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Popularity and worldwide reach of targeted, evidence-based internet streaming video interventions focused on men's health topics

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Abstract: Streaming video has emerged as a dominant content-delivery medium for healthcare information, with over 30 million visitors daily to the YouTube platform alone. Videos related to men's health have proliferated, but content produced by trained health care providers remains scarce. We evaluated educational YouTube streaming videos created in collaboration with a large, university-based health system focused on male factor infertility, men's health, and Peyronie's disease, uploaded during 2016–2018. All videos featured a board-certified urologist with fellowship training in andrology. Using YouTube's native analytics tools, we extracted data on views, engagement, and geographic reach through 8/2019. We obtained data for streaming videos on male infertility (n=3), general men's health (n=2), and Peyronie's disease (n=1). Video length ranged from 29 to 51 min, with a mean video duration of 39 min 41 sec. Actual mean watch time by viewers ranged from 3:45 to 8:30. The total view count was 646,684, with a watch time of nearly 3 million mins, reaching viewers in 47 countries. Fifty-three percent of watch time was on a mobile device and 33% on a personal computer. As patients increasingly turn to the internet for health information, health systems and physicians may wish to leverage high impact social media platforms such as YouTube to share evidence-based content. This study highlights the impressive reach a health system-sponsored video intervention using YouTube can have in sharing accurate video content related to a diverse range of men's health topics. This is the first health systems-based streaming-video intervention to leverage the video streaming and social media platform YouTube, to facilitate sharing reputable, high quality, and evidence-based men's health content.

Keywords: Internet; men's health, social media, urology

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Introduction

Streaming video serves as an innovative medium for health-related educational content and has profoundly influenced patients' understanding of pathology, diagnosis, and treatment of various health conditions (1). YouTube is the most popular online video-sharing platform, providing an unprecedented level of access to information for over

2 billion diverse users globally (2). However, previous research has warned that a lack of regulation of the content shared on YouTube may have significant implications for medical decision making (3).

The field of urology has not been spared from the dissemination of non-evidenced based material and misinformation via social networks such as YouTube.

Urological information has been found to be biased, commercialized, and misinformative (4). For example, many videos predate current guidelines supporting shared decision-making in prostate cancer screening for low risk disease and instead encourage more aggressive treatment than what is considered medically necessary and standard of care (4). A recent review by Loeb and colleagues found a negative correlation between scientific quality and number of video views, with 77% of videos analyzed containing misinformed or biased information despite a combined reach of over 6 million views. Alarmingly, YouTube's algorithm ranks and orders videos by popularity and viewer engagement, consequently resulting in viewers accessing the videos with the greatest number of engagements, regardless of content quality (5).

Despite the proliferation of videos related to men's health on YouTube, reliable content produced by trained health professionals remains scarce. In response to these gaps, our large, university-based health system has created a series of evidence-based men's health videos on YouTube to mitigate the spread of misinformation. We sought to evaluate the popularity and reach of these videos, which feature a urologist with fellowship training in andrology. Using YouTube analytics, we evaluated viewership characteristics with the goal of better understanding video popularity and reach. These data may inform urologists' approach to streaming video as an adjunctive tool for high-quality patient education.

Methods

We evaluated educational YouTube (www.youtube.com, San Bruno, CA, USA) streaming videos created in collaboration with a large, university-based health system focused on male factor infertility, men's health, and Peyronie's disease, uploaded during 2016–2018. All videos featured a board-certified urologist with fellowship training in andrology (co-author on this paper). Using YouTube's native analytics tools, we extracted data on views, watch time, user engagement, and geographic reach through August of 2019.

Viewership was quantified by the number of views—one view meaning a video is watched ≥ 30 seconds—as this metric is most commonly attributed to a video's success (6). Average view duration (watch time divided by the number of views) was also calculated for all videos; this metric has a direct effect on the YouTube algorithm, with longer view duration increasing the likelihood that a video will appear on “suggested” or “recommended” video lists (6). The

audience retention rate (percent of the video watched) was also identified to obtain a better understanding of the extent of user engagement with the content. We also obtained data on how viewers arrived at each video, known as the “traffic source”. Streaming videos were stratified into three traffic source groups: organic traffic (e.g., YouTube search), “suggested” video, or other (e.g., external sources, notifications, channel pages, etc.). Organic traffic refers to users accessing a video through direct engagement with the YouTube website without clicking another site's link or advertisement. External sources comprise traffic from websites and applications that have the YouTube video embedded. Viewer comments were reviewed for specific feedback to assess likeability of the videos and to identify areas for video improvement.

