Gender Bias in YouTube Videos Describing Common Urology Conditions

Rutul D. Patel, Priya Dave, Justin Loloi, Samantha Freeman, Nathan Feiertag, Mustufa Babar, and Kara L. Watts

OBJECTIVE To study implicit and explicit gender biases in YouTube videos describing common urologic conditions based on language patterns, speaker gender, and speaker profession.

METHODS Using a Boolean search, the top 30 videos for benign prostatic hyperplasia (BPH), kidney stones, urinary tract infections (UTIs), overactive bladder (OAB), erectile dysfunction (ED), and pelvic organ prolapse (POP) were retrieved. Using the Linguistic Inquiry and Word Count program (LIWC) software, video transcripts were analyzed for 16 word categories and compared by speaker gender and urology topic to assess for bias.

RESULTS OAB and POP had the least view counts and subscribers; kidney stone and ED videos had the most. Student education channels were more likely to feature male than female speakers (19 male vs. 6 female, P=0.01). A significant difference was noted between speaker gender in BPH (25 male vs. 4 female, P<0.001), OAB (4 male vs. 22 female, P<0.001), and POP (6 male vs. 23 female, P<0.001) videos. When examining linguistic patterns with the LIWC program, female speakers were more likely to mention personal concerns and use tentative words when speaking alone compared to males.

CONCLUSIONS Gender bias exists in YouTube videos concerning common urologic conditions. We must be mindful of how information is distributed in order to minimize the perpetuation of gender stereotypes that are common in medicine. Awareness of these patterns and biases should encourage Urologists to proactively consider how they present themselves and how they reference the conditions they present in social media outlets. UROLOGY 169: 256–266, 2022. © 2022 Elsevier Inc.

YouTube is the second most frequented website globally[1] and the most popular social media platform among adults.[2] Offering a variety of medical content, YouTube has emerged as a major source of medical information—and disinformation—for the general population,[3] students,[4] and aspiring and practicing physicians.[5] Recently, YouTube has been scrutinized for its role in spreading misinformation of several science-related topics such as COVID-19[6] and climate change.[7] Along with misinformation, there also exists a significant gender bias on YouTube with respect to audience reception of science videos.[8]

A 2018 study found gender to play a significant role in audience reception of science, technology, engineering, and mathematics (STEM) videos. Videos hosted by males had significantly more views and subscribers while female-hosted videos had significantly more likes and comments. However, user comments on female-hosted STEM videos were found to be disproportionately hostile, sexual, and critical.[8] While this has been less explored in Urology-specific YouTube videos, the prevalence of social media use in the urology is well documented. Urologists now use social media as vehicles for medical education,[9] mentorship,[10] and professional development.[11]

Gender bias is pervasive throughout medicine, and the field of Urology is still largely dominated by males. Recent American Urological Association (AUA) census data reveals that nearly 90% of practicing urologists[12] and 70%[13] of residents/fellows are male. Gender bias—whether explicit or implicit—in how urologic content is produced and received has the potential to impact patients, students, and practicing physicians alike. Thus, the aim of this study was to assess for gender bias on YouTube amongst common urologic conditions using overall linguistic patterns based on speaker gender and profession.

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From the Montefiore Medical Center, Bronx, NY; and the Albert Einstein College of Medicine, Bronx, NY
Address correspondence to: Kara Watts, M.D.; Department of Urology, Montefiore Medical Center, Albert Einstein College of Medicine, 1250 Waters Place, Bronx, NY 10461. E-mail: kwatts@montefiore.org
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METHODS

On July 27th, 2021, we used a cache-cleared, private browser (Mozilla Firefox) to search YouTube for videos related to the following six common urologic conditions: benign prostatic hyperplasia (BPH), kidney stones, urinary tract infections (UTIs), overactive bladder (OAB), erectile dysfunction (ED), and pelvic organ prolapse (POP). These six conditions were selected because of their relatively high prevalence among nonmalignant urologic diseases.[14] Furthermore, we deliberately included two conditions affecting males (ED and BPH), two primarily affecting females (OAB and POP), and two conditions that can affect both genders (UTIs and kidney stones) in order to start with gender parity of conditions searched. For each condition, a Boolean search function that incorporated the condition name and common acronyms was carried out. Search results were sorted by YouTube's "relevant" option, a function that presents videos in order of popularity. Videos not in English, without audio, and without a transcript were excluded. For each condition, the first 30 videos that met inclusion criteria were cataloged and included. YouTube search results list 15 − 20 videos per page based on relevance. This list repopulates as the user scrolls. Research has shown that more than 90% of users select a listing in the first two pages; in turn, we stopped at 30 videos per condition.[15,16]

