Abstract

Background: When this study began in 2018, I sought to determine the extent to which the top 50 schools of nursing were using hashtags that could attract attention from journalists on Twitter. In December 2020, the timeframe was expanded to encompass 2 more years of data, and an analysis was conducted of the types of hashtags used.

Objective: The study attempted to answer the following question: to what extent are top-ranked schools of nursing using hashtags that could attract attention from journalists, policy makers, and the public on Twitter?

Methods: In February 2018, 47 of the top 50 schools of nursing had public Twitter accounts. The most recent 3200 tweets were extracted from each account and analyzed. There were 31,762 tweets in the time period covered (September 29, 2016, through February 22, 2018). After 13,429 retweets were excluded, 18,333 tweets remained. In December 2020, 44 of the original 47 schools of nursing still had public Twitter accounts under the same name used in the first phase of the study. Three accounts that were no longer active were removed from the 2016-2018 data set, resulting in 16,939 tweets from 44 schools of nursing. The Twitter data for the 44 schools of nursing were obtained for the time period covered in the second phase of the study (February 23, 2018, through December 13, 2020), and the most recent 3200 tweets were extracted from each of the accounts. On excluding retweets, there were 40,368 tweets in the 2018-2020 data set. The 2016-2018 data set containing 16,939 tweets was merged with the 2018-2020 data set containing 40,368 tweets, resulting in 57,307 tweets in the 2016-2020 data set.

Results: Each hashtag used 100 times or more in the 2016-2020 data set was categorized as one of the following seven types: nursing, school, conference or tweet chat, health, illness/disease/condition, population, and something else. These types were then broken down into the following two categories: intercom hashtags and megaphone hashtags. Approximately 83% of the time, schools of nursing used intercom hashtags (inward-facing hashtags focused on in-group discussion within and about the profession). Schools of nursing rarely used outward-facing megaphone hashtags. There was no discernible shift in the way that schools of nursing used hashtags after the publication of The Woodhull Study Revisited.

Conclusions: Top schools of nursing use hashtags more like intercoms to communicate with other nurses rather than megaphones to invite attention from journalists, policy makers, and the public. If schools of nursing want the media to showcase their faculty members as experts, they need to increase their use of megaphone hashtags to connect the work of their faculty with topics of interest to the public.

(JMIR Nursing 2021;4(2):e25114) doi:10.2196/25114

KEYWORDS
Twitter; hashtag; nurses; media; intercom hashtag; megaphone hashtag
**Introduction**

Twitter is a microblogging website where users can post “tweets” (brief messages, images, and videos) to share with “followers” (people who have chosen to follow their Twitter account). Hashtags are words or phrases (without spaces) that are preceded by a pound sign (#) [1]. Hashtags first came into use on Twitter in 2007 when a user named Chris Messina put forward a proposal for “…improving contextualization, content filtering, and exploratory serendipity within Twitter” [2]. In his proposal, Messina wrote that his primary interest was “simply having a better eavesdropping experience on Twitter” [2]. In 2018, hashtags were widely used on Twitter to make tweets easy to find for other Twitter users interested in a given topic.

When the landmark Woodhull Study on Nursing and the Media was published in 1998, the voices and faces of nurses were found to be largely absent from news stories [3]. Mary Chaffee wrote that “[t]his lack of visibility limits nursing’s ability to communicate important health information, impedes nursing’s ability to define its role and contributions in the health care delivery system, and restricts nursing’s ability to advocate for health policy” [4]. Because Twitter was not launched until 8 years after the Woodhull Study was conducted, the researchers obviously could not look at Twitter data in their analysis. Shattell and Darmoc argue that nurses should consider using Twitter to make their “practical, real-life knowledge or…research findings or insights on current issues…available for the public” and to “harness attention from some more traditional media sources” [5]. While there is an abundance of research regarding the use of hashtags by health care professionals on Twitter [6-10], little is known about the ways in which schools of nursing used Twitter to invite attention from and engagement with journalists, policy makers, and the general public in the 2 years before The Woodhull Study Revisited was published in September 2018 and the 2 years after its publication. This study seeks to fill this gap.

When this study began in 2018 as a last-minute addition to The Woodhull Study Revisited, I sought to determine the extent to which the top 50 schools of nursing were using hashtags that could attract/invite attention from journalists on Twitter [11]. Preliminary findings using 2016-2018 data were intriguing but were not published with the rest of the results of The Woodhull Study Revisited [12]. In December 2020, the timeframe was expanded to encompass 2 more years of data so that before and after Woodhull Study Revisited analyses could be conducted. In addition, the scope was expanded to include an in-depth analysis of the types of hashtags used by schools of nursing. The resulting study is a comprehensive analysis of 4 years of tweets from the top 44 schools of nursing in the United States.

Methods have been described in detail using plain language so that researchers can easily replicate the study without needing specialized knowledge in natural language processing or machine learning. Democratizing Twitter analysis requires greater transparency regarding the methods used. As such, each table in this manuscript illustrates a step in the data analysis process that would otherwise be opaque to readers if the step was simply described in the narrative.

**Methods**

**Research Question**

The study sought to answer the following question: to what extent are top-ranked schools of nursing using hashtags that could attract/invite attention from journalists, policy makers, and the general public on Twitter? Below is a detailed description of the methods used for sampling, data collection, and data analysis.

**Sampling**

When this study began in February 2018, the sample of nursing schools was drawn from US News and World Report’s 2017 list of the top nursing schools with master’s degree programs. Fifty of the highest-ranked schools were selected from this list, with numerical rankings ranging from 1st to 48th (with several ties). The US News and World Report rankings were used as a mechanism for identifying the schools of nursing to include in this study with the knowledge that the rankings do not necessarily mean that the schools included at the top of the list are inherently “better” than the schools ranked lower. The decision to include the 50 highest-ranked schools of nursing in the sample was based on the fact that the US News and World Report rankings are the primary way that members of the media can quickly identify top schools of nursing nationally. The US News and World Report gets 7 million unique visitors to the education rankings and information webpages each month (US News and World Report, 2018).