Results

We collected data on a total of six YouTube videos related to male infertility ($n=3$), general men's health ($n=2$), and Peyronie's disease ($n=1$) (Tables 1,2). All date calculations and watch times used a cutoff reference date of August 2, 2019, for analysis. Across all videos, the mean video duration was 39 min 41 sec (39:41), total view count was 646,684, and total watch time was 2.9 million min, reaching viewers in 47 countries.

Total days elapsed from upload on YouTube through the cutoff reference date ranged from 745 to 1,300 days. Video viewership trended upward with every successive video across the 3-year span analyzed, with the exception of the video titled “*Movember & why you should support men's health*” having a trough approximately 1 month after its release to 0.3 average views per day from a total of 303 views over a period of 996 days. The most recently uploaded video, “*Improving fertility in men with poor sperm count*” had 130× more average views per day than the first video uploaded, “*Optimizing male fertility*”, which had 6 average views per day (Tables 1,2). When stratified by video topic, the video related to Peyronie's disease had the highest average lifetime views ($n=1$; 217,746), followed by male infertility videos ($n=3$; 141,025), and general men's health videos ($n=2$; 2,832). The “Movember” campaign video, one of the oldest uploaded, had the fewest lifetime views of 303 and a total watch time of 1,513 min. Figure 1 depicts the view counts across the lifespan of each video highlighting key viewer trends.

The total watch time for each video ranged from 1,153 min to 1.46 million min. Though video duration ranged

Table 1 Characteristics of health system-sponsored, evidence-based men's health streaming videos

Overall YouTube metrics for all men's health streaming videos (n=6)	Mean	Range
Video duration (min:sec)	39:41	29:06 to 51:39
Number of lifetime views	107,747	303 to 391,812
Watch time (min)	478,791	1,153 to 1,469,613

Table 2 Video-specific YouTube metrics

Video title	Days since upload	Mean views per day	Mean watch time (min:sec)	Total video duration (min:sec)	Audience Retention (%)
"Optimizing male fertility"	1,300	6	5:36	51:40	11
"Vasectomy reversal: fertility options after vasectomy"	1,297	18	6:19	41:17	15
"3 steps to better men's health"	1,053	5	8:30	39:00	22
"Movember & why you should support men's health"	998	0.3	4:59	29:07	17
"Insight into Peyronie's disease: cause and treatment for penis curvature"	745	292	5:21	36:41	15
"Improving fertility in men with poor sperm count"	502	781	3:45	40:19	9

from 29:07 to 51:40, actual mean watch time by viewers ranged from 3:45 to 8:30. "3 steps to better men's health" had the highest average video duration and audience retention rate (Tables 1,2). 53% of watch time was on a mobile device and 33% on a personal computer. All videos had a higher watch time on a personal computer device, excluding the video related to improving fertility in men with poor sperm count which had the majority of watch time (77%) on a mobile device (Table 3).

Table 4 depicts the percentage of each traffic source stratified into three groups by video analyzed. The most popular traffic source for 83% of the videos was via direct YouTube search. In contrast to all the other videos, the Movember video was most accessed via external sources (88%). The video "Insight into Peyronie's disease: Cause and treatment for penis curvature" had the highest number of viewer comments (n=455) followed by "Improving fertility in men with poor sperm count" (n=307), as shown in Table 5. Select comments are highlighted in Figure 2.

Discussion

YouTube is the most popular video sharing and social media site worldwide, with watch times reaching hundreds of millions of hours per day, providing easy access to medical information related to men's health (7). Yet, prior studies have underscored that inaccurate and misleading

content about urological conditions thrives online (3,4,8). Despite increased attention to the quality and accuracy of urological videos on YouTube, no study has been successful in developing an intervention to address this issue. We demonstrate that a health system approach to producing and disseminating high quality men's health-related content can have significant global popularity and reach; furthermore, most viewers accessed the videos via organic traffic (e.g., YouTube search). The outcomes of this study signal that the integration between streaming video services and health systems can prominently influence the dissemination of accurate and reliable men's health content.

