

DISSEMINATION OF HEALTH INFORMATION THROUGH SOCIAL NETWORKS: TWITTER AND ANTIBIOTICS

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Introduction

Web 2.0 & Twitter

What is Web 2.0?

Describes a change in the way people interact with information online, moving from passive consumption to active creation of content.

Tool	Examples
Blog	
Microblog	
Social Network	
Wiki	
Social News & Bookmarking	 
User Reviews	
Video/Photo Sharing	 

Web 2.0 & Health

- Web 2.0 trends extended to the health care arena as those seeking information online began disseminating their experiences & knowledge.
 - ▣ Used to get and share health information.
 - ▣ Used by providers to disseminate information.
 - ▣ 61% of American adults seek health information online; 37% have accessed user-generated information.

patientslikeme



WikiSurgery

THE FREE SURGICAL ENCYCLOPEDIA



What's **twitter**?

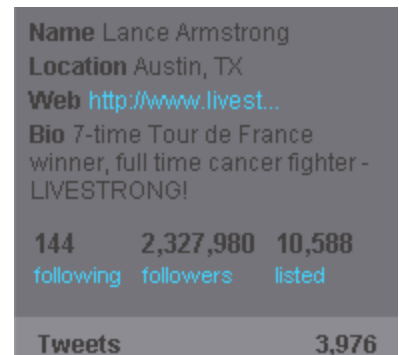
- A social networking & micro-blogging service that allows users to post frequent updates.
- Updates are limited to 140 characters and can be posted through a web form, instant message online, or text message via mobile phone.
- Twitter users follow one another's updates.
- Twitter updates are searchable.

Methods

Cross-sectional survey using content analysis of Twitter status updates between March 13 and July 31, 2009.

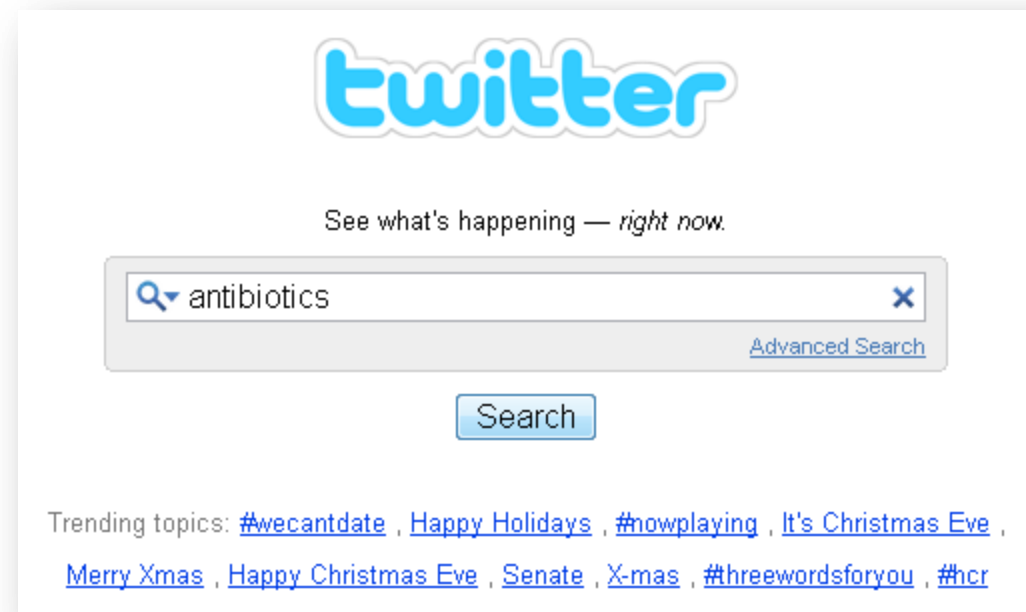
Study Setting

- Used publicly available Twitter webpages.
 - @ Aug. 09, approx. 94% of Twitter accounts were public, with number trending upward.
- Twitter makes public:
 - the # of people following user,
 - the # of people the user is following, and
 - the # of status updates (“tweets”) the user has posted.



Search Strategy

- Conducted searches for “antibiotic” & “antibiotics” weekly from March 13-July 31, 2009.
- Search resulted in 52,153 status updates mentioning at least 1 of the terms.