In February 2018, of US News and World Report’s 50 top schools of nursing, two schools did not have a Twitter account and one school had a locked private Twitter account that was inaccessible to anyone other than those who were given permission by the school to follow the account. Thus, the school of nursing with the locked Twitter account and the two schools without a Twitter account were excluded from the 2016-2018 data set. The three schools omitted from the 2016-2018 data set are indicated in Table 1. In December 2020, when the second phase of this study was conducted, 44 of the original 47 schools of nursing still had public Twitter accounts under the same name used in the 2016-2018 data set. The three schools that no longer had a public Twitter account under the same name in 2020 are indicated in Table 1 and were omitted from both the 2016-2018 and 2018-2020 data sets for the sake of consistency.
Table 1. Sample composition.

| 2017 US News & World Report Rank | Name of the university               | Name of the school of nursing           | Official school Twitter account in February 2018 | Account status in December 2020 |
|----------------------------------|--------------------------------------|----------------------------------------|--------------------------------------------------|---------------------------------|
| #1                               | Duke University                      | School of Nursing                      | @DukeU_NursngSchl                                | Active                          |
| #2                               | Johns Hopkins University             | School of Nursing                      | @JHU_Nursing                                     | Active                          |
| #3                               | University of Pennsylvania           | Penn Nursing Science                   | @PennNursing                                     | Active                          |
| #4                               | Emory University                     | Nell Hodgson Woodruff School of Nursing| @EmoryNursing                                    | Active                          |
| #5                               | Ohio State University                | College of Nursing                     | @osunursing                                      | Active                          |
| #6 Tie                           | University of Washington             | School of Nursing                      | @UWSoN                                           | Active                          |
| #6 Tie                           | Yale University                      | School of Nursing                      | @YaleNursing                                     | Active                          |
| #8 Tie                           | Columbia University                  | School of Nursing                      | @CU_Nursing                                      | Inactive                        |
| #8 Tie                           | University of Pittsburgh             | School of Nursing                      | @UPittNursing                                    | Active                          |
| #10                              | University of Maryland–Baltimore      | School of Nursing                      | @MarylandNursing                                  | Active                          |
| #11 Tie                          | Case Western Reserve University      | Frances Payne Bolton School of Nursing | @fpbmnsing                                       | Active                          |
| #11 Tie                          | University of Michigan–Ann Arbor     | School of Nursing                      | @UMichNursing                                    | Active                          |
| #13 Tie                          | New York University (Meyers)          | Rory Myers College of Nursing          | @NYUNursing                                      | Active                          |
| #13 Tie                          | University of Alabama–Birmingham     | School of Nursing                      | @UABSON                                          | Active                          |
| #15 Tie                          | University of California Los Angeles | School of Nursing                      | @UCLANursing                                     | Active                          |
| #15 Tie                          | Vanderbilt University                | School of Nursing                      | @VanderbiltNurse                                  | Active                          |
| #17                              | University of North Carolina–Chapel Hill | School of Nursing                  | @UNCSON                                          | Active                          |
| #18                              | Rush University                      | College of Nursing                     | @RushUNursing                                    | Active                          |
| #19                              | University of Virginia               | School of Nursing                      | @UVASON                                          | Active                          |
| #20 Tie                          | Pennsylvania State University–Univer- | College of Nursing                     | @PSUNursing                                      | Active                          |
| #20 Tie                          |ity Park                            |                                        |                                                  |                                 |
| #20 Tie                          | Rutgers University–Newark            | School of Nursing                      | @RU_Nursing                                      | Active                          |
| #20 Tie                          | University of Illinois–Chicago       | College of Nursing                     | @UICnursing                                      | Active                          |
| #23 Tie                         | University of Iowa                   | College of Nursing                     | @UICollegeneF Nurs                                | Inactive                        |
| #23 Tie                         | University of Texas–Austin           | School of Nursing                      | @LonghornNursing                                  | Active                          |
| #23 Tie                         | University of Texas Health Science Center–Houston | School of Nursing                | No Twitter account found                          | N/A                             |
| #26 Tie                         | Medical University of South Carolina | College of Nursing                     | @MUSC_CON Locked account                         | N/A                             |
| #26 Tie                         | University of Colorado Anschutz Med- | College of Nursing                     | @NursingCU                                        | Active                          |
| #28 Tie                         | Georgetown University               | School of Nursing and Health Studies   | @GtownNHS                                         | Active                          |
| #28 Tie                         | Indiana University–Purdue University–Indianapolis | School of Nursing            | @IUSONIndy                                        | Active                          |
| #28 Tie                         | University of San Diego              | Hahn School of Nursing and Health Sci- | No Twitter account found                          | N/A                             |
| #31 Tie                         | Arizona State University             | College of Nursing and Health Innov-   | @asunursing                                       | Active                          |
| #31 Tie                         | Boston College                      | Connell School of Nursing              | @BC_CSON                                         | Active                          |
| #31 Tie                         | The Catholic University of America   | School of Nursing                      | @CUANursing                                       | Active                          |
| 2017 US News & World Report Rank | Name of the university          | Name of the school of nursing | Official school Twitter account in February 2018 | Account status in December 2020 |
|----------------------------------|---------------------------------|------------------------------|-----------------------------------------------|-------------------------------|
| #31 Tie                          | George Washington University    | School of Nursing            | @GWNursing                                    | Active                        |
| #31 Tie                          | University of Utah              | College of Nursing           | @uofunursing                                   | Active                        |
| #36 Tie                          | Oregon Health and Science University | School of Nursing         | @OHSUNursing                                   | Active                        |
| #36 Tie                          | University of Rochester         | School of Nursing            | @UofRSON                                      | Active                        |
| #38 Tie                          | University of Cincinnati        | College of Nursing           | @UCursing                                      | Active                        |
| #38 Tie                          | University of Miami             | School of Nursing and Health Studies | @UMiamiNursing                              | Active                        |
| #38 Tie                          | University of Missouri          | Sinclair School of Nursing    | @MizzouNursing                                 | Active                        |
| #41 Tie                          | University of Arizona           | College of Nursing           | @UACONF                                      | Inactive                      |
| #41 Tie                          | Washington State University     | College of Nursing           | @WSUNursing                                   | Active                        |
| #43 Tie                          | University of Connecticut       | School of Nursing            | @UConnNursing                                  | Active                        |
| #43 Tie                          | University of Missouri–Kansas City | School of Nursing and Health Studies | @UMKCsoNHS                                    | Active                        |
| #45 Tie                          | Florida Atlantic University (Lynn) | Christine E. Lynn College of Nursing | @faunursing                                   | Active                        |
| #45 Tie                          | University of Massachusetts–Amherst | College of Nursing           | @UMAnursing                                   | Active                        |
| #48 Tie                          | University of Alabama           | Capstone College of Nursing   | @uaccn                                        | Active                        |
| #48 Tie                          | University of Tennessee–Knoxville | College of Nursing           | @utknursing                                   | Active                        |
| #48 Tie                          | Virginia Commonwealth University | School of Nursing            | @VCUNursing                                   | Active                        |
| #48 Tie                          | Wayne State University          | College of Nursing           | @WSUCoN                                       | Active                        |

* aSchools that no longer had a public Twitter account under the same name in 2020.

* bSchools omitted from the 2016-2018 data set.

* cN/A: not applicable.

