common procedures performed on children, accounting for an

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Table 1
Boolean search terms used to identify videos.

Topic	Search term
Adenotonsillectomy	~"Tonsillectomy" OR ~"adenoidectomy" OR ~"tonsil removal" OR ~"adenoid removal" OR ~"tonsil surgery" OR ~"adenoid surgery" OR ~"tonsillitis surgery"
Bilateral tympanostomy with tubes	~"Ear tubes" OR ~"ear tube surgery" OR ~"ear infection surgery" OR ~"myringotomy" OR ~"tympanostomy tubes"

estimated 530,000 (TA) and 667,000 (BMTT) of the 3,266,000 ambulatory surgeries performed in the United States in 2006 in those under the age of 15 [12]. This likely equates to at least 1 million parents each year who are learning about TA and BMTT and need quality sources of information from which to learn. The objective of the current study is to systematically identify YouTube videos that are likely to be encountered by parents (or patients) seeking information on BMTT and TA and assess the overall quality of this video library to help otolaryngologists guide potential patients and parents of pediatric patients on how best to find quality information on YouTube.

2. Methods

This study was exempt from Institutional Review Board approval at our institution as it involved the use of public access data only. On February 4th and 7th 2013, a YouTube search was performed on https://www.youtube.com/ for videos pertaining to TA and BMTT respectfully. Utilizing Google search term operators, comprehensive search terms were developed to account for the search terms most likely entered by parents seeking more information about these procedures [13]. This enabled for one comprehensive search versus several searches of each individual term (See Table 1). The only search filter used was the "sort by" filter of "relevance," which is the default filter for a typical YouTube search. Advertisements presented by YouTube at the beginning and end of the search results were not counted and were ignored. The duration of the video, the number of views, the upload date, and the likes and dislikes (crude viewer feedback) of these videos was recorded. Using this information, the days since upload, views per day, and likes/dislikes ratio was calculated. Some videos were posted by multiple users, creating duplicates. These duplicates were considered individually, as they were considered unique by the YouTube search algorithm.

To identify the videos that were most likely to be watched by parents/patients, views per day since posting were calculated for all videos. Practical cutoffs of 10 views/day (TA) and 5 views/day (BMTT) were established with the difference being due to tonsillectomy videos being viewed twice as often as ear tube videos (31.3 views/day vs. 16.0 views/day). The videos that met the criteria were found in the first six and five pages of YouTube video results for TA and BMTT respectfully. Any further pages of results would likely be viewed infrequently by parents and patients and were thus ignored. YouTube uses a proprietary algorithm to rank their search results, but it is known [14] that viewing frequency and how much of the video a viewer watches contribute to the ranking. Thus, surveying the most frequently viewed videos in the first several pages of search results will likely include videos watched by a majority of parents and patients.

A customized scoring scheme was developed where scores were given for category, goal, video/audio quality, accuracy, comprehensiveness, and procedure-specific content. (See Table 2) The procedure specific questions were develop a priori after considering the basic questions a reasonable viewer would want to know if researching that procedure. Description of the video under the "about" tab was considered in the scoring of the videos. Each video was scored by two independent viewers (M.D.P and S.E.B) who were knowledgeable in the indications, technique, and complications of ear tube insertion and tonsillectomy/adenoidectomy as either a senior Otolaryngology Resident (M.D.P) or a Board-Certified Otolaryngology Attending (S.E.B). Both scorers participated in the development of the customized scoring scheme and were familiar with the criteria for each score category. Numerical scores from the two scorers were averaged and final categories were chosen based on simple majority. The customized scoring scheme was assessed for inter-rater reliability but was not assessed for validity as normal standard for YouTube video quality has not been established. Additionally, this study was designed to assess YouTube content using a practical "what would

Table 2
Customized scoring scheme.