We found that on average there were 107,747 lifetime views across six evidence-based men's health streaming videos, with average viewership ranging from 1.2 to 3,124 views per month across 47 countries. The rise of YouTube has magnified the reach of men's health information that historically was inaccessible outside the context of a clinic encounter or proactive research. Though not all videos performed well; the video "Movember & why you should support men's health" was part of an educational campaign and did not receive as many lifetime views as the other 5 videos. A recent study by Warren and colleagues showed that YouTube videos featuring physicians were of significantly higher quality and less biased, but had lower viewership compared to videos not featuring a physician (9). Despite prior evidence suggesting content disseminated

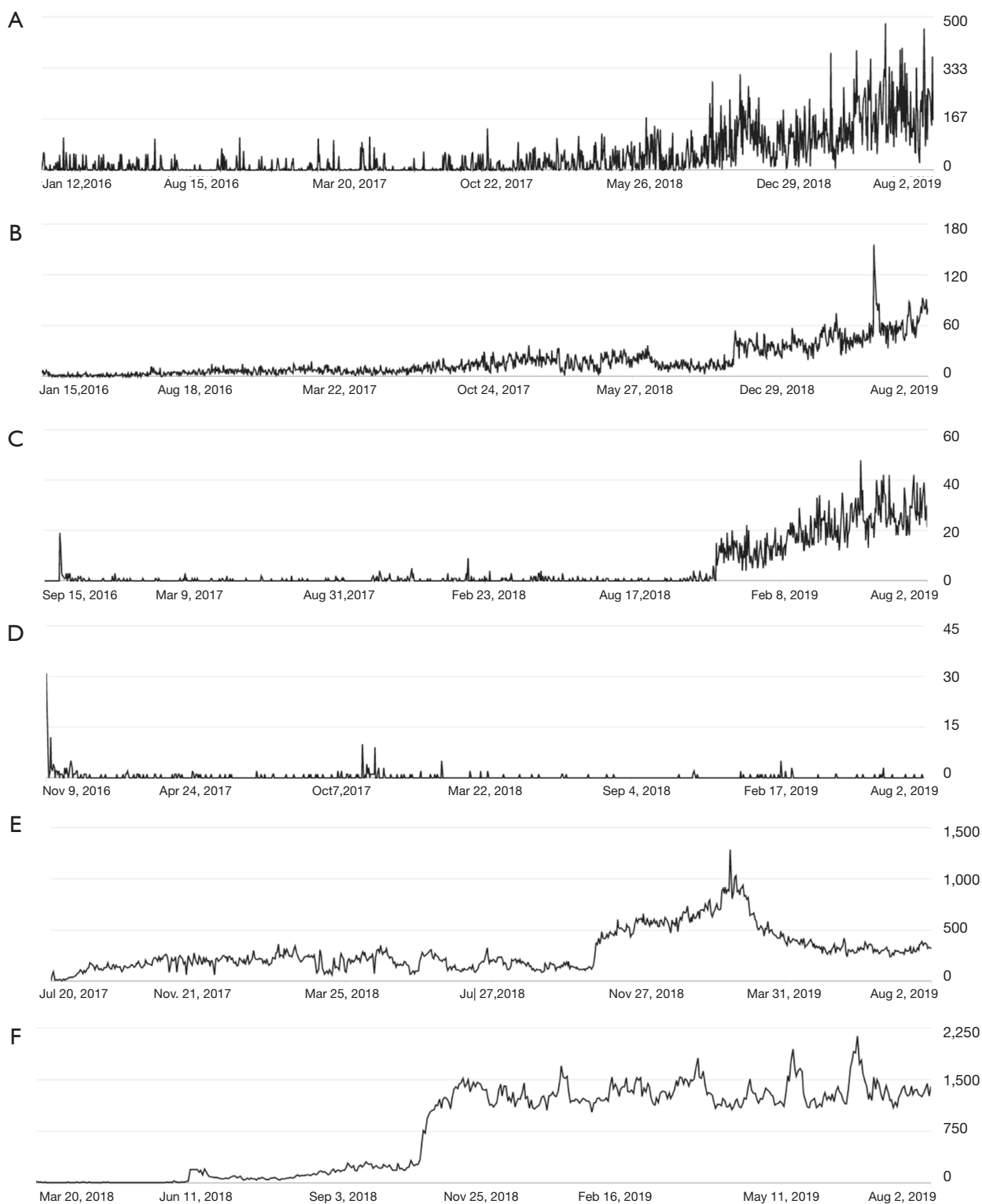


Figure 1 YouTube video viewer trends comparing number of views across video lifetime. (A) Trends for “Optimizing male fertility.” (B) Trends for “Vasectomy reversal: Fertility options after vasectomy.” (C) Trends for “3 steps to better men’s health.” (D) “Movember & why you should support men’s health.” (E) “Insight into Peyronie’s disease: Cause and treatment for penis curvature.” (F) “Improving fertility in men with poor sperm count.”

Table 3 Watch time stratified by device type for each YouTube video

Video	Watch time (mins)	Device type (percentage)		
		Computer	Mobile phone	Other [†]
"Optimizing male fertility"	59,835.00	55.7%	23.7%	21%
"Vasectomy reversal: fertility options after vasectomy"	142,220.00	35%	31%	34%
"3 steps to better men's health"	31,601.00	73%	15%	12%
"Movember & why you should support men's health"	1,513.00	63%	18%	19%
