Audience of Academic Otolaryngology on Twitter: Cross-sectional Study

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Abstract

Background: Despite the ubiquity of social media, the utilization and audience reach of this communication method by otolaryngology-head and neck surgery (OHNS) residency programs has not been investigated.

Objective: The purpose of this study was to evaluate the content posted to a popular social media platform (Twitter) by OHNS residency programs.

Methods: In this cross-sectional study, we identified Twitter accounts for accredited academic OHNS residency programs. Tweets published over a 6-month period (March to August 2019) were extracted. Tweets were categorized and analyzed for source (original versus retweet) and target audience (medical versus layman). A random sample of 100 tweets was used to identify patterns of content, which were then used to categorize additional tweets. We quantified the total number of likes or retweets by health care professionals.

Results: Of the 121 accredited programs, 35 (28.9%) had Twitter accounts. Of the 2526 tweets in the 6-month period, 1695 (67.10%) were original-content tweets. The majority of tweets (1283/1695, 75.69%) were targeted toward health care workers, most of which did not directly contain medical information (954/1283, 74.36%). These tweets contained information about the department’s trainees and education (349/954, 36.6%), participation at conferences (263/954, 27.6%), and research publications (112/954, 11.7%). Two-thirds of all tweets did not contain medical information. Medical professionals accounted for 1249/1362 (91.70%) of retweets and 5616/6372 (88.14%) of likes on original-content tweets.

Conclusions: The majority of Twitter usage by OHNS residency programs is for intra and interprofessional communication, and only a minority of tweets contain information geared toward the public. Communication and information sharing with patients is not the focus of OHNS departments on Twitter.

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KEYWORDS
Twitter; otolaryngology; residency; medical education; social media; internet

Introduction

Social media continues to be a growing and evolving aspect of daily life for the general population. Over the last 15 years, the percentage of US adults who use at least one social media website has increased from 5% to 72% [1]. Online resources and social media platforms hold significant potential as methods of communication and information dissemination between health care providers and their patients.

With the development of electronic medical records, many hospital systems allow for patients to contact their providers and access records through an online patient portal [2]. Younger patients are more likely than their older counterparts to use these portals in the orthopedic [3] and cancer [4] patient populations. There is a similar correlation of social media usage with age, as a higher proportion of younger adults are using social media (90% of individuals aged 18-29 years) compared to older adults (40% of individuals over the age of 65 years) [1].
With the ever-expanding role of telemedicine in patient care, particularly during the COVID-19 pandemic, we must be mindful of opportunities for patient engagement and education outside of the office. With its rising ubiquity, the utilization and audience reach of social media by medical professionals is an emerging field of research. Twitter is a popular platform that has proven to be useful in academic networking [5-8]. In the field of otolaryngology-head and neck surgery (OHNS), Twitter has been studied as a patient resource for information about tonsillectomy [9], cochlear implantation [10], and hearing loss [11]. However, there have been no investigations into the use of this social media platform by academic OHNS residency programs. Thus, the purpose of this study was to evaluate the content and target audience of academic OHNS residency programs on Twitter.

**Methods**

Data for this cross-sectional study were collected in August 2019 from Twitter (Twitter Inc, San Francisco, CA). OHNS residency programs were included if they were accredited by the Accreditation Council for Graduate Medical Education (ACGME). Twitter accounts were identified by searching each program’s website for profile links as well as by searching for the name of the program directly on Twitter. Accounts that were division-specific were excluded.

Twitter metrics (number of tweets, number of followers, and accounts being followed by the program) and tweets from the last 6 months were downloaded with Twitonomy (Diginomy Pty Ltd, New South Wales, Australia). A content analysis of all individual tweets from these accounts during the 6-month period from March to August 2019 was also performed. The text of each tweet was categorized for origin of content (original text created by the account versus retweet of another user’s content), level of information (directly informative, indirectly informative by providing a link or web address for additional information, or uninformative), and target audience (health care worker versus general public). For example, a tweet promoting a grand rounds session would be categorized as original content, uninformative, and targeting health care workers (Figure 1).

To further characterize the information communicated in the tweets, a sample of 100 tweets was analyzed to identify common themes, which was then applied to categorize additional tweets. This sample of tweets was selected with a random number generator. The total number of likes or retweets each tweet received by health care professionals was also quantified to characterize the population of users interacting with published tweets. Users were categorized as health care professionals if their Twitter profile listed their profession or if they were listed as an employee on an institutional website. These individuals included physicians, nurses, physician assistants, nurse practitioners, speech-language pathologists, and audiologists.