Category	**Goal**
(T)estimonial, personal experience	(D)escription of procedure
(A)dvertisement (industry)	(I)ndications
(E)ducational, either from provider or institution	(P)ost-op care
(N)ews program, report	(C)omplications
(O)ther	(O)ther
Video quality	**Audio quality**
3 – Good – Clear visuals and text, with some professional graphics or effects. HD	3 – Good – No difficulty understanding spoken words, music.
2 – Fair – Regular video quality, average text clarity. Home video.	2 – Fair – Speech difficult to understand, distracting audio or background sounds.
1 – Poor – Visuals are blurry, grainy, or difficult to understand.	1 – Poor – No audio.
Accuracy score (standard = common knowledge of a competent otolaryngologist)	**Comprehensiveness score** (according to the goal above)
4 – No erroneous factual statements, excellent pt/parent usefulness	4 – Complete presentation of topic, no obvious omissions
3 – Minor errors, strong opinions, good usefulness	3 – Mostly complete presentation, no important omissions
2 – Multiple errors, limited usefulness	2 – Fairly complete presentation, important omissions but still useful
1 – Misleading statements, no usefulness	1 – Misleading, incomplete presentation of topic
TA specific questions	**BMTT specific questions**
1 – What are tonsils/adenoids? (Addressed-1 Not Addressed-0)	1 – When are ear tubes needed? (Addressed-1 Not Addressed-0)
2 – Why do tonsils/adenoids need to be removed?	2 – What are the risks to putting in ear tubes?
3 – What risks are involved with tonsillectomy and adenoidectomy?	3 – Does it correctly describe the procedure?
4 – Does it correctly describe the procedure?	

Table 3
Scoring for adenotonsillectomy (TA) and ear tube surgery (BMTT).

	Adenontonsillectomy (TA) ($n=55$)	Ear tube surgery (BMTT) ($n=47$)
Category*		
-Educational	54%	78%
-Testimonial	42%[a]	13%[a]
-News program	7%	13%
-Advertisement	2%	6%
-Other	0%	0%
Goal*		
-Description of procedure	69%	74%
-Indications of surgery	27%	38%
-Post-operative care	18%	17%
-Complications	0%	0%
-Other	0%	0%
Mean duration in minutes (range)	5:20 (0:35–43:00)	2:42 (0:32–12:34)
Median days online (range)	984 (48–2156)	850 (5–1993)
Median views per day (range)	31.3 (10–1027)[b]	16.0 (5–945)[b]
Median "likes" (range)	24 (0–496)[c]	6 (1–156)[c]
Median "dislikes" (range)	3 (0–99)[d]	1 (0–32)[d]
Median like/dislike ratio	6	5
Mean video quality score (1–3)	2.4	2.4
Mean audio quality score (1–3)	2.3	2.3
Mean accuracy score (1–4)	2.5	2.5
Mean comprehensiveness score (1–4)	2.0	2.1
Mean overall quality score (4–18)	10.5	10.6

* Exceeds total of 100% as some videos were placed in more than one category.
[a] $p=0.002$ (Fisher's exact test).
[b] $p=0.009$ (Rank sum test, non-parametric data).
[c] $p<0.0001$ (Rank sum test, non-parametric data).
[d] $p=0.0003$ (Rank sum test, non-parametric data).

a reasonable parent want to know" standard and was not intended to develop a formal video scoring instrument.

Statistical analysis was performed with computer statistical software (STATA Version 8.2 College Station, Texas, USA). Descriptive statistics, comparison of means (student's *t*-test, analysis of variance with Bonferroni multiple comparisons test, or rank sum test/Kruskal–Wallis Test), contingency tables (Fisher's exact test), inter-rater reliability (Fleiss Kappa), and statistical correlation (Spearman's Rho) were performed. A *p*-value of less than 0.05 was considered significant.

3. Results

The initial search strategy yielded 120 videos for TA and 88 for BMTT. After applying the frequently viewed cutoffs (10 per day for TA and 5 per day for BMTT) the final study dataset included fifty-five videos for TA and forty-seven videos for BMTT. The results of the scoring are shown in Table 3. TA videos were viewed more frequently per day than BMTT videos ($p=0.009$). Likely as a consequence of this fact, TA videos had significantly more "likes" ($p<0.0001$, Wilcoxin rank sum test) and "dislikes" ($p=0.0003$) posted than BMTT videos. However, the "like" to "dislike" ratio was not significantly different for TA versus BMTT videos ($p=0.0941$). Testimonial type videos were more common for TA than BMTT (41.8% vs. 12.8%, Fisher's exact test, $p=0.002$). There was no significant difference in mean views per day for educational versus testimonial versus news program type videos. Unfortunately, only six videos (5.9%) received high scores in both video/audio quality and accuracy/comprehensiveness of content. Content accuracy was scored generally higher than content comprehensiveness (mean score = 2.51 vs. 2.07, two-tailed *t*-test, $p<0.0001$).