**Data Collection**

Data collection was conducted twice during this study. In February 2018, a list of the top 50 schools of nursing was matched with publicly accessible Twitter accounts and then a data request was submitted to Export Tweet for the most recent 3200 tweets from each of the top-ranked schools of nursing. Because schools of nursing tweet with varying frequency, the past 3200 tweets for any given school of nursing covered a wide array of time frames. At one end of the spectrum, there were five schools of nursing, including Vanderbilt University, Johns Hopkins University, University of Michigan–Ann Arbor, Boston College, and University of Pennsylvania, for whom the oldest tweet in the data set was from 2016. At the other end of the spectrum, there were five schools of nursing, including University of Virginia, Yale University, Case Western Reserve University, University of Utah, and University of North Carolina–Chapel Hill, for whom the oldest tweet was from early 2009. Table 2 lists the oldest tweet in the data set from each school, with schools of nursing listed in order of their oldest tweet in the data set.
| Name of the university                                      | Official school Twitter account | Date of the oldest tweet in the 2016-2018 data set |
|-------------------------------------------------------------|---------------------------------|--------------------------------------------------|
| University of Virginia                                     | @UVASON                         | March 02, 2009                                   |
| Yale University                                             | @YaleNursing                    | March 10, 2009                                   |
| Case Western Reserve University                             | @fpbnursing                     | March 12, 2009                                   |
| University of Utah                                          | @uofunursing                    | May 5, 2009                                      |
| University of North Carolina–Chapel Hill                    | @UNCSON                         | May 7, 2009                                      |
| University of California Los Angeles                        | @UCLANursing                    | August 7, 2009                                   |
| New York University (Meyers)                                | @NYUNursing                     | October 27, 2009                                 |
| University of Missouri–Kansas City                          | @UMKCSoNHS                      | December 07, 2009                                |
| University of Illinois–Chicago                              | @UICrnsing                      | January 4, 2010                                  |
| Arizona State University                                    | @asunursing                     | January 19, 2010                                 |
| Washington State University                                 | @WSUNursing                     | January 29, 2010                                 |
| Florida Atlantic University (Lynn)                          | @faunursing                     | April 22, 2010                                   |
| University of Miami                                         | @UMiamiNursing                  | April 30, 2010                                   |
| George Washington University                                 | @GW Nursing                     | September 29, 2010                               |
| University of Alabama–Birmingham                            | @UABSON                         | May 12, 2011                                     |
| Wayne State University                                      | @WSUCoN                         | June 21, 2011                                    |
| Indiana University–Purdue University–Indianapolis            | @IUSONIndy                      | July 13, 2011                                    |
| University of Washington                                    | @UWSon                          | July 26, 2011                                    |
| Emory University                                            | @EmoryNursing                   | February 10, 2012                                |
| Oregon Health and Science University                        | @OHSU Nursing                   | February 18, 2012                                |
| Georgetown University                                       | @GtownNHS                       | March 12, 2012                                   |
| Ohio State University                                       | @osunursing                     | April 12, 2012                                   |
| University of Alabama                                       | @uaccn                          | April 24, 2012                                   |
| Duke University                                             | @DukeU_NrsngSchl                | May 11, 2012                                     |
| University of Massachusetts–Amherst                         | @UMAnursing                     | June 12, 2012                                    |
| University of Tennessee–Knoxville                           | @utknursing                     | July 17, 2012                                    |
| Rush University                                             | @RushUNursing                   | July 27, 2012                                    |
| University of Maryland–Baltimore                            | @MarylandNursing                | August 10, 2012                                  |
| University of Missouri                                       | @MizzouNursing                  | May 13, 2013                                     |
| University of Rochester                                     | @UoRSON                         | October 28, 2013                                 |
| University of Colorado Anschutz Medical Campus              | @NursingCU                      | February 28, 2014                                |
| University of Pittsburgh                                     | @UPitNursing                    | March 18, 2014                                   |
| Rutgers University–Newark                                    | @RU_Nursing                     | April 30, 2014                                   |
| University of Cincinnati                                    | @UCnursing                      | June 17, 2014                                    |
| Pennsylvania State University–University Park                | @PSUNursing                     | October 23, 2014                                 |
| University of Connecticut                                    | @UConnNursing                   | November 30, 2014                                |
| Virginia Commonwealth University                             | @VCUNursing                     | January 27, 2015                                 |
| University of Texas–Austin                                  | @LonghornsNursing               | April 9, 2015                                    |
| The Catholic University of America                          | @CUANursing                     | April 10, 2015                                   |
| University of Pennsylvania                                   | @PennNursing                    | March 24, 2016                                   |
| Boston College                                              | @BC_CSON                        | April 7, 2016                                    |
Table 2 was used to determine the most recent “oldest tweet” date in the 2016-2018 data set. The @VanderbiltNurse Twitter account had the most recent “oldest tweet” (September 29, 2016), so September 29, 2016, was selected as the start date for the analysis. This meant that the time period to be covered in the 2016-2018 data set would be September 29, 2016, through February 22, 2018. Tweets with dates older than September 29, 2016, were filtered out from the data set, resulting in 16,939 tweets for the 2016-2018 data set. Table 3 describes the composition of the final 2016-2018 data set, with schools listed in alphabetical order by Twitter account name.

| Name of the university                  | Official school Twitter account | Date of the oldest tweet in the 2016-2018 data set |
|----------------------------------------|---------------------------------|-----------------------------------------------|
| University of Michigan–Ann Arbor       | @UMichNursing                   | June 16, 2016                                 |
| Johns Hopkins University               | @JHUNursing                     | July 22, 2016                                 |
| Vanderbilt University                  | @VanderbiltNurse                | September 29, 2016                            |
Table 3. Composition of the 2016-2018 data set.