Data analyses and descriptive statistics were performed using R version 3.6.2 software (Vienna, Austria). Difference in social media metrics were determined by the $\chi^2$ test.
Figure 1. Sample tweets demonstrating original content (A) targeted toward patients and contained no medical information (ie, uninformative), (B) targeted toward patients and directly containing medical information, (C) targeted toward medical professionals and uninformative, and (D) targeted toward medical professionals and directly containing medical information.

Results

Of the 121 ACGME-accredited residency programs, 35 (28.9%) had Twitter accounts (Table 1). Twenty-six (74.3%) of these were active during the study period. A total of 2526 tweets were published during the study period. Programs published a median of 69 tweets (IQR 34-157). Over half of the tweets (1330/2526, 52.65%) from the study period were written by four accounts (Vanderbilt University, University of Kansas, University of North Carolina, University of Nebraska). Tweets were retweeted a total of 14,970 times (range 0-2603; median 1, IQR 0-2) and liked 46,988 times (range 0-9014; median 4, IQR 1-8).
Table 1. Twitter metrics of programs that were active during the study period.

| Program                              | Twitter handle | Total number of tweets | Number of accounts following | Number of followers |
|--------------------------------------|----------------|------------------------|-----------------------------|---------------------|
| Baylor College of Medicine           | BCM_Oto        | 560                    | 340                         | 839                 |
| Cleveland Clinic                     | CCF_ent_program| 28                     | 12                          | 83                  |
| Duke University                      | Duke_Oto       | 155                    | 55                          | 150                 |
| Columbia University                  | ColumbiaOto    | 121                    | 611                         | 287                 |
| Georgetown University                | georgetownOTO  | 6                      | 147                         | 55                  |
| Henry Ford Hospital                  | henryfordent   | 94                     | 116                         | 51                  |
| Mayo Clinic (Rochester)              | MayoClinicENT  | 169                    | 312                         | 168                 |
| Medical College of Wisconsin         | Mcwent         | 155                    | 65                          | 491                 |
| Northwestern University              | NM_ENT         | 273                    | 208                         | 140                 |
| Penn State Health                    | WeAreOto       | 346                    | 476                         | 910                 |
| Southern Illinois University         | SIU_ENT        | 60                     | 58                          | 156                 |
| University of California, Davis      | UCDAVIS_OTOHNS | 211                    | 168                         | 412                 |
| University of Alabama                | UAB_OTO        | 287                    | 144                         | 244                 |
| University of Arizona                | UofAENT        | 246                    | 246                         | 471                 |
| University of Arkansas               | UAMS ENT       | 147                    | 9                           | 65                  |
| University of Florida                | UPOtolaryngolo1| 56                     | 28                          | 66                  |
| University of Kansas                 | KU_ENT         | 1291                   | 805                         | 1060                |
| University of Michigan               | UMichOto       | 1128                   | 186                         | 757                 |
| University of Minnesota              | ent_unm        | 88                     | 75                          | 326                 |
| University of Missouri               | MizzouENT      | 135                    | 20                          | 147                 |
| University of Nebraska               | EntUnmc        | 281                    | 514                         | 160                 |
| University of North Carolina         | unc_ent        | 484                    | 595                         | 995                 |
| University of Virginia               | uvaotohns      | 1356                   | 23                          | 712                 |
| Vanderbilt University                | vanderbiltENT  | 1990                   | 1697                        | 2099                |
| Washington University in St. Louis   | WUSTL_ENT      | 111                    | 125                         | 158                 |
| Yale                                 | Yale_ENT       | 101                    | 221                         | 166                 |

Residency program accounts published 1695/2526 (67.10%) tweets of original content, and the remaining 32.90% (831/2526) of tweets were retweets or republication of another user’s content. Original-content tweets were subsequently retweeted by other Twitter users 1362 times (range 0-15; median 0, IQR 0-1) and liked 6372 times (range 0-48; median 2, IQR 1-5). Medical professionals accounted for 1249/1362 (91.70%) of retweets and 5616/6372 (88.14%) of likes on original tweets. The majority of tweets (1283/1695, 75.69%) contained information targeted for health care workers, and included tweets describing recent publications, grand rounds, and new hires. The remaining 24.31% (412/1695) of tweets were targeted toward patients or the general public, and included tweets on recommended cancer screening protocols, patient testimonials, news stories, and cancer awareness months.