"Insight into Peyronie's disease: cause and treatment for penis curvature"	1,167,963.00	53%	29%	18%
"Improving fertility in men with poor sperm count"	1,469,613.00	15%	77%	8%
Total	2,872,745.00	33%	53%	14%

[†], "Other" including tablet, TV, game console

Table 4 Traffic sources for YouTube videos

Video title	Traffic source (percentage)		
	YouTube search	Suggested video	Other [†]
"Optimizing male fertility"	51.2	26.5	22.3
"Vasectomy reversal: fertility options after vasectomy"	59.2	30.4	10.4
"3 steps to better men's health"	86.8	1.7	11.5
"Movember & why you should support men's health"	8.3	3.6	88.1
"Insight into Peyronie's disease: cause and treatment for penis curvature"	57.7	26.1	16.2
"Improving fertility in men with poor sperm count"	71.6	6.9	21.5

[†], "Other" including external sources, notifications, channel pages, etc.

Table 5 Number of viewer comments for YouTube videos

Video	# of comments
"Optimizing male fertility"	16
"Vasectomy reversal: fertility options after vasectomy"	32
"3 steps to better men's health"	8
"Movember & why you should support men's health"	0
"Insight into Peyronie's disease: cause and treatment for penis curvature"	455
"Improving fertility in men with poor sperm count"	307

by physicians has its challenges in reaching successful viewership, our data demonstrate that streaming videos created by an academic health system can have prodigious reach, though not all content may be equivalently successful in achieving high viewership numbers.

Our study showed greater organic traffic via YouTube search than through non-organic sources (e.g., clicking paid advertisements) to access the health system videos. This higher rate of YouTube search is consistent with the increasing trend of individuals directly seeking health