Video length, upload date, uploading channel type, number of views, views per month, like-to-dislike ratio, dislikes, comments, and subscribers, uploading channel type, and transcript type for each video was recorded. Transcripts were either sourced by the video uploader or autogenerated by YouTube. Autogenerated transcripts were screened and edited to ensure accuracy when compared to videos. Transcripts were subsequently analyzed using the Linguistic Inquiry and Word Count (LIWC) program, a validated software used to assess language patterns. The LIWC program compares text files against a preset library of 6400+ words and word stems reporting percentages of text (based on word count) that correspond to categories of interest.[17]

Videos were further categorized based on speaker visibility (yes or no), speaker profession, and speaker gender (exclusively male, exclusively female, or both male and female speakers) based on the definitions provided in Supplementary Table 1. Videos with no visible speaker were primarily animations or lectures. Speaker's profession was determined using titles, degrees, and qualifications disclosed in the video. Speaker gender was determined by video context, channel description, speaker voice, and other identifying information. It was not meant to be an assumption of how the speaker self-identifies. Examples and definitions of LIWC output categories analyzed for this study are displayed in Supplementary Table 2.

Chi-square test, Fischer's exact test, independent-test-test, and one-way ANOVA tests were used to compare categorical and numerical variables. If data showed absence of homogeneity of variance amongst groups (based on Levene's statistic), a Welch ANOVA was used in place of one-way ANOVA. For categorical variables with three or more groups, a post-hoc Tukey's analysis was conducted to assess for differences within groups. All analyses were conducted using SPSS Version 27 and statistical significance was set at P<0.05.

RESULTS

Comparing Urologic Conditions

To arrive at the goal of 180 videos (30 per condition), we screened 211 YouTube videos. There were no significant differences in video length, views per month, like-to-dislike ratio, or number of comments amongst the urologic conditions (Table 1). Mean view count for UTI (267,294 views), BPH (101,200), kidney stone (570,820), OAB (54,306), ED (592,150), and POP (48,023) videos differed significantly ($P<0.001$). There was also a significant difference in the mean number of subscribers based on condition, with the most among UTI (629,443 subscribers) and kidney stone (1,140,341), followed by ED (583,724), BPH (237,575), POP videos (137,083) and OAB (90,959) ($P=0.025$).

Table 2 shows the distribution of uploading channel type, transcript type, speaker visibility, speaker gender, and speaker profession. Of the 180 videos analyzed, 89 (49.44%) had exclusively male speakers, 79 (43.89%) had exclusively female speakers, and 12 (6.67%) had both male and female speakers. The most popular uploading channel type was Hospital/Healthcare Network (41.66%) followed by Student Education (13.88%) and Medical Professional's Personal Channel (13.88%). Speakers were visible in 69.44% of videos.

ED and POP videos had a higher percentage of positive emotion words (Table 1). OAB and ED videos used a greater percentage of achievement words. UTI and POP videos had higher rates of female reference while ED and BPH had higher rates of male reference. UTI videos also used a higher percentage of health words, while BPH, ED, and POP videos used a higher percentage of sexual words. OAB videos had a significantly higher number of personal concern words and ED videos used a greater percentage of informal language.

Comparing Speaker Gender

Nine of the ten uploading channel types had a relatively even distribution of male and female speakers (Table 3). Only student education channels had a significantly higher number of male speakers compared to female speakers (19 vs. 6, P=0.01). Student education videos featuring male speakers also averaged higher view counts compared to videos with female speakers (319,089 vs. 154,928) as well as a higher number of subscribers (816,282 vs. 610,800). BPH (25 male vs. 4 female, $P<0.001$), kidney stone (20 male vs. 8 female vs. 2 both, $P=0.03$), OAB (4 male vs. 22 female vs. 4 both, $P<0.001$), and POP videos (6 male vs. 23 female vs. 1 both, $P<0.001$) all differed significantly in gender of speaker. Narrated videos were significantly more likely to feature male speakers than female speakers (38 vs. 17, $P=0.004$), while visible speakers were more likely to be female (62 female vs. 51 male, $P=0.004$).

There were no significant differences in mean video length, number of views, views per month, like-to-dislike ratio, number of comments, or number of subscribers based on speaker gender (Table 3). Videos with female speakers were significantly more likely to use tentative words (such as perhaps and maybe) compared to videos with speakers of both genders ($P=0.02$). Videos with both gender speakers were significantly more likely to use words that emphasized certainty, affiliation, reward, personal concerns and incorporate informal language. Videos with female speakers or speakers from both genders were more likely to contain female references compared to videos with only male speakers. Conversely, videos with male speakers ($P=0.013$) or speakers from both genders ($P=0.001$) were significantly more likely to contain male references compared to videos with only female speakers.

When LIWC outputs for urologic conditions were stratified by speaker gender, there was a difference in videos with male speakers compared to female speakers (Supplementary Table 3).

