

## RESEARCH LETTER

## YouTube as a Source of Information on Immunization: A Content Analysis

**To the Editor:** Health care professionals have expressed concerns about the quality and veracity of information individuals receive from Internet-based sources.<sup>1</sup> One area of controversy is the use of Internet sites to communicate information on immunization.<sup>2</sup> YouTube is a video-sharing Internet Web site created in 2005 that provides free video streaming. It allows users to share multimedia clips that contain information related to the risks and benefits of immunization. To our knowledge, no studies have examined the content of these videos. We conducted a descriptive study to characterize the available information about immunization on YouTube.

**Methods.** On February 20, 2007, we searched YouTube (www.youtube.com) using the keywords *vaccination* and *immunization*. We included all unique videos with English-language content that contained any message about human immunization. We extracted information on the type of video, clip length, and scientific claims made by the video. We measured the users' interaction with these videos using view counts and the viewer reviews indicated by the star-rating system from 1 star (poor) to 5 stars (awesome). Videos were categorized as *negative* if the main message of the video portrayed immunization negatively (eg, emphasized the risk of immunization, advocated against immunizing, promoted distrust in vaccine science, made allegations of conspiracy or collusion between supporters of vaccination and manufacturers).

Videos were categorized as *positive* if the central message supported immunization, portraying it positively (eg, described the benefits and safety of immunizing, described immunization as a social good, or encouraged people to receive immunizations). Positive videos were labeled as public service announcements if they were made by governmental agencies or nongovernmental organizations to provide information about immunization as a service to

the public. Videos were categorized as *ambiguous* if they either contained a debate or were ambivalent (ie, a beneficial or social good was countered by negative experiences such as anxious parents and crying infants). The scientific claims made by the videos were classified as *substantiated* or *unsubstantiated/contradicts* using as a reference standard the 2006 Canadian Immunization Guide<sup>3</sup> and its human papillomavirus (HPV) vaccine and thimerosal updates,<sup>4</sup> which were the most current guidelines available at the time of the search. All videos were analyzed independently by 2 researchers (J.K. and V.P.G.) and disagreements were resolved by an arbitrator (K.W.).

**Results.** We identified and analyzed 153 videos. The weighted  $\kappa$  statistic for agreement on classification of videos was 0.93. Seventy-three (48%) of the videos were positive, 49 (32%) were negative, and 31 (20%) were ambiguous (TABLE 1). Compared with positive videos, negative videos were more likely to receive a rating, and they had a higher mean star rating and more views. Among the positive videos, public service announcements received the lowest mean (SD) ratings (2.6 [1.6] stars) and the fewest views (median, 213; interquartile range, 114-409). The most commonly discussed vaccine topic was general childhood vaccines (38 videos [25% of the total]). The most commonly discussed specific vaccine was the HPV vaccine (36 videos [24% of the total]); 20 of these were positive, 4 of which were industry-sponsored. Of the HPV vaccine-related videos, 24 specifically referred to Merck or Gardasil.

Of the negative videos, 22 (45%) conveyed messages that contradicted the reference standard. None of the positive videos made scientific statements that contradicted the reference standard. TABLE 2 lists the 5 most frequent topics and the scientific claims made.

**Comment.** Approximately half of the videos posted were not explicitly supportive of immunization, and information in negative videos often contradicted the reference standard. The video ratings and view counts suggest the presence of a community of YouTube users critical of immunization. Clinicians therefore need to be

**Table 1.** Ratings and Views of YouTube Videos About Immunizations<sup>a</sup>

Category of Main Message <sup>b</sup>	No. of Videos	No. of Views, Median (IQR)	No. (%) Rated	Viewer Rating, Mean (SD) <sup>c</sup>	No. (%) of Viewer Ratings	
					≥4	≤2
Positive	73	181 (63-755)	46 (63)	3.5 (1.5)	25 (54)	12 (26)
Negative	49	520 (232-1085)	42 (86)	4.4 (0.9)	34 (81)	2 (5)
Ambiguous	31	391 (87-1052)	20 (65)	4.4 (0.8)	17 (85)	0
Ambivalent	20	895 (369-1386)	17 (85)	4.3 (0.9)	14 (82)	0
Debate	11	61 (38-221)	3 (27)	4.7 (0.6)	3 (100)	0
<b>Total</b>	<b>153</b>	<b>345 (81-957)</b>	<b>108 (71)</b>	<b>4.0 (1.3)</b>	<b>76</b>	<b>14</b>

Abbreviation: IQR, interquartile range.

<sup>a</sup>Videos were obtained by keyword search of www.youtube.com on February 20, 2007.