The inter-rater reliability of the customized scoring scheme was formally assessed. The kappa coefficient was calculated for each component of the scoring scheme as was the Spearman's rho coefficient. (See Table 4) There was generally poor reliability for video quality score but the other components of the scheme demonstrated good to excellent reliability. Validity was not formally assessed as there is no accepted criterion standard for YouTube video quality.

YouTube video quality by type of video was comparatively assessed in terms of video and audio quality, accuracy and comprehensiveness, and the addressing of the procedure-specific questions. (See Table 5) Videos categorized as testimonials had a significantly lower mean accuracy score (2.23 vs. 2.63, $p=0.02$), comprehensiveness score (1.71 vs. 2.22, $p=0.007$), and TA specific content score (0.63 vs. 1.69, $p=0.001$) score than educational type videos. Additionally, testimonial videos were found to have a significantly lower mean accuracy score (3.08 vs. 2.23, $p=0.033$), mean comprehensiveness score (2.42 vs. 1.71, $p=0.045$), and TA specific content score (0.63 vs. 2.00, $p=0.029$) compared to news program videos. There was no significant difference between testimonial and news program videos. There was no association

Table 4
Reliability data for the customized scoring scheme.

Reliability parameter	Video quality score (1–3)	Audio quality score (1–3)	Accuracy score (1–4)	Comprehensiveness score (1–4)	TA specific questions (0–4)($n=52$)	BMTT specific questions (0–3)($n=47$)
Kappa inter-rater reliability (*p*-value)	0.063 ($p=0.09$)	0.45 ($p<0.0001$)	0.17 ($p=0.0003$)	0.22 ($p=0.0003$)	0.38 ($p<0.0001$)	0.19 ($p=0.01$)
Spearman's rho correlation coefficient (*p*-value)	0.26 ($p=0.01$)	0.70 ($p<0.0001$)	0.68 ($p<0.0001$)	0.58 ($p<0.0001$)	0.82 ($p<0.0001$)	0.53 ($p=0.0002$)

Table 5
Comparison of mean scores based on video type.

Video type	Video quality score (1–3)	Audio quality score (1–3)	Accuracy score (1–4)	Comprehensiveness score (1–4)	TA specific questions (0–4)	BMTT specific questions (0–3)
Educational ($n=58$)	2.51	2.22	2.62*	2.22*	1.69*	1.40
Testimonial ($n=29$)	2.32	2.41	2.23	1.71	0.64	0.89
News Program ($n=9$)	2.33	2.79	3.08**	2.42**	2.00**	1.40
Advertisement ($n=4$)	2.33	2.17	2.17	1.6	1.00	0.78

* $p<0.05$ for educational versus testimonial.
** $p<0.05$ for news program versus testimonial.

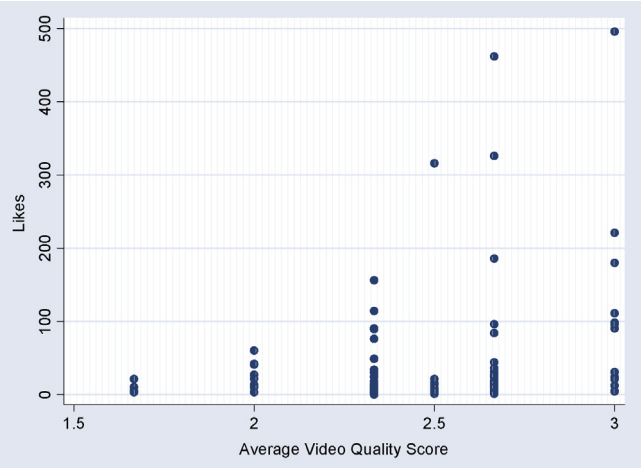

Fig. 1. Two way scatter plot of average video quality score (1–3 scale) and number of posted "likes" (Spearman's rho = 0.262, $p = 0.0079$).

between accuracy, comprehensiveness, TA specific content and BMTT specific content, and posted "likes", "dislikes", and the "like/dislike ratio". However, not surprisingly there was an association between the number of posted "likes" and the mean video quality (spearman's rho = 0.262, $p = 0.008$) (See Fig. 1) (Table 6).

Overall, the observed videos were mixed in addressing the selected procedure-specific questions. None of the TA or BMTT videos was scored to have addressed all of the procedure-specific questions. Table 5 shows the detailed results of the scoring of the videos in regards to the procedure-specific questions. The videos did a particularly poor job in addressing risks of the procedures and a better job describing the technical details of the procedures themselves.