Table 1. Comparison of video parameters and Linguistic Inquiry and Word Count (LIWC) program outputs stratified by urologic conditions

		UTI (n=30)	BPH (n=30)	Stones (n=30)	OAB (n=30)	ED (n=30)	POP (n=30)	Total (n=180)	*P*-Value
Video Parameters (mean ± SD)	**Video Length (mins)**	5:45 ± 5:32	10:12 ± 8:51	6:43 ± 7:19	6:09 ± 6:40	6:56 ± 4:23	6:11 ± 5:46	6:59 ± 6:39	0.11
	Views	267,294 ± 637,136	101,200 ± 175,692	570,820 ± 1,095,412	54,306 ± 102,237	592,150 ± 853,947	48,023 ± 85,082	272,299 ± 662,997	<0.001*
	Views Per Month	9297 ± 17,017	4783 ± 14,155	163,208 ± 836,179	2847 ± 25,191	2519 ± 34,180	1379 ± 2054	34,502 ± 342,939	0.40
	Like-to-Dislike Ratio	31 ± 31	23 ± 16	29 ± 29	25 ± 22	26 ± 28	24 ± 27	26 ± 26	0.84
	Comments	286 ± 681	40 ± 67	963 ± 3387	93 ± 157	628 ± 815	26 ± 62	356 ± 1513	0.13
	Subscribers	629,553 ± 892,831	237,575 ± 277,230	1,140,341 ± 2,878,308	90,959 ± 156,650	583,274 ± 1,244,311	137,083 ± 228,543	464,465 ± 1,359,918	0.025*
	Word Count	919 ± 890	1475 ± 1358	1038 ± 1193	925 ± 949	1105 ± 699	893 ± 895	1059 ± 1026	0.22
LIWC analysis of Linguistic Trends (mean ± SD)	**Positive Emotion**	1.67 ± 0.88	1.74 ± 0.67	1.58 ± 0.57	2.04 ± 0.92	2.37 ± 0.89	2.29 ± 0.80	1.95 ± 0.85	<0.001*
	Negative Emotion	1.77 ± 0.88	1.79 ± 0.92	2.05 ± 1.07	1.58 ± 0.85	2.09 ± 1.02	1.63 ± 0.87	1.82 ± 0.95	0.18
	Tentative	4.50 ± 1.43	3.63 ± 1.36	4.15 ± 1.53	3.91 ± 1.32	3.75 ± 1.61	4.39 ± 1.29	4.06 ± 1.44	0.11
	Certainty	1.12 ± 0.71	0.73 ± 0.42	1.00 ± 0.54	0.96 ± 0.64	1.19 ± 0.68	1.01 ± 0.60	1.00 ± 0.62	0.07
	Affiliation	1.25 ± 0.82	1.11 ± 0.84	1.53 ± 1.24	1.40 ± 0.87	1.54 ± 0.84	1.68 ± 0.97	1.42 ± 0.95	0.20
	Achievement	0.79 ± 0.37	1.14 ± 0.44	0.89 ± 0.60	1.42 ± 0.89	1.35 ± 0.64	1.04 ± 0.61	1.11 ± 0.65	<0.001*
	Power	2.04 ± 0.98	2.09 ± 0.69	2.47 ± 0.76	2.41 ± 0.94	2.16 ± 0.70	2.33 ± 1.05	2.25 ± 0.87	0.28
	Reward	1.08 ± 0.81	0.96 ± 0.57	1.07 ± 0.64	1.01 ± 0.63	1.33 ± 0.71	0.88 ± 0.61	1.06 ± 0.67	0.17
	Risk	0.72 ± 0.48	0.86 ± 0.52	0.77 ± 0.53	0.76 ± 0.71	0.71 ± 0.45	0.70 ± 0.49	0.75 ± 0.53	0.87
	Female Reference	0.75 ± 0.73	0.03 ± 0.06	0.08 ± 0.19	0.37 ± 0.87	0.12 ± 0.36	1.14 ± 1.09	0.41 ± 0.77	<0.001*
	Male Reference	0.40 ± 0.58	0.66 ± 0.41	0.17 ± 0.31	0.17 ± 0.33	0.97 ± 0.81	0.04 ± 0.11	0.40 ± 0.57	<0.001*
	Biological Processes	9.98 ± 3.84	8.93 ± 2.98	7.67 ± 2.23	10.06 ± 3.51	8.40 ± 3.68	9.16 ± 2.99	9.03 ± 3.31	0.04*
	Health	4.91 ± 2.36	3.61 ± 1.29	2.63 ± 1.27	3.66 ± 1.92	3.73 ± 2.07	3.80 ± 1.49	3.72 ± 1.88	<0.001*
	Sexual	0.37 ± 0.42	2.49 ± 1.05	0.02 ± 0.08	0.13 ± 0.27	2.95 ± 1.58	1.37 ± 1.06	1.22 ± 1.46	<0.001*
	Personal Concerns	2.45 ± 1.19	2.32 ± 0.94	2.21 ± 1.14	4.14 ± 1.39	2.87 ± 0.99	2.44 ± 1.16	2.74 ± 1.31	<0.001*
	Informal Language	0.33 ± 0.36	0.44 ± 0.37	0.28 ± 0.41	0.40 ± 0.34	0.65 ± 0.66	0.24 ± 0.26	0.39 ± 0.43	0.003*

Results for linguistic trend analysis reported as percentages of word count (i.e., Male Reference 5.02 = 5.02% of words belong to the "Male Reference" category.
UTI = Urinary Tract Infection, BPH = Benign Prostatic Hyperplasia, OAB = Overactive Bladder, ED = Erectile Dysfunction, POP = Pelvic Organ Prolapse.
SD = standard deviation.
* = Statistically significant difference between groups at $P<0.05$.