| Name of the university                                      | Official school Twitter account | Number of tweets |
|-------------------------------------------------------------|---------------------------------|------------------|
| Arizona State University                                   | @asunursing                     | 430              |
| Boston College                                             | @BC_CSON                        | 138              |
| The Catholic University of America                         | @CUANursing                     | 7                |
| Duke University                                            | @DukeU_NrsngSchl                 | 415              |
| Emory University                                           | @EmoryNursing                   | 437              |
| Florida Atlantic University (Lynn)                         | @faunursing                     | 303              |
| Case Western Reserve University                            | @fpbnursing                     | 159              |
| Georgetown University                                      | @GtownNHS                       | 257              |
| George Washington University                               | @GWUNursing                     | 883              |
| Indiana University-Purdue University–Indianapolis          | @IUSONIndy                      | 251              |
| Johns Hopkins University                                   | @JHUNursing                     | 1992             |
| University of Texas–Austin                                | @LonghornNursing                | 545              |
| University of Maryland–Baltimore                           | @MarylandNursing                | 738              |
| University of Missouri                                     | @MizzouNursing                  | 49               |
| University of Colorado Anschutz Medical Campus             | @NursingCU                      | 206              |
| New York University (Meyers)                               | @NYUNursing                     | 184              |
| Oregon Health and Science University                       | @OHSUNursing                    | 312              |
| Ohio State University                                      | @osunursing                     | 949              |
| University of Pennsylvania                                 | @PennNursing                    | 1342             |
| Pennsylvania State University–University Park              | @PSUNursing                     | 94               |
| Rutgers University–Newark                                   | @RU_Nursing                     | 88               |
| Rush University                                            | @RushUNursing                   | 191              |
| University of Alabama–Birmingham                           | @UABSON                         | 390              |
| University of Alabama                                      | @uaccn                          | 166              |
| University of California–Los Angeles                       | @UCLANursing                    | 99               |
| University of Cincinnati                                   | @UCnursing                      | 318              |
| University of Connecticut                                  | @UConnNursing                   | 20               |
| University of Illinois–Chicago                             | @UICnursing                     | 124              |
| University of Massachusetts–Amherst                        | @UMAnursing                     | 38               |
| University of Miami                                        | @UMiamiNursing                  | 39               |
| University of Michigan–Ann Arbor                           | @UMichNursing                   | 942              |
| University of Missouri–Kansas City                         | @UMKCSoNHS                      | 31               |
| University of North Carolina–Chapel Hill                   | @UNCSON                         | 80               |
| University of Rochester                                    | @UofRSON                        | 587              |
| University of Utah                                         | @uofunursing                    | 138              |
| University of Pittsburgh                                    | @UPittNursing                   | 179              |
| University of Tennessee–Knoxville                          | @utknursing                     | 208              |
| University of Virginia                                     | @UVASON                         | 120              |
| University of Washington                                   | @UWSoN                          | 152              |
| Vanderbilt University                                      | @VanderbiltNurse                | 2692             |
| Virginia Commonwealth University                            | @VCUNursing                     | 107              |
| Wayne State University                                     | @WSUCoN                         | 42               |
During phase two of the study, a data request was submitted to Vicinitas for all tweets from February 23, 2018, through December 13, 2020, from the 44 still-active Twitter accounts. Tweets prior to February 23, 2018, were deleted from the data set. Table 4 lists the oldest tweet in the 2018-2020 data set from each school, along with the number of tweets per school.

| Name of the university         | Official school Twitter account | Number of tweets |
|--------------------------------|---------------------------------|-----------------|
| Washington State University    | @WSUNursing                     | 265             |
| Yale University                | @YaleNursing                    | 232             |
Table 4. Oldest tweet and total tweets from each school in the 2018-2020 data set.

| Name of the university                                             | Official school Twitter account | Oldest tweet date | Total number of tweets |
|-------------------------------------------------------------------|---------------------------------|------------------|------------------------|
| University of Virginia                                           | @UVASON                         | February 28, 2018 | 914                    |
| Yale University                                                   | @YaleNursing                    | February 23, 2018 | 550                    |
| Case Western Reserve University                                   | @fpbnursing                     | February 23, 2018 | 701                    |
| University of Utah                                                | @uofunursing                    | February 23, 2018 | 707                    |
| University of North Carolina–Chapel Hill                         | @UNCCSON                        | February 23, 2018 | 396                    |
| University of California–Los Angeles                             | @UCLANursing                    | February 28, 2018 | 446                    |
| New York University (Meyers)                                      | @NYUNursing                     | February 23, 2018 | 655                    |
| University of Missouri–Kansas City                                | @UMKCSoNHS                      | March 1, 2018     | 105                    |
| University of Illinois–Chicago                                    | @UICnursing                     | February 27, 2018 | 523                    |
| Arizona State University                                          | @asunursing                     | February 23, 2018 | 1943                   |
| Washington State University                                      | @WSUNursing                     | February 23, 2018 | 504                    |
| Florida Atlantic University (Lynn)                                | @faunursing                     | February 23, 2018 | 565                    |
| University of Miami                                               | @UMiamiNursing                  | February 27, 2018 | 445                    |
| George Washington University                                      | @GWNursing                      | February 23, 2018 | 2056                   |
| University of Alabama–Birmingham                                  | @UABSON                         | February 28, 2018 | 990                    |
| Wayne State University                                            | @WSUCoN                         | February 27, 2018 | 141                    |
| Indiana University-Purdue University–Indianapolis                 | @IUSONIndy                      | February 25, 2018 | 445                    |
| University of Washington                                          | @UWSoN                          | February 23, 2018 | 822                    |
| Emory University                                                  | @EmoryNursing                   | February 23, 2018 | 859                    |
| Oregon Health and Science University                              | @OHSUNursing                    | February 23, 2018 | 375                    |
| Georgetown University                                            | @GtownNHS                       | February 23, 2018 | 961                    |
| Ohio State University                                            | @osunursing                     | February 23, 2018 | 1927                   |
| University of Alabama                                             | @uaccn                          | March 1, 2018     | 210                    |
| Duke University                                                   | @DukeU_NrsngSchl                | February 23, 2018 | 900                    |
| University of Massachusetts–Amherst                              | @UMAnursing                     | April 27, 2018    | 53                     |
| University of Tennessee–Knoxville                                | @utk nursing                    | February 23, 2018 | 577                    |
| Rush University                                                   | @RushUNursing                   | March 1, 2018     | 334                    |
| University of Maryland–Knoxville                                 | @MarylandNursing                | February 26, 2018 | 1348                   |
| University of Missouri                                            | @MizzouNursing                  | February 26, 2018 | 258                    |
| University of Rochester                                           | @UofRSON                        | February 23, 2018 | 558                    |
| University of Colorado Anschutz Medical Campus                    | @NursingCU                      | February 23, 2018 | 595                    |
| University of Pittsburgh                                          | @UPittNursing                   | February 23, 2018 | 400                    |
| Rutgers University–Newark                                          | @RU_Nursing                     | February 27, 2018 | 462                    |
| University of Cincinnati                                         | @UCnursing                      | February 24, 2018 | 509                    |
| Pennsylvania State University–University Park                     | @PSUNursing                     | February 23, 2018 | 600                    |
| University of Connecticut                                        | @UConnNursing                   | February 27, 2018 | 136                    |
| Virginia Commonwealth University                                  | @VCUNursing                     | February 26, 2018 | 240                    |
| University of Texas–Austin                                       | @LonghornNursing                | February 25, 2018 | 795                    |
| The Catholic University of America                               | @CUANursing                     | March 9, 2018     | 1                      |
| University of Pennsylvania                                       | @PennNursing                    | February 23, 2018 | 2357                   |
| Boston College                                                    | @BC_CSON                        | February 23, 2018 | 281                    |
| University of Michigan–Ann Arbor                                  | @UMichNursing                   | February 23, 2018 | 1435                   |
After cleaning the data, the 2016-2018 and 2018-2020 data sets were merged into a single data set containing 57,307 tweets. Table 5 describes the composition of the new 2016-2020 data set, with schools listed in alphabetical order by Twitter account name.