The majority of original tweets were uninformative and did not contain any medical information (1130/1695, 66.67%). Only 116 of original tweets (6.84%) directly contained medical information and an additional 449 tweets (26.49%) indirectly provided medical information by including links to external websites with medical information. Tweets targeted toward the general public were more likely to directly contain medical information (16.5% vs 3.7%, P<.001; relative risk [RR] 4.41, 95% CI 3.1-6.28). Conversely, tweets targeted toward physicians were more likely to be uninformative (74.4% vs 42.7%, P<.001; RR 1.74, 95% CI 1.55-1.96).

A random sample of 100 posts were analyzed to identify content themes (Table 2). Given that the largest sample of tweets (n=954) were targeted toward medical professionals and uninformative, these tweets were then coded into the identified themes. Trainees and education were the most common subject of these tweets, followed by participation at conferences and research publications.
In this study, we reviewed and analyzed the usage patterns of academic OHNS residency programs on Twitter. Thirty-five programs had accounts on Twitter at the time of this analysis, which represents more than double the 14 programs that were on Twitter in April 2017 [12]. Interestingly, 4 programs (11% of the programs on Twitter) were responsible for over half of the tweets produced in our 6-month study period. A recent investigation by the Pew Research Center found that the most active 10% of Twitter users produce 80% of all tweets [13]. These data are likely skewed by the number of inactive users or “bot” accounts (automated accounts that post content based on algorithms, as opposed to a human-run account). Although moderately imbalanced, the activity of the OHNS community is more equitable compared with the activity of the entire Twitter population. Approximately 25% of programs with Twitter accounts did not publish any tweets during the study period. It is possible that the individuals responsible for managing these accounts are no longer employed by the institutions, or perhaps the accounts have been neglected since their creation.

The current use of Twitter in the academic OHNS community is focused on intra and interprofessional communication. The content included in these tweets reflects topics of trainees and education, presentations at academic conferences, and research publications. These findings are consistent with previously published studies in other fields of medicine [6,7,14,15]. Medical professionals provided the majority of interactions with tweets by OHNS residency programs, accounting for 97.1% of retweets and 88.1% of likes. Even though approximately one-quarter of the tweets analyzed in this study were targeted toward patients and the general public, the overwhelming majority of interactions with the tweets were provided by healthcare professionals, suggesting that the general public is not interacting with the content that is curated for them. Additionally, very few of these tweets directly contained medical information that provides patient education. In a 2017 study, 43% of tweets by urology departments were directed at physicians [16], which was lower than the rate observed in this study for the OHNS community. This relationship may vary in each field of medicine, as Kloth et al [17] observed fewer interactions between pain patients and their providers on Twitter compared to oncology patients. These findings confirm that Twitter is not the currently preferred medium of communication for information dissemination to patients. The reason behind these patterns is unknown, although possible factors include patients preferring other online/social media platforms as medical resources, fear of misinformation, or personal privacy concerns. Future studies may focus on understanding patient preferences for the communication of medical information on social media.

Although Twitter does not seem to be a favorable network for patient communication, it efficiently serves as a professional networking medium. Twitter has been used to supplement academic conferences and disseminate information to a broader audience [18-20]. Moreover, maintaining an active social media presence to promote department activity may improve a department’s reputation. Both US News and World Report and Doximity ranking systems include program reputation [21,22], and have previously been associated with program social media presence in OHNS and other fields [12,20,23]. In a multi-institutional survey of surgeons, 70% indicated they believe that social media benefits professional development [24]. This may be of particular importance for women and
underrepresented minorities in medicine who face unique challenges in their academic careers, as Twitter provides a network of mentors and peers who may otherwise be inaccessible [25,26]. Moreover, these networks may be utilized by residency applicants to garner information about prospective programs, particularly as the COVID-19 pandemic has affected the residency application process [27-29]. Given the lack of away rotations or in-person interviews, students may be spending more time on social media searching for information compared to previous years. In a survey-based study, Oyewumi et al [30] reported that almost 60% of Canadian otolaryngologists utilize social media but most were unsure how to apply these tools to their practice. As our understanding of social media in medicine continues to develop, hospitals and OHNS departments may consider incorporating social media training into their educational curriculum to ensure that their health care providers are optimizing the use of these platforms.