Table 2. Number of videos in each video demographic category stratified by urologic conditions

		UTI (n=30)	BPH (n=30)	Stones (n=30)	OAB (n=30)	ED (n=30)	POP (n=30)	Total (n=180)
Uploading Channel Type	Hospital/Healthcare Network	12	14	14	12	6	17	75
	Student Education	9	9	3	0	1	3	25
	Medical Professional Development	1	0	1	0	0	0	2
	Medical Professional's Personal Channel	4	3	1	9	6	2	25
	Private Company	1	2	0	2	4	1	10
	Media Outlet	1	0	0	0	6	0	7
	Medical Society	0	1	2	3	1	1	8
	Digital Media Company	0	0	4	0	1	1	6
	General Education	2	1	5	4	0	3	15
	Personal Channel	0	0	0	0	5	2	7
Transcript Type	Autogenerated	21	25	17	23	22	24	132
	Sourced	9	5	13	7	8	6	48
Speaker Visible	No (Narration only)	11	15	12	5	5	7	55
	Yes (Speaker on screen)	19	15	18	25	25	23	125
Speaker Gender	Male	18	25	20	4	16	6	89
	Female	11	4	8	22	11	23	79
	Both	1	1	2	4	3	1	12
Speaker Profession	Physician	23	23	18	15	16	20	115
	Ancillary Medical Staff	2	2	2	3	0	1	10
	Physical Therapist	0	0	0	7	3	5	15
	Patient	0	0	1	1	4	1	7
	Hosts/Anchor	1	0	3	0	2	0	6
	Undisclosed	4	5	6	4	5	3	27

UTI = Urinary Tract Infection, BPH = Benign Prostatic Hyperplasia, OAB = Overactive Bladder, ED = Erectile Dysfunction, POP = Pelvic Organ Prolapse.

Table 3. Distribution of speaker gender based on uploading channel type, urologic conditions, and speaker visibility along with comparison of mean video parameters and Linguistic Inquiry and Word Count (LIWC) program outputs based on speaker gender

		Male (n=89)	Female (n=79)	Both (n=12)	Total (n=180)	*P*-Value
Uploading Channel Type	Hospital/Healthcare Network	35	35	5	80	
	Student Education	19	6	0	25	*=0.012
	Medical Professional Development	1	1	0	2	
	Medical Professional Personal Channel	12	13	0	25	
	Private Company	6	3	1	10	
	Media Outlet	1	3	3	7	†<0.001 ‡=0.017
	Medical Society	2	6	0	8	
	Digital Media Company	3	3	0	6	
	General Education	6	6	3	15	
	Personal Channel	4	3	0	7	
Urologic Conditions	UTI	18	11	1	30	
	BPH	25	4	1	30	*<0.001
	Stones	20	8	2	30	*=0.032
	OAB	4	22	4	30	*<0.001 †=0.002
	ED	16	11	3	30	
	POP	6	23	1	30	*<0.001
Speaker Visible	No (Narration only)	38	17	0	55	*=0.004
	Yes (Speaker on screen)	51	62	12	125	*=0.004
Speaker Profession	Physician	66	37	12	115	*<0.001
	Ancillary Medical Staff	2	8	0	8	*=0.031
	Physical Therapist	0	15	0	15	
	Patient	5	2	0	7	
	Host/Anchor	3	5	0	8	
	Undisclosed	14	13	0	27	
Video Parameters (Mean ± SD)	Video Length (mins)	7:44 ± 6:45	6:33 ± 6:52	4:23 ± 2.48	6:59 ± 6:39	
	Views	319,432 ± 776,109	248,408 ± 564,722	80,006 ± 101,849	272,299 ± 662,997	
	Views Per Month	61,632 ± 485,728	8573 ± 23,140	1829 ± 252	34,502 ± 342,939	
	Likes-to-Dislike Ratio	27 ± 27	26 ± 26	18 ± 11	26 ± 26	
	Comments	525 ± 2096	201 ± 424	82 ± 102	356 ± 1513	
	Subscribers	614,006 ± 1,803,984	319,560 ± 710,499	322,182 ± 515,143	464,465 ± 1,359,918	
	Word Count	1168 ± 1031	979 ± 1066	784 ± 581	1059 ± 1026	
LIWC analysis of Linguistic Trends (mean ± SD)	Positive Emotion	1.87 ± 0.85	2.00 ± 0.85	2.24 ± 0.78	1.95 ± 0.85	
	Negative Emotion	1.92 ± 0.92	1.72 ± 0.99	1.65 ± 0.84	1.82 ± 0.95	
	Tentative	3.99 ± 1.54	4.28 ± 1.33	3.07 ± 0.91	4.06 ± 1.44	‡=0.021
	Certainty	0.95 ± 0.56	0.98 ± 0.64	1.55 ± 0.66	1.00 ± 0.62	†=0.004 ‡=0.008
	Affiliation	1.35 ± 0.96	1.39 ± 0.90	2.15 ± 0.95	1.42 ± 0.95	†=0.019 ‡=0.028
	Achievement	1.09 ± 0.61	1.10 ± 0.71	1.23 ± 0.45	1.11 ± 0.65	