4. Discussion

This study demonstrates that YouTube has a considerable repository of TA and BMTT related videos that are readily accessible to patients and parents of pediatric patients who may be seeking information on these procedures. There was generally more content addressing TA than BMTT. Most of the videos were determined to be educational in nature, yet there remained a wide range in the quality of the videos available. Only six (5.9%) out of the 102 videos reviewed were found to be high quality by all measures by all three of the authors and none of either the TA or BMTT videos were found to address all of the procedure specific questions. Testimonial videos were found to be more common for TA versus BMTT and were found to be of poorer general quality.

The results of this study have implications for parents and patients, as well as physicians. Parents searching for information about TA and BMTT on the internet have a tremendous amount of information to sift through, and YouTube is no exception. Helpful videos exist on YouTube that can assist in the patient or parent's decision-making process and education, but the majority are of poor production or educational quality. Without a clinical background by which to judge the videos, most parents or patients will be unable to determine whether a video is of value in correctly understanding TA and/or BMTT.

Armed with these data physicians can inform their patients which types of videos to seek and which to avoid. The higher-quality videos tend to be news programs followed by educational-themed programs. Testimonial videos are a poor information source, both for TA and for BMTT. This is likely due to the goal of most of these videos being to relate their surgical experience, versus educate the viewer. They also were often produced using a smartphone camera or hand-held video camera, which decreased the production quality. The increased prevalence of testimonial videos for TA is likely due to the increased post-operative recovery time accompanying that procedure versus BMTT, as many of the TA testimonials were videos about the user's post-operative recovery. The quantity of the BMTT videos in the YouTube library was smaller than that for TA, which is also likely due to the increased prevalence of testimonial-type videos for TA. As BMTT is estimated to be a more common procedure, this demonstrates a possible need for more quality productions that discuss BMTT.

There was a general scarcity of YouTube videos that addressed the indications and risks of each of these procedures. Unfortunately, this is perhaps the most important topic that physicians would want parents and patients to understand. As parents and patients have increasingly become a more proactive part of their healthcare decision-making team, it is imperative that they understand the indications as well as the risks of a proposed procedure. The 20 TA videos that did address risks were not representative of the typical, common risks of TA [15]. One news program described a child who experienced a fatal post-operative hemorrhage after the procedure. This outlier may serve to over-emphasize this catastrophic, yet extremely rare outcome to parents using YouTube as a source of information. The inadequacy of information about the indications and risks for TA and BMTT demonstrates that YouTube may not be able to fully answer a parent's important questions about the procedures, and demonstrates the need for the physician to direct the patient to useful sources of information. In fact, the essential issue that is raised by this study may be that patients and non-medical personnel are the ones who create and post the great majority of the videos on YouTube instead of physicians and medical professionals. This inevitably leads to bias and omission of important information. Perhaps, medical professionals may want to strongly consider a commitment to creating comprehensive, high quality videos on YouTube that cover the essential information about TA, BMTT, and other common procedures and then direct patients to those videos. Given the observed quality of information on YouTube documented within this study this would seem to be a highly worthwhile endeavor.

Further comment should be made about the amount of "likes" a video has and its implications. The like and dislike function of a video on YouTube is a way for the viewer to quickly share their favorable or unfavorable rating upon viewing a video, thus providing some sense to a potential viewer about whether a given video will be helpful or entertaining. One would intuitively conclude that a video on TA or BMTT with lots of "likes" would be better overall quality than one with less "likes" or more "dislikes". Unfortunately, the "likes" and "dislikes" did not correlate with the accuracy, comprehensiveness, or the procedure-content scores that a video received, but rather they positively correlated only with the video quality. This may be an example of the viewer "judging the book by its cover", or that

Table 6
Results for procedure-specific questions.

	Proportion of videos addressing the question
Adenotonsillectomy questions (n = 55)	
What are tonsils/adenoids?	16% (9 of 55)
Why do tonsils/adenoids need to be removed?	44% (24 of 55)
What risks are involved with tonsillectomy and adenoidectomy?	36% (20 of 55)
Does it appropriately describe the procedure?	60% (33 of 55)
Ear tube surgery questions (n = 47)	
When are ear tubes needed?	70% (33 of 47)
What are the risks to putting in ear tubes?	30% (14 of 47)
Does it appropriately describe the procedure?	85% (40 of 47)

viewers attribute quality of a video primarily to how clear the picture is. Future producers of videos for patient education should pay attention to the quality of their video production, and avoid the camcorder or smartphone approach to video production if they want their video to be well "liked" and frequently viewed.