Beyond Twitter, new social media platforms are constantly being developed and popularized, providing new methods to disseminate health information. For example, TikTok is an app that allows users to upload video clips up to 60 seconds long with music, text, and filters. A few physicians have turned to this platform, particularly targeting teenage populations, to provide health education and combat misinformation on topics such as birth control, vaping, and vaccination [31,32]. Additionally, there are patient-specific online networking sites such as PatientsLikeMe, which specifically attract patients with a common condition to connect with other individuals and gather information about their disease, available treatments, and treatment side effects [33,34]. Facebook groups have been shown to be useful platforms for patients with idiopathic subglottic stenosis to share resources, personal experiences, and emotional support [35]. These platforms highlight areas of information need, and may improve communication and information dissemination from health care providers. Social media platforms also hold promise to recruit patients for research endeavors [36].

**Limitations**

There are a few limitations to this study. Many individual otolaryngologists are active on Twitter; however, these accounts were not included in this analysis, as we focused on the activity of residency programs over individuals. Furthermore, private practice groups and academic institutions without residency programs were not included, and the content of their social media presence was not captured. To facilitate recruitment of medical students during the COVID-19 pandemic, some institutions have created separate, resident-led social media accounts distinct from preexisting departmental accounts, and these two groups have overlapping but separate target audiences. Patients may not be interested in the hobbies and social events of residents, whereas this is essential information for medical students. Conversely, departments may be able to advertise with testimonials or education materials to attract new patients. The data in this study were collected prior to the pandemic and, to our knowledge, no institutions had multiple Twitter accounts at the time of data analysis. However, future studies may consider how these groups utilize different social media platforms to effectively reach their target audience. When coding tweets based on theme, some tweets contained information that included more than one theme. For example, a tweet describing a resident’s presentation at a conference describes both a trainee and conference participation. Each tweet was ultimately coded to only one theme based on the primary message conveyed in the tweet, and this must be taken into account when interpreting the data. Finally, given the cross-sectional nature of this analysis, we were not able to assess any temporal changes in social media presence.

**Conclusion**

Social media is ubiquitous and presents a unique communication medium within the health care industry. The majority of Twitter usage by OHNS residency programs is for intra and interprofessional communication. Only a minority of tweets contain information geared toward the general public, highlighting that communication and information sharing with patients is not the current focus of OHNS residency programs on Twitter.

**Conflicts of Interest**

None declared.

**References**

1. Social Media Fact Sheet. Pew Research Center. 2019. URL: https://www.pewresearch.org/internet/fact-sheet/social-media/ [accessed 2020-04-05]
2. Redelmeier DA, Kraus NC. Patterns in patient access and utilization of online medical records: analysis of MyChart. J Med Internet Res 2018 Feb 06;20(2):e43 [FREE Full text] [doi: 10.2196/jmir.8372] [Medline: 29410386]
3. Plate JF, Ryan SP, Bergen MA, Hong CS, Attarian DE, Seyler TM. Utilization of an electronic patient portal following total joint arthroplasty does not decrease readmissions. J Arthroplasty 2019 Feb;34(2):211-214. [doi: 10.1016/j.arth.2018.11.002] [Medline: 30497899]
4. Gerber DE, Laccetti AL, Chen B, Yan J, Cai J, Gates S, et al. Predictors and intensity of online access to electronic medical records among patients with cancer. J Oncol Pract 2014 Sep;10(5):e307-e312 [FREE Full text] [doi: 10.1200/JOP.2013.001347] [Medline: 25006222]
5. Nikolian VC, Barrett M, Valbuena VS, Ibrahim AM, Eidy H, Ghandour MH, et al. Educational content and the use of social media at US departments of surgery. Surgery 2018 Feb;163(2):467-471. [doi: 10.1016/j.surg.2017.10.039] [Medline: 29241992]
6. Hill SS, Dore FJ, Em ST, McLoughlin RJ, Crawford AS, Sturrock PR, et al. Twitter use among departments of surgery with general surgery residency programs. J Surg Educ 2021;78(1):35-42. [doi: 10.1016/j.jsurg.2020.06.008] [Medline: 32631768]