Continued

Table 3. Continued

	Male (n=89)	Female (n=79)	Both (n=12)	Total (n=180)	*P*-Value
Power	2.22 ± 0.80	2.24 ± 0.92	2.47 ± 1.08	2.25 ± 0.87	
Reward	0.99 ± 0.67	1.02 ± 0.62	1.78 ± 0.59	1.06 ± 0.67	†<0.001 ‡=0.001
Risk	0.75 ± 0.49	0.78 ± 0.59	0.60 ± 0.43	0.75 ± 0.53	
Female Reference	0.27 ± 0.56	0.55 ± 0.94	0.61 ± 0.72	0.41 ± 0.77	*=0.05
Male Reference	0.48 ± 0.55	0.24 ± 0.48	0.86 ± 0.89	0.40 ± 0.57	*=0.013 ‡=0.001
Biological Processes	9.00 ± 3.49	9.33 ± 3.11	7.37 ± 2.95	9.03 ± 3.31	
Health	3.79 ± 2.13	3.72 ± 1.62	3.29 ± 1.47	3.72 ± 1.88	
Sexual	1.43 ± 1.49	1.03 ± 1.47	0.92 ± 0.95	1.22 ± 1.46	
Personal Concerns	2.45 ± 1.14	2.98 ± 1.42	3.26 ± 0.36	2.74 ± 1.31	*=0.023
Informal Language	0.43 ± 0.50	0.29 ± 0.30	0.73 ± 0.45	0.39 ± 0.43	‡=0.003

Results for linguistic trend analysis reported as percentages of word count (i.e., Male Reference 5.02 = 5.02% of words belong to the "Male Reference" category.
UTI = Urinary Tract Infection, BPH = Benign Prostatic Hyperplasia, OAB = Overactive Bladder, ED = Erectile Dysfunction, POP = Pelvic Organ Prolapse.
SD = Standard Deviation.
P-values given for statistically significant differences only.
* = Comparison of means for male speaker vs. female speakers.
† = Comparison of means for male speaker vs. both male and female speakers.
‡ = Comparison of means for female speaker vs. both male and female speakers.

BPH videos with female speakers were viewed significantly more (288,593 views vs. 67,887, *P*=0.018) and used a higher percentage of health related words (4.95% vs. 3.45%, *P*=0.028). Kidney stone videos with both male and female speakers used a significantly higher percentage of positive emotion, affiliation, female reference, and sexual words than each gender individually. Similarly, OAB videos with both male and female speakers used more power and reward words, such as worthless and benefit, respectively.

Comparing Speaker Profession

Cumulatively, healthcare professionals were the featured speaker in 140/150 (93.3%) videos (Table 2). Speakers most commonly comprised physicians (115 videos, 63.9%), followed by physical therapists (15 videos, 8.3%) and ancillary medical staff (10 videos, 5.6%). The remaining speakers were either patients (7 videos, 3.9%), hosts/anchors (6 videos, 3.3%), or speakers whose profession was undisclosed (27 videos, 15%).

When stratifying speaker profession by speaker gender, a significant difference was observed in the number of male and female physicians and male and female ancillary medical staff (Table 3). Specifically, physician speakers were more likely to be male (66 male vs. 37 female, *P*<0.001), and ancillary medical staff speakers were more likely to be female (8 female vs. 2 male, *P*=0.03). The speaker was female in all 15 of the videos featuring physical therapists.

Subanalysis of Physician Speakers

Table 4 highlights a subanalysis of the videos featuring physicians based on speaker gender. In this subset, Media Outlet channels were significantly more likely to feature both male and female speakers than just male speakers (3 both vs. 1 male, *P*=0.002). Differences amongst speaking physician gender was also observed in BPH, kidney stone, OAB, and POP videos. Male physicians were significantly more likely to be the speaker of BPH (20 male vs. 2 female, *P*=0.009) and kidney stone videos (15 male vs. 1 female, *P*=0.021). Conversely, female physicians were significantly more likely to be the speaker of OAB (7 female vs. 4 male) and POP videos (14 female vs. 5 male, *P*<0.001).