This study demonstrates the potential of YouTube as a parent-education tool. Nearly a third of parents report using their smartphone to look up information concerning their child's condition while awaiting an appointment with an otolaryngologist [16]. This time in the waiting room is a valuable time that could be used to enhance the patient encounter with their otolaryngologist. One possible application would be to post information for how to find certain YouTube videos that the provider may find useful, such as those they may have produced themselves, so that the parent can look them up on their smartphone device while they wait for their child to be seen.

In a recent article [11], the authors investigated the usefulness of the various videos on YouTube that discuss pediatric TA. They reviewed 156 videos, which likely included some of the 55 that we reviewed, as their search terms were similar to ours. They developed a usefulness checklist to score the videos, which included a list of 11 items that they felt to be important in determining whether a video would be useful to a patient considering TA. Several of their criteria were also used in our survey, such as indications, surgical technique, and complications such as bleeding. Their usefulness criteria also found that personal testimonials do not contain information that is helpful for patients, and they found that a majority (39.2%) were somewhat useful, which is concordant with our average quality score of 10.5/18. They found three videos that received top scores, where we found only six. It is significant for the future of studies assessing YouTube as a source of patient information that two different scoring systems found similar usefulness and quality in the videos they assessed. This may indicate that subjective scoring systems developed using professional judgment can be a reliable method of evaluation until a tested and validated system can be established.

Our study is novel in that it categorized and measured the accuracy of the information in the videos, included a survey of BMTT videos, and it assessed the video and audio quality. The categorization that our study undertook showed that educational videos predominate the library, future studies could qualify whether they were produced for physicians or patients. Scoring the accuracy of the videos enabled us to show that most videos are slightly more accurate than misleading (2.5/4 accuracy mean). Including BMTT in our survey shows that while the BMTT and TA videos have similar scores in our assessments, the BMTT videos are viewed less frequently (16.0 vs. 31.3 views/day) and are shorter in length (2:42 vs. 5:20 min) compared to the TA video library. Our assessment of video quality found that our grading of video quality correlated with the amount of "likes" that a video had, which may demonstrate the importance that viewers place on aesthetic quality of a video.

Lastly, the videos we reviewed did a better job in accurately describing the technical aspects of each procedure, which may indicate that the intended audience of most of these videos was otolaryngologists rather than patients or their parents. This study also helps direct the clinician who plans on producing their own YouTube videos for patient education, by outlining some criteria which they can seek to adequately address in their own productions. New videos however, will find it difficult to become a top search results as videos with more views and a longer duration of time viewed tend to dominate the top spots in most searches [14].

The weaknesses of this study include the fluid nature of the YouTube video library, the unknown method by which video results are ordered, and the subjective nature of our grading criteria. The results of our study will undoubtedly change over time as new videos are uploaded to YouTube. The results of a typical search will also be ordered according to a proprietary algorithm not available to the public, thus placing a filter on any comprehensive YouTube library analysis.

The subjective measures by which the videos were scored are subject to the bias of the authors and are limited by lack of proven applicability to other videos. There currently is no standard for quality assessment of YouTube videos for patient education, but a recent review [17] of papers seeking to measure YouTube video quality found that most papers used expert judgment as their primary quality measure, with popularity and adequate length or duration as the other metrics used to measure quality. Our current review largely makes its quality assessments through expert judgment, but we did incorporate some popularity-driven measures such as our calculated views/day metric to determine videos of sufficient quality to be graded. Utilizing expert judgment to evaluate applicability for parental education is both a strength and weakness of this study, as the unique perspective of parenthood may lend itself to being more accepting of testimonials as a good educational medium. The utilization of expert judgment is somewhat ameliorated in this regard by the fact that all of the authors are parents themselves.

5. Conclusion

Parents/patients searching YouTube for information on pediatric TA and BMTT will encounter a large volume of information of general low quality. Testimonials are common but were of significantly lower quality than other types of commonly encountered videos. Viewer perceived quality ("likes") did not correlate to formally scored content quality, but rather only correlated to the quality of the video image.

Conflicts of interest statement

All authors have no financial or personal relationships with other people or organizations that could inappropriately influence (bias) their work.

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Disclaimer

The views herein are the private views of the authors and do not reflect the official view of the Department of the Army, the Department of the Air Force, or the Department of Defense.

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