7. Chandrasekar T, Goldberg H, Klaassen Z, Wallis CID, Leong JY, Liem S, et al. Twitter and academic urology in the United States and Canada: a comprehensive assessment of the Twitterverse in 2019. BJU Int 2020 Jan;125(1):173-181. [doi: 10.1111/bju.14920] [Medline: 31602782]

8. Chandawarkar AA, Gould DJ, Grant Stevens W. The top 100 social media influencers in plastic surgery on Twitter: who should you be following? Aesthet Surg J 2018 Jul 13;38(8):913-917. [doi: 10.1093/asjsfy/024] [Medline: 29518179]

9. Hairston TK, Links AR, Harris V, Tunkel DE, Walsh J, Beach MC, et al. Evaluation of parental perspectives and concerns about pediatric tonsillectomy in social media. JAMA Otolaryngol Head Neck Surg 2019 Jan 01;145(1):45-52 [FREE Full text] [doi: 10.1001/jamaoto.2018.2917] [Medline: 30452510]

10. Saxena RC, Lehmann AE, Hight AE, Darrow K, Remenschneider A, Kozin ED, et al. Social media utilization in the cochlear implant community. J Am Acad Audiol 2015 Mar;26(2):197-204 [FREE Full text] [doi: 10.3766/jaaa.26.2.8] [Medline: 25690778]

11. Crowson MG, Tucci DL, Kaylie D. Hearing loss on social media: Who is winning hearts and minds? Laryngoscope 2018 Jun;128(6):1453-1461. [doi: 10.1002/lary.26902] [Medline: 28988431]

12. Xie DX, Dedmon MM, O’Connell BP, Yawn RJ, Haynes DS. Evaluation of social media presence of otolaryngology residency programs in the United States. JAMA Otolaryngol Head Neck Surg 2018 Sep 01;144(9):802-806 [FREE Full text] [doi: 10.1001/jamaoto.2018.1447] [Medline: 30335882]

13. Gramlich J. 19 striking findings from 2019. Pew Research Center. 2019 Dec 13. URL: https://www.w2ogroup.com/world-report-2019-2020-best-hospitals/ [accessed 2020-04-05]

14. Coret M, Rok M, Newman J, Agzarian J, Finley C, et al. Twitter activity is associated with a higher research citation index for academic thoracic surgeons. Ann Thorac Surg 2020 Aug;110(2):660-663. [doi: 10.1016/j.athoracsur.2019.09.075] [Medline: 31756321]

15. Pershad Y, Hangge PT, Albadawi H, Oklu R. Social medicine: Twitter in healthcare. J Clin Med 2018 May 28;7(6):121 [FREE Full text] [doi: 10.3390/jcm7060121] [Medline: 29843360]

16. Ciprut S, Curnyn C, Davuluri M, Sternberg K, Loeb S. Twitter activity associated with U.S. news and world report reputation scores for urology departments. Urology 2017 Oct;108:11-16. [doi: 10.1016/j.urology.2017.05.051] [Medline: 28669746]

17. Kloth YM, Deutsch KM, Danielson KA, Strack J, Law C. What Twitter teaches us about patient-provider communication on pain. PLoS One 2019;14(2):e0226321 [FREE Full text] [doi: 10.1371/journal.pone.0226321] [Medline: 31877158]

18. Pemmaraju N, Mesa RA, Majhail NS, Thompson MA. The use and impact of Twitter at medical conferences: Best practices and Twitter etiquette. Semin Hematol 2017 Oct;54(4):184-188 [FREE Full text] [doi: 10.1053/j.seminhematol.2017.08.003] [Medline: 29153078]

19. Wilkinson SE, Basto MY, Perovic G, Lawrencewuck N, Murphy DG. The social medicine revolution is changing the conference experience: analytics and trends from eight international meetings. BJU Int 2015 May;115(5):839-846. [doi: 10.1111/bju.12910] [Medline: 26902269]

20. Chung A, Woo H. Twitter in urology and other surgical specialties at global conferences. ANZ J Surg 2016 Apr;86(4):224-227. [doi: 10.1111/ans.13393] [Medline: 26631323]

21. Olimsted M, Powell R, Murphy J, Bell D, Morley M, Stanley M. RTI International. 2019. URL: https://www.world-report-2019-20-best-hospitals/ [accessed 2020-04-05]