Compared to male physicians, female physicians were also significantly more likely to make female references (0.88% of transcript vs. 0.21%, *P*<0.001). Physician videos with both gender speakers were significantly more likely to make male references when compared to videos where the speaker was a male physician (0.86% of transcript vs. 0.43%, *P*=0.029) or a female physician (0.86% of transcript vs. 0.21%, *P*=0.001). Male physician videos were also twice as likely to make male references than female physician videos (0.43% of transcript vs. 0.21%, *P*=0.016).

DISCUSSION

To our knowledge, this is the first study to assess gender biases in urologic content on YouTube. Layered analysis of speaker gender stratified by uploading channel type, urologic condition, speaker visibility, and speaker profession revealed significant differences between the number of videos with male vs. female speakers as well as differences in linguistic patterns.

Table 4. Subanalysis of uploading channel type, and urologic conditions, along with comparison of mean video parameters and Linguistic Inquiry and Word Count (LIWC) program outputs for physician speakers stratified by speaker gender

		Physician Speakers (n=115)			
		Male (n=66)	Female (n=37)	Both (n=12)	*P*-Value
Uploading Channel Type (count)	Hospital/Healthcare Network	34	25	5	
	Student Education	9	3	0	
	Medical Professional Development	0	1	0	
	Medical Professional Personal Channel	11	3	0	
	Private Company	4	0	1	
	Media Outlet	1	2	3	†=0.002
	Medical Society	1	1	0	
	Digital Media Company	3	0	0	
	General Education	4	2	3	
	Personal Channel	0	0	0	
Urologic Conditions (count)	UTI	14	8	1	
	BPH	20	2	1	*=0.009
	Stones	15	1	2	*=0.021
	OAB	4	7	4	*=0.043
	ED	8	5	3	
	POP	5	14	1	*<0.001
Video Parameters (mean ± SD)	Video Length (mins)	7:23 ± 6:13	7:28 ± 6:50	4:23 ± 2:48	
	Views	222,171 ± 561,792	200,623 ± 392,650	80,006 ± 101,849	
	Views Per Month	9507 ± 19,037	8750 ± 28,969	1829 ± 2525	
	Like-to-Dislike Ratio	24 ± 23	23 ± 25	18 ± 11	
	Comments	209 ± 681	286 ± 603	82 ± 109	
	Subscribers	552,993 ± 1,931,605	287,236 ± 599,037	322,182 ± 515,143	
	Word Count	1120 ± 968	1078 ± 1037	784 ± 581	
LIWC analysis of Linguistic Trends (mean ± SD)	Positive Emotion	1.87 ± 0.89	2.14 ± 0.81	2.24 ± 0.78	
	Negative Emotion	1.89 ± 0.92	1.56 ± 0.81	1.65 ± 0.84	
	Tentative	4.22 ± 1.63	4.62 ± 1.31	3.07 ± 0.91	†=0.046 ‡=0.006
	Certainty	0.93 ± 0.55	1.10 ± 0.71	1.55 ± 0.66	†=0.005
	Affiliation	1.32 ± 0.96	1.46 ± 0.91	2.15 ± 0.95	†=0.018
	Achievement	1.14 ± 0.66	1.28 ± 0.61	1.23 ± 0.45	
	Power	2.22 ± 0.84	2.04 ± 0.74	2.47 ± 1.08	
	Reward	0.93 ± 0.63	1.23 ± 0.73	1.78 ± 0.59	†<0.001 ‡=0.038
	Risk	0.74 ± 0.48	0.84 ± 0.50	0.60 ± 0.43	
	Female Reference	0.21 ± 0.41	0.88 ± 1.08	0.61 ± 0.72	*<0.001
	Male Reference	0.43 ± 0.47	0.21 ± 0.41	0.86 ± 0.89	*=0.016 †=0.029 ‡=0.001
	Biological Processes	9.26 ± 3.07	8.84 ± 2.25	7.37 ± 2.95	

Continued

Table 4. Continued

	Physician Speakers (n=115)			
	Male (n=66)	Female (n=37)	Both (n=12)	*P*-Value
Health	3.93 ± 2.02	3.70 ± 1.15	3.29 ± 1.47	
Sexual	1.34 ± 1.35	1.14 ± 1.26	0.92 ± 0.95	
Personal Concerns	2.49 ± 1.15	2.77 ± 1.17	3.26 ± 1.36	
Informal Language	0.39 ± 0.45	0.28 ± 0.27	0.73 ± 0.45	†=0.025 ‡=0.003

Results for linguistic trend analysis reported as percentages of word count (i.e., Male Reference 5.02 = 5.02% of words belong to the "Male Reference" category.
UTI = Urinary Tract Infection, BPH = Benign Prostatic Hyperplasia, OAB = Overactive Bladder, ED = Erectile Dysfunction, POP = Pelvic Organ Prolapse
SD = Standard Deviation
P-Value only given for statistically significant differences.
* = Comparison of means for male speaker vs. female speakers.
† = Comparison of means for male speaker vs. both male and female speakers.
‡ = Comparison of means for female speaker vs. both male and female speakers.