In December 2020, the original list of 47 schools of nursing was matched with publicly accessible Twitter accounts. Of the original 47 schools of nursing, 44 still had public Twitter accounts under the same name used in the first part of the study. The three Twitter accounts that were no longer active (@UICollegeofNurs, @UACON, and @CU_Nursing) were removed from the original data set, resulting in a data set containing 16,939 tweets from 44 top-ranked schools of nursing. The most recent 3200 tweets from each of the Twitter accounts were extracted and analyzed. Excluding retweets, there were 40,368 tweets for the time period covered (February 23, 2018, through December 13, 2020). These 40,368 tweets were added to the data set, resulting in a data set containing 57,307 tweets from September 29, 2016, through December 13, 2020.
### Table 5. Composition of the final 2016-2020 data set.

| Name of the university                                  | Official school Twitter account | Number of tweets in the 2016-2018 data set | Number of tweets in the 2018-2020 data set | Total number of tweets in the 2016-2020 data set |
|---------------------------------------------------------|---------------------------------|-------------------------------------------|-------------------------------------------|-----------------------------------------------|
| Arizona State University                                | @asunursing                     | 430                                       | 1943                                      | 2373                                          |
| Boston College                                          | @BC_CSON                       | 138                                       | 281                                       | 419                                           |
| The Catholic University of America                     | @CUANursing                     | 7                                        | 701                                       | 708                                           |
| Duke University                                         | @DukeU_NrsngSchl                | 415                                       | 900                                       | 1315                                          |
| Emory University                                        | @EmoryNursing                   | 437                                       | 859                                       | 1296                                          |
| Florida Atlantic University (Lynn)                      | @faunursing                     | 303                                       | 565                                       | 868                                           |
| Case Western Reserve University                         | @fpbnursing                     | 159                                       | 2056                                      | 2215                                          |
| Georgetown University                                  | @GtownNHS                       | 257                                       | 961                                       | 1218                                          |
| George Washington University                            | @GWNursing                      | 883                                       | 445                                       | 1328                                          |
| Indiana University-Purdue University–Indianapolis       | @IUSONIndy                      | 251                                       | 6570                                      | 6821                                          |
| Johns Hopkins University                                | @JHUNursing                     | 1992                                      | 655                                       | 2647                                          |
| University of Texas–Austin                             | @LonghornNursing                | 545                                       | 1927                                      | 2472                                          |
| University of Maryland–Baltimore                        | @MarylandNursing                | 738                                       | 375                                       | 1113                                          |
| University of Missouri                                  | @MizzouNursing                  | 49                                        | 600                                       | 649                                           |
| University of Colorado Anschutz Medical Campus          | @NursingCU                      | 206                                       | 334                                       | 540                                           |
| New York University (Meyers)                            | @NYUNursing                     | 184                                       | 462                                       | 646                                           |
| Ohio State University                                  | @osunursing                     | 949                                       | 210                                       | 1159                                          |
| University of Pennsylvania                             | @PennNursing                    | 1342                                      | 990                                       | 2332                                          |
| Pennsylvania State University–University Park           | @PSUNursing                     | 94                                        | 446                                       | 540                                           |
| Rutgers University–Newark                                | @RU_Nursing                     | 88                                        | 509                                       | 597                                           |
| Rush University                                         | @RushU Nursing                  | 191                                       | 595                                       | 786                                           |
| University of Alabama–Birmingham                        | @UABSON                         | 390                                       | 136                                       | 526                                           |
| University of Alabama                                   | @uaccn                          | 166                                       | 523                                       | 689                                           |
| University of California–Los Angeles                   | @UCLANursing                    | 99                                        | 1348                                      | 1447                                          |
| University of Cincinnati                                | @UCnursing                      | 318                                       | 53                                        | 371                                           |
| University of Connecticut                               | @UConnNursing                   | 20                                        | 445                                       | 465                                           |
| University of Illinois–Chicago                          | @UIcNursing                     | 124                                       | 1435                                      | 1559                                          |
| University of Massachusetts–Amherst                     | @UMANursing                     | 38                                        | 258                                       | 296                                           |
| University of Miami                                     | @UMiamiNursing                  | 39                                        | 105                                       | 144                                           |
| University of Michigan–Ann Arbor                        | @UMichNursing                   | 942                                       | 396                                       | 1338                                          |
| University of Missouri–Kansas City                      | @UMKcSoNHS                      | 31                                        | 2357                                      | 2388                                          |
| University of North Carolina–Chapel Hill                | @UNCSON                         | 80                                        | 400                                       | 480                                           |
| University of Rochester                                 | @UoRSON                         | 587                                       | 558                                       | 1145                                          |
| University of Utah                                      | @uofunursing                    | 138                                       | 577                                       | 715                                           |
| University of Pittsburgh                                | @UPittNursing                   | 179                                       | 795                                       | 974                                           |
| University of Tennessee–Knoxville                       | @utknursing                     | 208                                       | 707                                       | 915                                           |
| University of Virginia                                  | @UVASON                         | 120                                       | 914                                       | 1034                                          |
| University of Washington                                | @UWSoN                          | 152                                       | 822                                       | 974                                           |
| Vanderbilt University                                   | @VanderbiltNurse                | 2692                                      | 4719                                      | 7411                                          |
| Virginia Commonwealth University                        | @VCUNursing                     | 107                                       | 240                                       | 347                                           |
Data Analysis

The analyses in this study were conducted using R version 4.0.3 (Bunny-Wunnies Freak Out), R Studio Version 1.3.1093, and Microsoft Excel for Mac Version 16.43. The following are the steps taken to generate a list of the most frequently used hashtags in the 2016-2020 data set, along with the number of times each hashtag appeared. Initially, the Excel file was uploaded to R software. The R Markdown package was installed, and the elements of Van Horn and Beveridge coding were used [13].

The text strings in the data set were cleaned. The character encoding in tweets was homogenized to remove the strings of nonsense characters indicating the presence of emojis in the source tweets. This converted character encoding to Unicode UTF-8. Thereafter, capitalization in tweets was removed by turning everything into lowercase. Subsequently, extra whitespace and URLs were removed from the tweets. Once the text strings were cleaned, the hashtags present in the data set were identified and a list of the hashtags from most to least frequently used was generated. The data frame generated in R was exported to Excel, with hashtags listed in one column and their frequency in another. The corresponding script in R has been provided in Multimedia Appendix 1 so that readers can replicate the analysis.