<sup>b</sup>Definitions of main message category are in the Methods section.

<sup>c</sup>Scale ranged from 1 to 5 stars (1, "poor"; 2, "nothing special"; 3, "worth watching"; 4, "pretty cool"; 5, "awesome").

**Table 2.** Claims Made in YouTube Videos About Immunization<sup>a</sup>

Topic	No. of Videos	Category of Main Message, No. (%)			
		Positive	Negative	Ambivalent	Debate
General childhood immunization, nonspecific	38	13	9	16	0
Substantiated by reference standard					
Immunization is painful	15	0	2 (22)	13 (81)	0
Can cause adverse events	12	3 (23)	5 (56)	4 (25)	0
Effective against target disease	5	5 (38)	0	0	0
Unsubstantiated or contradicts reference standard					
Frequently causes serious adverse events <sup>b</sup>	3	0	3 (33)	0	0
Caused particular case of permanent injury <sup>c</sup>	2	0	2 (22)	0	0
Can cause autism <sup>b</sup>	2	0	2 (23)	0	0
HPV immunization	36	20	6	0	10
Substantiated by reference standard					
Cervical cancer is a serious disease	28	16 (80)	2 (33)	0	10 (100)
Prevents HPV infections that currently cause cancer	21	16 (80)	2 (33)	0	3 (30)
Insufficient evidence that vaccine will prevent cancer	10	2 (10)	2 (33)	0	6 (60)
Realistic alternatives to immunization	9	3 (15)	4 (67)	0	2 (20)
Can cause mild adverse events	7	3 (15)	2 (33)	0	2 (20)
Gardasil not tested on the targeted population	5	0	1 (17)	0	4 (40)
Unsubstantiated or contradicts reference standard					
May increase high-risk sexual behavior <sup>c</sup>	10	1 (10)	3 (50)	0	6 (60)
Influenza immunization	18	13	4	1	0
Substantiated by reference standard					
Influenza is a serious disease	12	11 (85)	1 (25)	0	0
Immunization is effective against influenza	11	11 (85)	0	0	0
Immunization is safe	8	8 (62)	0	0	0
Can cause mild adverse events	4	3 (23)	0	1 (100)	0
Not vaccinating puts others at risk	4	4 (31)	0	0	0
Unsubstantiated or contradicts reference standard					
Frequently causes serious adverse events <sup>b</sup>	4	0	4 (100)	0	0
Thimerosal-immunization	14	0	13	0	1
Substantiated by reference standard					
Effective against target disease	4	0	3 (23)	0	1 (100)
Unsubstantiated or contradicts reference standard					
Thimerosal can cause autism <sup>b</sup>	12	0	11 (23)	0	1 (100)
Caused particular case(s) of permanent injury <sup>c</sup>	7	0	7 (23)	0	0
Frequently causes serious adverse events <sup>b</sup>	6	0	5 (23)	0	1 (100)
Frequently causes other neurological injury <sup>b</sup>	6	0	5 (23)	0	1 (0)
Research supports link between thimerosal and autism <sup>b</sup>	6	0	5 (23)	0	1 (100)
General immunization, nonspecific	14	8	6	0	0
Substantiated by reference standard					
Vaccine preventable diseases pose serious risks	8	5 (62)	3 (50)	0	0
Immunization is effective (prevents target disease)	6	6 (75)	0	0	0
Immunizations are safe	4	4 (50)	0	0	0
Immunizations can cause adverse events	4	0	4 (67)	0	0
Unsubstantiated or contradicts reference standard					
Frequently causes serious adverse events <sup>b</sup>	3	0	3 (50)	0	0
Caused particular case of permanent injury <sup>c</sup>	2	0	2 (33)	0	0

Abbreviations: HPV, human papillomavirus.

<sup>a</sup>Videos were obtained by keyword search of www.youtube.com on February 20, 2007. Topics are the 5 most frequent. Definitions of main message category are in the Methods section. Includes claims with frequency more than 1.<sup>b</sup>Contradicts reference standard.<sup>c</sup>Unsubstantiated.

aware of Internet video-sharing sites and should be prepared to respond to patients who obtain their health information from these sources.<sup>5</sup> The potential use of these sites for effective communication by health professionals should also be considered.

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**Financial Disclosures:** None reported.

**Author Contributions:** Dr Wilson had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.  
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**Financial Disclosures:** None reported.

**Funding/Support:** None.

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For some years I thought that my inability to diagnose my patients' complaints was due to personal defects; but gradually, through consultations and in other ways, I came to recognise that the kind of information I wanted did not exist.

—Sir James Mackenzie (1853-1925)