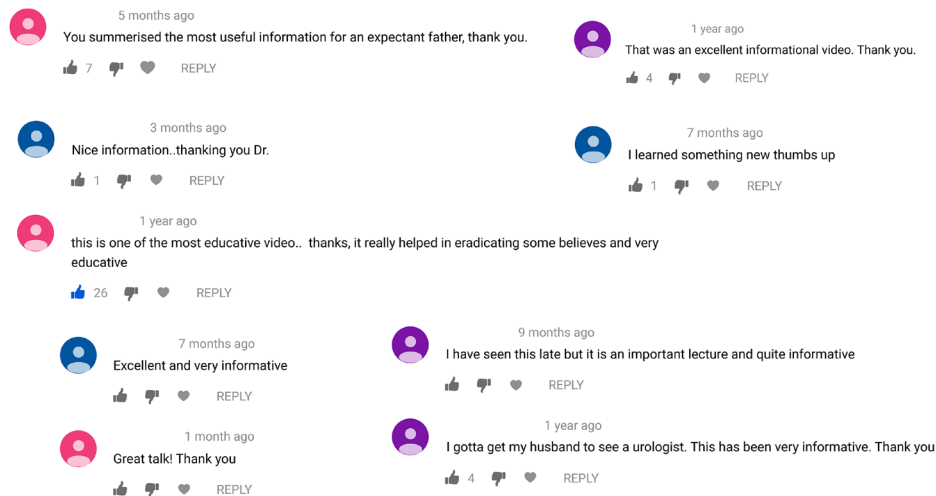


Figure 2 Representative comments by viewers of men's health YouTube streaming videos.

information online (10). Previous work compared quality of videos to their search result ranking and found that high-quality educational videos had low ranking positions, leading to less user access and engagement (11). YouTube's search algorithm determines ranking based on the congruency between viewer keyword queries and the keywords tagged by the health system videos (5). To improve search engine optimization and ensure greater engagement with reliable video content, future investigations should focus on better understanding viewer keyword queries.

While noting the impressive reach and popularity of our videos, social media analytics have granular feedback that can be acted on to optimize video content, including data on watch time and audience retention rate. We found that all videos had a duration >29 min, yet an audience retention rate as low as 9% (Table 4). Interestingly, our study showed no trend suggesting longer videos had lower audience retention rates. In fact, the two videos with the lowest mean average views per day ("3 steps to better men's health" and "Movember & why you should support men's health") had the highest audience retention rates. Based on the six videos analyzed, video length did not impact audience retention. Therefore, to optimize future men's health videos, knowledge translation efforts may need to consider other aspects such as content and user engagement to increase viewership and retention.

User-generated comments are important surrogates of user engagement on YouTube. We found that our six evidenced-based videos elicited numerous positive

comments including, "You summarized the most useful information for an expectant father, thank you" and "I have seen this late, but it is an important lecture and quite informative" (Figure 2). User comments also highlighted how a video demystified common misconceptions, e.g., "this is one of the most educative video. Thanks, it really helped in eradicating some believes and very educative [sic]". These quotations underscore the potential for evidence-based interventions to reduce the urological misinformation commonly found online, while also strengthening the patient-physician relationship. Poor patient-provider communication during a clinical office visit has been shown to drive individuals toward seeking information from streaming videos on YouTube, increasing the risk of exposure to misinformation (12). Thus, it becomes imperative that health professionals assist or inform patients on how to access credible information on YouTube as part of their visit. Referring patients to evidenced based health system videos on the popular YouTube platform may be useful in this setting.

The present study is not without limitations. We focused on evaluating the popularity and reach of a health-system based video intervention as a means to mitigate the proliferation of inaccurate and misleading urological content on YouTube. We did not have access to comments deemed offensive and removed from YouTube by content moderators, which may have provided an additional insight into viewer feedback on videos. Also, it must be noted that we did not compare quality and video characteristics between videos created by a health system and non-health

system users. Nevertheless, we believe that information provided by a health system in general is trustworthy and of interest to health consumers. Furthermore, this study did not assess the ranking assigned by the YouTube search algorithm to the health system videos using video specific keywords. We recognize that understanding how these ranking algorithms work is key to prevent videos from becoming invisible to viewers due to incorrect search optimization strategies. Future studies may also benefit from analyzing a larger quantity of videos and perhaps incorporating videos published on other websites known to stream videos.

Conclusions

Although the internet has empowered individuals to play an active role in their health, the quality of information on urological conditions suffers from a proliferation of non-evidenced based material and misleading content. To combat this misinformation, health systems and health professionals can be leaders in producing high quality, evidence-based content that viewers actively engage with and share. This study highlights the impressive global reach and popularity of a health system-sponsored video intervention. To our knowledge, this is the first study to evaluate the success of a health system using YouTube to facilitate sharing reputable, high quality, and evidence-based content related to men's health.

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Footnote

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Scientific, and Endo Pharmaceuticals. The other authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Consistent with previous investigations on social media data, this work was exempt by the institutional review board of the University of California, Los Angeles as it involves publicly available data and does not involve human subjects.

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