Results

There were 6866 different hashtags used in the 2016-2020 data set. All hashtags that had been used 100 times or more across the entire corpus of tweets in the data set were identified, and these 71 hashtags were characterized as being those with the highest frequency of use by the schools of nursing in the study. These 71 hashtags were used a total of 26,243 times in the 2016-2020 data set, as detailed in Table 6. Among the 6866 different hashtags appearing in the 2016-2020 data set, 3774 were used only once and 6178 were used 10 or fewer times.
Table 6. Hashtags used 100 times or more in the 2016-2020 data set.

| Hashtag                  | Number of times used |
|--------------------------|----------------------|
| #nursing                 | 3259                 |
| #pennnursing             | 1980                 |
| #healthcare              | 1265                 |
| #gwu                     | 1192                 |
| #nurses                  | 991                  |
| #covid19                 | 895                  |
| #umson                   | 887                  |
| #nurse                   | 857                  |
| #jhson                   | 606                  |
| #conhi                   | 587                  |
| #nursingschool           | 565                  |
| #dnp                     | 535                  |
| #vandygram               | 452                  |
| #nursesweek              | 451                  |
| #emorynursing            | 444                  |
| #bsn                     | 442                  |
| #canenurse               | 419                  |
| #uabson                  | 374                  |
| #npslead                 | 372                  |
| #msn                     | 358                  |
| #umichnursing            | 353                  |
| #tbt                     | 348                  |
| #pennnursinginnovation   | 347                  |
| #volnurse                | 335                  |
| #simulation              | 287                  |
| #fpbnursing              | 279                  |
| #phd                     | 260                  |
| #runursing               | 247                  |
| #gocougs                 | 245                  |
| #raisehigh               | 232                  |
| #research                | 230                  |
| #icymi                   | 226                  |
| #up                      | 218                  |
| #cunursing               | 215                  |
| #vusn                    | 215                  |
| #health                  | 210                  |
| #hiv                     | 205                  |
| #mentalhealth            | 204                  |
| #buckeyenurses           | 200                  |
| #nursepractitioner       | 199                  |
| #virginia                | 196                  |
| #yearofthenurse          | 185                  |
When the data set was divided into two parts to detect changes in the use of hashtags by schools of nursing after the results of The Woodhull Study Revisited were published, the findings were similar to those of the analysis of the data set as a whole. There were 27 hashtags that had been used 100 times or more in the September 29, 2016, to September 27, 2018, data set. Among the 3307 different hashtags appearing in this data set, 1806 (54.6%) were used only once and 3028 (91.6%) were used 10 or fewer times. In comparison, there were 47 hashtags that had been used 100 times or more in the September 28, 2018, to December 13, 2020, data set. Among the 4812 different hashtags appearing in this data set, 2716 (56.4%) were used only once and 4350 (90.4%) were used 10 or fewer times. Tables 7 and 8 provide details on the hashtags used 100 times or more during each time period.
Table 7. Hashtags used 100 times or more before *The Woodhull Study Revisited*.

| Top hashtags (September 29, 2016-September 27, 2018) | Number of times used |
|--------------------------------------------------|----------------------|
| #nursing                                         | 1671                 |
| #pennnursing                                     | 1017                 |
| #gwu                                             | 671                  |
| #umson                                           | 530                  |
| #healthcare                                      | 516                  |
| #nurses                                          | 507                  |
| #nurse                                           | 409                  |
| #jhson                                           | 402                  |
| #conhi                                           | 393                  |
| #emorynursing                                    | 252                  |
| #nursingschool                                   | 243                  |
| #bsn                                             | 232                  |
| #nursesweek                                      | 227                  |
| #tbt                                             | 205                  |
| #buckeyenurses                                   | 177                  |
| #dnp                                             | 164                  |
| #volnurse                                        | 156                  |
| #amrchat                                         | 154                  |
| #icowhi16                                        | 144                  |
| #jhuson                                          | 143                  |
| #research                                        | 136                  |
| #buckeyenurse                                    | 133                  |
| #health                                          | 128                  |
| #canenurse                                       | 111                  |
| #wegotthis                                       | 109                  |
| #cunursing                                       | 106                  |
| #virginia                                        | 104                  |
Table 8. Hashtags used 100 times or more after The Woodhull Study Revisited.

| Top hashtags (September 28, 2018-December 13, 2020) | Number of times used |
|-------------------------------------------------|----------------------|
| #nursing                                        | 1588                 |
| #pennnursing                                    | 963                  |
| #covid19                                        | 895                  |
| #healthcare                                     | 749                  |
| #gwu                                            | 521                  |
| #nurses                                         | 483                  |
| #vandygram                                      | 449                  |
| #nurse                                          | 448                  |
| #dnp                                            | 371                  |
| #unson                                          | 357                  |
| #umichnursing                                   | 353                  |
| #npslead                                        | 350                  |
| #nursingschool                                  | 322                  |
| #uabson                                         | 313                  |
| #canenurse                                      | 308                  |
| #msn                                            | 275                  |
| #pennnursinginnovation                          | 264                  |
| #simulation                                     | 229                  |
| #raisehigh                                      | 228                  |
| #nursesweek                                     | 224                  |
| #bsn                                            | 210                  |
| #phd                                            | 205                  |
| #jhson                                          | 204                  |
| #conhi                                          | 194                  |
| #emorynursing                                   | 192                  |
| #yearofthenurse                                 | 185                  |
| #fpbnursing                                     | 182                  |
| #volnurse                                       | 179                  |
| #runursing                                      | 177                  |
| #vusn                                           | 171                  |
| #gocougs                                        | 163                  |
| #gohopnurse                                     | 161                  |
| #nashville                                      | 161                  |
| #mentalhealth                                   | 151                  |
| #tbt                                            | 143                  |
| #np                                             | 141                  |
| #fau                                            | 132                  |
| #icymi                                          | 129                  |
| #nursepractitioner                              | 128                  |
| #menin nursing                                  | 127                  |
| #abcj19                                         | 118                  |
| #hiv                                            | 115                  |
Typology of Frequently Used Hashtags

Using Excel, a thematic analysis was conducted of the hashtags that were used 100 times or more in the 2016-2020 data set. Collectively, the 71 hashtags were used a total of 26,243 times. To conduct the thematic analysis, the list of 71 frequently used hashtags was considered and similarities were assessed. As similarities were identified, the hashtags were grouped into categories, and this process of coding (and recoding) hashtags was continued until there were six categories that explained the vast majority of the hashtags. A seventh category was added to capture the assortment of hashtags that did not lend themselves to categorization. The following seven types of hashtags emerged during the process of thematic analysis: (1) Nursing, hashtags about nurses, nursing, nursing degrees, nursing licenses, etc; (2) Schools, hashtags about universities, schools, colleges, mascots, or locations; (3) Illness/disease/condition, hashtags about illnesses, diseases, conditions, or awareness day/month; (4) Population, hashtags about populations that nurses serve; (5) Health, hashtags about health care, health, global health, etc; (6) Conference or tweet chat, hashtags about conferences or specific Twitter chats for health care professionals; (7) Something else, hashtags that did not fit into one of the other six categories. Table 9 lists the hashtags contained in each of the seven categories.