Education channels geared towards students in the healthcare profession were more likely to feature male speakers than females. On average, student education videos with only male speakers also garnered more views and subscribers. Several studies have investigated the role of gender representation and its impact on males and females pursuing careers in STEM fields. Exposure to female scientists has been shown to have a positive effect on male and female students.[18] Conversely, a lack of female role models in STEM fields, whether in media or personal life, has been shown to promote masculinization of careers and a doubt amongst female students in their own ability to pursue these fields.[19] While these studies primarily focused on adolescent female students, we believe that a similar trend can be observed in students in the healthcare profession as well. By having a disproportionately higher number of male speakers, channels that are directed at students may inadvertently cause female students to self-select out of a Urologic specialty.

The distribution of speaker gender amongst urologic conditions showed further evidence of gender biases. BPH and kidney stone videos were significantly more likely to feature male speakers, while OAB and POP videos were significantly more likely to feature female speakers. These gender-based associations remained significant when limiting analysis to physician speakers. Videos addressing BPH and kidney stones, which are commonly seen in outpatient urology practices,[14] were more likely to have male physician speakers. Physicians featured in OAB and POP videos, however, were more likely to be female. This lack of parity in speaker gender may influence patient decision regarding the gender of the Urologist he/she seeks. Wynn et al.'s study of patient preference for urologist gender revealed that many female patients were more likely to select female urologists due to previous negative experiences or perceived gender-specific treatment styles.[20]

Speaker gender was also found to have a significant effect on linguistic patterns. When speakers from only one gender were present, they referenced their own gender twice as often. However, when speakers from both genders were present, there were significantly more male references compared to videos with exclusively male or exclusively female speakers. The same did not hold true for female references. Male dominance of mix-gender conversations is well-established in social,[21] educational,[22] and professional settings.[23] Importantly, this association was not present when stratifying by gender-specific urologic conditions. Speaker gender did not significantly affect the amount of male or female references in videos about ED, BPH, or POP. An association was observed, however, in the subset of videos featuring physician speakers. Similar to the overall results, female physicians were significantly more likely to reference females and male physicians were significantly more likely to reference males. Once again, when physician speakers from both genders were present, males were referenced significantly more, underscoring a gender disparity that exists in medicine and in our field.

Furthermore, our study showed that female speakers were significantly more likely to mention personal concerns than male speakers. We found that female speakers, on average,

were more likely to address everyday challenges that many urologic conditions pose. These results are analogous to Linden et al.'s study which found that female patients with cancer were two or three more times more likely to express emotions than their male contemporaries.[24] Studies have also reported that patients respond positively to physicians who use communal language, and are more likely to recommend their services.[25] The fact that female speakers are more likely to discuss personal concerns could explain our data where BPH videos with female speakers had more mean views. This association also remains significant when limiting analysis to physician speakers. We found mean view count for BPH videos featuring female physicians to be significantly higher than those featuring male physicians. However, we don't know how this may impact a patient's decision or selection for Urologist gender or, even, an aspiring medical student's decision to pursue this field. Interestingly, patient preference of gender-concordant urologists is well documented; especially amongst patients with urinary incontinence.[20,26]

This study is not without limitations. We are limited by the program we used to analyze the video transcripts. Because we utilized a computer software to analyze linguistic patterns, our results and analysis are limited by the LIWC dictionaries and their respective sensitivities and specificities. Another limitation of this study is the assumption of speaker gender for videos without visible speakers. While the best effort was made to discern speaker gender from the information available, there may have been errors that misrepresent speaker gender.

Despite these limitations, we believe the novelty of this study and significance of its results lays the foundation for future studies to assess for biases based on race, age, or even language. A particular strength of this study is the number of conditions included. By analyzing videos from six common urologic conditions and including 30 videos from each condition, we are able to provide a more holistic framework of the gender biases that exist on urology YouTube. Another strength of this study is the subanalysis of physician speakers, which allowed us to add a layer of consistency to an otherwise heterogenous pool of videos. This also ensures that our results are more representative of the professional urologic community rather than the general public.

CONCLUSION

Our findings highlight implicit gender bias in YouTube videos describing common urologic conditions. Given that many of these videos portray a male speaker, this may perpetuate the fact that Urology continues to be a male-dominated profession, potentially discouraging females from applying. In addition, patterns of language use by gender may also influence patient gender selection of Urologist. Many urologic conditions have significant quality of life implications, and male speakers were less likely to address these concerns in their videos. With social media being a prominent source of education and information sharing, we must be mindful of what, how, and by whom information is distributed in order to minimize the perpetuation of stereotypes. By investigating the gender disparities in video representation as well as linguistic patterns, we hope to shed light on gender bias in the field of Urology via Social Media platforms that has potential to influence provider interest and patient accessibility.