22. Residency Navigator 2019-2020. Doximity. 2019. URL: https://www.doximixty.com/residency [accessed 2020-04-05]

23. The social oncology report 2018. W2O Group. 2018 May 31. URL: https://www.w2ogroup.com/the-social-oncology-report-2018/ [accessed 2020-04-05]

24. Wagner JP, Cochran AL, Jones C, Gusani NJ, Varghese TK, Attai DJ. Professional use of social media among surgeons: results of a multi-institutional study. J Surg Res 2018 Jul;226:viii-xii. [doi: 10.1016/j.jss.2018.03.049] [Medline: 28964746]

25. Lewis JD, Fane KE, Ingraham AM, Khan A, Mills AM, Pitt SC, et al. Expanding opportunities for professional development: utilization of Twitter by early career women in academic medicine and science. JMR Med Educ 2018 Jul 23;4(2):e11140 [FREE Full text] [doi: 10.2196/11140] [Medline: 30037788]

26. Logghe HJ, Selby LV, Boeck MA, Stamp NL, Chuen J, Jones C. The academic tweet: Twitter as a tool to advance academic surgery. J Surg Res 2018 Jun;226:viii-xvii. [doi: 10.1016/j.jss.2018.03.049] [Medline: 29622401]

27. Xie DX, Hillel AT, Ward BK. Otolaryngology residency match during the COVID-19 pandemic: what happens next? JAMA Otolaryngol Head Neck Surg 2020 Aug 01;146(8):687-688. [doi: 10.1001/jamaoto.2020.1078] [Medline: 32496515]

28. Quesada PR, Solis RN, Diaz RC, Kraft SM. Otolaryngology residency application during the SARS-CoV-2 (COVID-19) pandemic. Otolaryngol Head Neck Surg 2020 Jul;163(1):89-90. [doi: 10.1177/0194599820925037] [Medline: 32366198]

29. Mecham JC, Menapace DC, Bowe SN, Carlson ML. Recruitment and networking with social media for the otolaryngology match in the COVID-19 pandemic. Otolaryngol Head Neck Surg 2021 Mar;164(3):545-546. [doi: 10.1177/0194599820957952] [Medline: 32870124]
30. Oyewumi M, Lee J, Vescan A. Social media in otolaryngology-head and neck surgery. Ear Nose Throat J 2017 Sep;96(9):E29-E33. [Medline: 28931200]

31. Farr C. Doctors go to TikTok to talk to teens about vaping, birth control and how celery juice won't cure cancer. CNBC. 2019 Nov 29. URL: https://www.cnbc.com/2019/11/29/doctors-use-tiktok-to-talk-to-teens-about-vaping-birth-control.html [accessed 2020-04-05]

32. Goldberg E. Doctors on TikTok try to go viral. New York Times. 2020 Jan 31. URL: https://www.nytimes.com/2020/01/31/health/tiktok-doctors-sex-ed.html [accessed 2020-04-05]

33. Rundle CW, Dellavalle RP. PatientsLikeMe and atopic dermatitis: characterizing the atopic dermatitis patient profile. Dermatol Online J 2018 Aug 15;24(8):13030/qt70k8c9jn [FREE Full text] [Medline: 30677844]

34. Wicks P, Mack Thorley E, Simacek K, Curran C, Emmas C. Scaling PatientsLikeMe via a “generalized platform” for members with chronic illness: web-based survey study of benefits arising. J Med Internet Res 2018 May 07;20(5):e175 [FREE Full text] [doi: 10.2196/jmir.9009] [Medline: 29735472]

35. Gelbard A, Francis DO, Sandulache VC, Simmons JC, Donovan DT, Ongkasuwan J. Causes and consequences of adult laryngotracheal stenosis. Laryngoscope 2015 May;125(5):1137-1143 [FREE Full text] [doi: 10.1002/lary.24956] [Medline: 25290987]

36. Bradley M, Braverman J, Harrington M, Wicks P. Patients’ motivations and interest in research: characteristics of volunteers for patient-led projects on PatientsLikeMe. Res Involv Engagem 2016;2:33 [FREE Full text] [doi: 10.1186/s40900-016-0047-6] [Medline: 29507767]

Abbreviations

ACGME: Accreditation Council for Graduate Medical Education

OHNS: otolaryngology-head and neck surgery

RR: relative risk

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