Table 9. Hashtag typology of the 2016-2020 data set.

| Category | Description of the category | Hashtags | Number of times used |
|----------|-----------------------------|----------|----------------------|
| Nursing  | About nurses, nursing, nursing degrees, nursing licenses, etc | #bsn, #dnp, #meninnursing, #msn, #nationalnursesweek, #np, #npnurse, #npweek, #nurse, #nurseleader, #nursepractitioner, #nurses, #nursesweek, #nursing, #nursingresearch, #nursingschool, #nursingstudent, #phd, #prerequisites, #simulation, and #yearofthenurse | 9810 |
| Schools  | About universities, schools, colleges, mascots, or locations | #bestgradschools, #buckeyenurse, #buckeyenurses, #canenurse, #cunursing, #cwru, #emorynursing, #fau, #fkmnursing, #gocougs, #gohopnurse, #gohopnurses, #gohopnurses, #jhson, #jhson, #nashville, #nyu, #pennnursing, #pennnursinginnovation, #raisigh, #runursing, #uabson, #uiuc, #umich, #umichnursing, #umson, #uofunursing, #vandygram, #virginia, #volnurse, and #vusn | 10,974 |
| Illness/disease/condition | About illnesses, diseases, conditions, or awareness day/month | #covid19, #hiv, and #opioid | 1211 |
| Population | About populations that nurses serve | #veterans | 170 |
| Health | About health care, health, global health, etc | #globalhealth, #health, #healthcare, and #mentalhealth | 1801 |
| Conference or tweet chat | About conferences or specific Twitter chats for health care professionals | #abcj19, #amarchat, #conhi, and #icowhi16 | 1003 |
| Something else | Hashtags that did not fit into one of the other six categories | #givingtuesday, #igyymi, #innovation, #research, #ibt, and #wegotthis | 1274 |

For the purposes of this study, the seven types of hashtags were considered to be either inward facing (“intercom hashtags”) or outward facing (“megaphone hashtags”). Intercom hashtags were those intended to invite attention from/interaction with nurses, members of the university/school community, or attendees at a nursing conference or Twitter chat. Megaphone hashtags were those intended to invite attention from/interaction with people such as journalists, policymakers, and the general public. The intercom hashtag types were as follows: nursing (hashtags about nurses, nursing, nursing degrees, nursing licenses, etc); schools (hashtags about universities, schools, colleges, mascots, or locations); and conference or tweet chat (hashtags about conferences or specific Twitter chats for health care professionals). The megaphone hashtag types were as follows: illness/disease/condition (hashtags about illnesses, diseases, conditions, or awareness day/month); population (hashtags about populations that nurses serve); health (hashtags about...
health care, health, global health, etc); and something else (hashtags that did not fit into one of the other six categories).

The vast majority of the 71 hashtags that were used 100 times or more in the 2016-2020 data set can be categorized as intercom hashtags (inward-facing hashtags focused on in-group discussion within and about the profession). Collectively, nursing hashtags (n=9810, 37.4%), school hashtags (n=10,974, 41.8%), and conference or tweet chat hashtags (n=1003, 3.8%) comprised 83.0% (n=21,787) of the 26,243 times that the 71 frequently used hashtags occurred in the data set.

In contrast, few of the 71 hashtags that were used 100 times or more in the 2016-2020 data set can be categorized as megaphone hashtags. Collectively, health hashtags (n=1801, 6.9%), illness/disease/condition hashtags (n=1211, 4.6%), and population hashtags (n=170, 0.7%) comprised 12.1% (n=3182) of the 26,243 times that the 71 frequently used hashtags occurred in the data set. When the “something else” hashtags (5%) were added, the total of megaphone hashtags was approximately 18% of the 26,243 times that the 71 frequently used hashtags occurred in the data set.

When the data set was divided into two parts to detect changes in the use of hashtags by schools of nursing after the results of *The Woodhull Study Revisited* were published, the findings were similar to those of the analysis of the data set as a whole, with one notable exception. Prior to the publication of *The Woodhull Study Revisited* on September 27, 2018, none of the hashtags that were used 100 times or more pertained to an illness, disease, or condition. In the 2 years after the publication of *The Woodhull Study Revisited*, 7% of the frequently used hashtags pertained to an illness, disease, or condition. Further analysis revealed that this shift was attributable to the use of the following two hashtags: #covid19 (n=895) and #hiv (n=115).

**Missed Opportunities for Tweeting About Trending Topics**

Of the 6866 different hashtags appearing in the 2016-2020 data set, 6178 were used 10 times or less. These seldom-used hashtags included a number of hashtags that were widely used on Twitter during the time period covered by this study. Table 10 contains a list of some of these hashtags along with the number of times each hashtag was used in the 2016-2020 data set.
Table 10. Missed opportunities to use hashtags of public interest.

| Topic and hashtag                      | Number of times used in the 2016-2020 data set |
|----------------------------------------|-----------------------------------------------|
| **Racism, racial bias, and racial justice** |                                              |
| #racism                                | 10                                            |
| #blacklivesmatter                      | 9                                             |
| #antiracism                            | 6                                             |
| #blm                                   | 6                                             |
| #bias                                  | 3                                             |
| #implicitbias                          | 1                                             |
| #racialbias                            | 1                                             |
| #unconsciousbias                       | 1                                             |
| #systemicracism                        | 1                                             |
| #racialjustice                         | 1                                             |
| **Sexism, sexual harassment, and rape** |                                              |
| #sexualharassment                      | 2                                             |
| #rape                                  | 2                                             |
| #sexism                                | 1                                             |
| #timesuphealthcare                     | 1                                             |
| **Politics**                           |                                              |
| #electionday                           | 9                                             |
| #vote                                  | 8                                             |
| #election2020                          | 2                                             |
| #election                              | 2                                             |
| #trump                                 | 2                                             |
| #election2016                          | 1                                             |
| #presidentialdebate2020                | 1                                             |
| **LGBTQ+ health**                      |                                              |
| #lgbtqhealth                           | 2                                             |
| #homophobia                            | 1                                             |
| #heterosexism                          | 1                                             |
| #transhealth                           | 1                                             |
| **Cancer**                             |                                              |
| #lungcancer                            | 8                                             |
| #pancreaticcancer                      | 3                                             |
| #colorectalcancer                      | 3                                             |
| #ovariancancer                         | 2                                             |
| #skincancer                            | 1                                             |
| #pediatriccancer                       | 1                                             |
| #livercancer                           | 1                                             |
| #childhoodcancer                       | 1                                             |
| **Other diseases and conditions**      |                                              |
| #kidneydisease                         | 6                                             |
| #hepatitis                             | 2                                             |
| #arthritis                             | 2                                             |
Table 1. Number of times used in the 2016-2020 data set

| Topic and hashtag | Number of times used in the 2016-2020 data set |
|-------------------|-----------------------------------------------|
| #hearingloss      | 2                                             |
| #parkinsons       | 1                                             |
| #als              | 1                                             |
| Sexual health     |                                               |
| #sexualhealth     | 7                                             |
| #sexuality        | 1                                             |
| #abortion         | 1                                             |
| #condom           | 0                                             |
| #birthcontrol     | 0                                             |
| #familyplanning   | 0                                             |
| End of life       |                                               |
| #death            | 6                                             |
| #grief            | 2                                             |
| #advancedirective | 1                                             |
| #livingwill       | 1                                             |
| #dying            | 0                                             |

*LGBTQ: lesbian, gay, bisexual, transgender, gender non-conforming, queer and/or questioning.