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SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at https://doi.org/10.1016/j.urology.2022.06.042.

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EDITORIAL COMMENT

Gender bias within surgical subspecialties is striking and multifactorial in nature.[1] Identification of potential upstream causes is important to shift trends towards diversity in medical education and surgical trainees. This study astutely quantifies the gender representation from mainstream information sources, where a significantly higher proportion of men are featured in educational content rendering a larger viewership for male educators and narrators. From the author's analysis and interpretation, gender bias amongst urologic educational content may impact the pipeline of trainees into formal medical training. *Chapman et. al.'s* findings are congruent showing a 1.45% increase in female trainees for each 1% increase in female faculty.[2] Similarly, *Findlay et. al.* recently affirmed the importance of gender representation and mentorship by identifying a positive correlation between percentages of female residents and faculty.[3]

The shift of educational content delivery to a video modality, often posted on YouTube, poses new concerns regarding urologic content consumption. While many focus on evaluating the quality of available content, the undertones and subliminal messaging within content delivery is an equally important topic.[4] Representation of gender may provide a gender-specific expectation for a provider's scope of practice. *Barnes et al* identify this phenomenon in general surgery where female general surgeons are assumed and encouraged to be breast surgeons in private practice environments.[5] This experience is similar to the assumption urologists who are female may be assumed or expected to practice female urology. Equally as damaging as these peer expectations are the patient expectations of which gender is competent in a scope of practice. Studies show a pattern of referral for female patients to see female surgeons clearly exists.[6] Patients who are only exposed to male urologists, speaking as expert opinion, may not seek out female urologists due to an underlying bias regarding the female urologist's competency. Patients may also assume they should not see physicians of the opposite gender for gender-specific issues, thereby limiting and potentially alienating patient choice. These referral patterns and assumptions regarding female surgeon's scope of practice is damaging to the patient-physician relationship and furthers institutionalized gender bias patterns. Those responsible for media posting on behalf of healthcare entities should consider involving institutional experts in diversity, equity, and inclusion to mitigate potential damaging effects from a physician, patient, and societal perspective prior to posting medical content. Thank you to the authors for their efforts in further shining the light on opportunities to increase diversity in our field.

Brittany E. Levy, Andrew M. Harris, University of Kentucky

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AUTHOR REPLY

While our study highlights gender biases within Urologic educational content published online, it should be noted, as pointed out by Drs. Harris and Levy, that these biases exist offline as well. The piece entitled *On manels and manferences in urology*, by Drs. Imogen Patterson and Sigrid V. Carlsson, comments on the stark difference between the number of male and female speakers at academic Urology conferences.[1] Even when controlling for merit-based metrics (number of publications, H-index, etc.), male urologists were still presented with more panel positions than their female contemporaries.

As noted by the reviewers, an increase in female faculty often results in an increase in the number of female trainees.[2] A similar trend is observed in urology residency programs where the number of female residents is positively correlated with the number of female faculty.[3] As a field, Urology continues to add more women to the workforce, with the percent of practicing urologists in the United states increasing from 7.7% to 10.9% between 2014-2021.[4] In the same time frame, the number of female urology applicants grew from 114 to 180 (25.6% of applicants to 32.4%) and the number of matched female applicants rose from 82 to 130 (25.8% of matched applicants to 35.6%).[4–6]

Simultaneous to increased workforce presence, women urologists must be supported in opportunities for leadership positions. Previous studies have reported that women comprise 7.9% and less than 3.3% of all urology residency program directors and chairs, respectively.[7] Likewise, women rarely hold board of director (BOD) positions within urologic subspecialty societies, two of which have had 0 female urologists on their BOD from 2014 − 2020. In fact, the subspecialty society with the highest percentage of women in leadership positions is the Society of Urodynamics, Female Pelvic Medicine & Urogenital Reconstruction (SUFU).[8] This disproportionate distribution of BOD positions can further perpetuate the bias that female urologists are expected to practice female-specific urology. As noted by Dr. Levy and Dr. Harris, these unfair expectations and assumptions, which are also present in general surgery, not only damage patient-physician relationships, but also propagate biases that affect practice patterns.

There are, however, reasons to be optimistic. Female representation in the field continues to rise[4] and the percentage of female urologists on the editorial board of major Urology journals nearly doubled between 2015 − 2020.[9] We encourage our Urologic community to pursue active efforts to mitigate implicit and explicit gender biases present in our field. We thank the editors and reviewers of *Urology* for providing us a platform to present our findings on this important topic.

Rutul D. Patel, Justin Loloi, Kara L. Watts,
Department of Urology, Montefiore Medical Center, Bronx, NY

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