Discussion

Although the top 44 schools of nursing have an active social media presence on Twitter, collectively, their use of hashtags functions more like an intercom to communicate with other nurses rather than a megaphone to invite attention from and dialogue with journalists, policy makers, and the general public. Because intercom hashtags are both inward facing and overused, they are of minimal use when it comes to drawing attention from and interacting with people outside of nursing. If schools of nursing want the media to showcase the voices of their faculty members as experts, schools of nursing need to be more strategic in their use of hashtags on Twitter. In order to accomplish this, schools of nursing need to increase their use of megaphone hashtags to connect the work of their faculty and students with topics and events of interest to the general public. For example, when topics like #guncontrol are trending, schools of nursing could tweet about the work their faculty members are doing in violence prevention.

On Twitter, schools of nursing have a unique opportunity to amplify the voices of their faculty members on health-related topics of widespread public interest like the impact of systemic racism on health, gun violence, and access to care, among others. If schools of nursing continue to use mostly intercom hashtags on Twitter, they will have squandered a powerful opportunity to share their expertise beyond the boundaries of the discipline.

Acknowledgments

I thank the following individuals: Curtis Kephart, who manages the @RStudio Twitter account, for replying to my tweet with advice about using case_when inside dylyr::mutate; John D Martin, III for responding to my tweet and then following up with a proposed script on RStudio Community when I was working on a streamgraph for this project; Martin Wade for answering my question on RStudio Community with a proposed script for creating a streamgraph; Dan Sullivan for his response to my post on RStudio Community, his explanation on how to create a reprex, and his reprex for the problem I was trying to solve; Barbara Glickstein and Diana Mason for inviting me to conduct the first part of this project as a last-minute addition to The Woodhull Study Revisited; Mary Jean Schumann for her support of the study when she was head of the George Washington University School of Nursing’s Center for Health Policy and Media Engagement; and Timothy Keyes for writing a script snippet for me and sharing it on GitHub when I was struggling to create a data frame in R. The September 29, 2016, to February 22, 2018, Twitter data for this project were purchased with funds provided by the George Washington University School of Nursing’s Center for Health Policy and Media Engagement. The February 23, 2018, to December 13, 2020, Twitter data for this project were purchased with my personal funds (US $40).

Conflicts of Interest

None declared.
Multimedia Appendix 1
R script for generating the data frame of the most frequently used hashtags in the data set.

[DOCX File, 14 KB - nursing_v4i2e25114_app1.docx]

References

1. Chang H. A new perspective on Twitter hashtag use: Diffusion of innovation theory. Proc. Am. Soc. Info. Sci. Tech 2011 Feb 03;17(1):1-4. [doi: 10.1002/meet.1540701295]

2. Groups for Twitter; or A Proposal for Twitter Tag Channels. Factory Joe. 2007. URL: https://factoryjoe.com/2007/08/25/groups-for-twitter-or-a-proposal-for-twitter-tag-channels/ [accessed 2019-11-19]

3. Sigma Theta Tau International. The Woodhull study on nursing and the media: Health care's invisible partner. Indianapolis, IN: Sigma Theta Tau International, Center Nursing Press; 1997.

4. Chaffee M. Health communications: Nursing education for increased visibility and effectiveness. Journal of Professional Nursing 2000 Jan;16(1):31-38 [FREE Full text] [doi: 10.1016/s8755-7223(00)80009-5]

5. Shattell M, Darmoc R. Becoming a Public Thought Leader in 140 Characters or Less: How Nurses Can Use Social Media as a Platform. J Psychosoc Nurs Ment Health Serv 2017 Jun 01;55(6):3-4 [FREE Full text] [doi: 10.3928/02793695-20170519-06] [Medline: 28585660]

6. Ojo A, Guntuku SC, Zheng M, Beidas RS, Ranney ML. How Health Care Workers Wield Influence Through Twitter Hashtags: Retrospective Cross-sectional Study of the Gun Violence and COVID-19 Public Health Crises. JMIR Public Health Surveil 2021 Jan 06;7(1):e24562 [FREE Full text] [doi: 10.2196/24562] [Medline: 33315578]

7. Choo EK, Ranney ML, Chan TM, Trueger NS, Walsh AE, Tegtmeyer K, et al. Twitter as a tool for communication and knowledge exchange in academic medicine: A guide for skeptics and novices. Medical Teacher 2014 Dec 19;37(5):411-416. [doi: 10.3109/0142159x.2014.993371]

8. Roland D, Spurr J, Cabrera D. Preliminary Evidence for the Emergence of a Health Care Online Community of Practice: Using a Netnographic Framework for Twitter Hashtag Analytics. J Med Internet Res 2017 Jul 14;19(7):e252 [FREE Full text] [doi: 10.2196/jmir.7072] [Medline: 28710054]

9. Keim-Malpass J, Mitchell EM, Sun E, Kennedy C. Using Twitter to Understand Public Perceptions Regarding the #HPV Vaccine: Opportunities for Public Health Nurses to Engage in Social Marketing. Public Health Nurs 2017 Jul 06;34(4):316-323. [doi: 10.1111/phn.12318] [Medline: 28261846]

10. O'Connor S. Using social media to engage nurses in health policy development. J Nurs Manag 2017 Nov 23;25(8):632-639. [doi: 10.1111/jonm.12501] [Medline: 28736934]

11. Mason DJ, Glickstein B, Nixon L, Westphaln K, Han S, Acquaviva K. Research Brief - The Woodhull study revisited: Nurses' representation in health news media. Truth About Nursing. 2018. URL: https://www.truthaboutnursing.org/research/orig/woodhull/Woodhull_Study_Revisited_Research_Brief.pdf [accessed 2020-12-17]

12. Mason DJ, Nixon L, Glickstein B, Han S, Westphaln K, Carter L. The Woodhull Study Revisited: Nurses' Representation in Health News Media 20 Years Later. J Nurs Scholarsh 2018 Nov 27;50(6):695-704 [FREE Full text] [doi: 10.1111/jnu.12429] [Medline: 30260071]

13. Van Horn NM, Beveridge A. Example Twitter Analysis. MassMine: Your Access to Data. 2016. URL: https://www.massmine.org/docs/twitter-analysis.html [accessed 2018-03-01]