Determining Categories

- Q-methodology
 - Separately evaluated 100 random updates & classified into broad categories.
 - Discussed categories to reach consensus: Advertisements, Advice/Information, Animals, Cost, Diagnosis, General Use, Other, Positive Feedback, Resistance, Side Effects/Negative Reactions, and Wanting/Needing.
- Repeated process, applying 11 categories to two new sets of 100 randomly selected status updates.
 - Created new category, “Misunderstanding and/or Misuse,” which subsumed “Advertisements,” as all examples of ads were from illegitimate sources.
 - references to using antibiotics to treat a virus, cold, or flu; attempts to access or sell antibiotics without a prescription; incorrect use and didn't finish dose; refusal to take antibiotics under any circumstances.

Data Collection – Content Analysis

- Once categories were established, 1,000 status updates were randomly selected from the full sample of 52,153 updates mentioning antibiotics.
- Each was grouped into a single category.
- Areas of ambiguity were discussed and agreed upon by consensus. When updates included links, they were checked to clarify user's intent.
- Removed updates that used the term antibiotics metaphorically.
 - ▣ “Turning benign symbiotes into vicious, antibiotic resistant bacteria dedicated to film industry destruction”

Data Collection – Misuse/Misunderstanding

- Further mined 52,153 updates for following phrases: “cold+antibiotic(s),” “extra+antibiotic(s),” “flu+antibiotic(s),” and “share+antibiotic(s).”
- Each was reviewed for indication of misunderstanding and/or misuse of antibiotics.
- Recorded the following:
 - ▣ # of people following user,
 - ▣ # of people user is following, and
 - ▣ # of updates user has posted.



Results



Results Summary – Content Analysis

- **General Use** was most common category
 - ▣ Number of days remaining
 - ▣ Hope to feel better soon
- **Advice and Information** 2nd most common
 - ▣ Personal advice “get antibiotics if it’s serious”
 - ▣ Reference news articles
- **Side Effects/Negative Reactions** 3rd most common
 - ▣ General “antibiotics made me want to die”
 - ▣ Specific “make me want to vomit”
 - ▣ Inconveniences (abstaining from alcohol, sensitivity to sun)
- 29 removed because they used antibiotics as a metaphor.

Results – Misunderstanding/Misuse

- **Flu+antibiotics** most popular category
 - 345 updates included misinformation
 - reached a total of 172,571 followers
- **Cold+antibiotics** 2nd most popular category
 - 302 status updates included misinformation
 - reached 850,375 followers
- **Other categories** (leftover antibiotics, extra antibiotics, and share antibiotics)
 - 40 status updates included misinformation
 - reached 23,016 followers



Discussion



Twitter is big

- Rapid growth of 1,460% increase between June 08 and 09, 44.5 million visitors worldwide as of June 09. (See Gigatweet.)
- Interesting examples include:
 - ▣ NASA to provide updates on space shuttle status,
 - ▣ student journalist to get himself out of an Egyptian jail by tweeting to his Twitter network: “Arrested,” and
 - ▣ to disseminate information during the protests in Iran.

Potential Health-Related Applications

- Better understand cases of misuse/misunderstanding
- Behavior change
 - ▣ Twitter-based reminders to take medications, stop smoking, lose weight, etc. (see work in this arena with text messaging)
- Disseminate valid information
 - ▣ Services are available to monitor and auto-respond to trigger word combinations, such as “flu+antibiotics.”
- Gather real-time health data by creating a “mashup,” combining health status updates with location-based information.
 - ▣ Supplement disease surveillance systems by (1) allowing people to submit symptoms and location data in a predefined, machine-readable format (see [TwitterVoteReport](#)) or (2) searching for passively submitted information as we did.

Study Limitations

- Validity of content is unknown.
 - ▣ Study assumed updates are an indicator of what people think, believe, or understand. Possible that some updates are embellished or exaggerated and thus cannot be taken at face value.
- Seasonal bias.
 - ▣ Outbreak of H1N1 increased the frequency with which Twitter users discussed the flu, and, likely, co-occurrence of “flu+antibiotics.” However, this would not necessarily affect relative level of inaccurate information.
 - ▣ Possible that novel nature of H1N1 & amplified news coverage led to increase in misinformation.
- Measurement bias.
 - ▣ Choosing categories is subjective, though Q sort methodology was used to reduce effect.
 - ▣ A portion of updates could reasonably be placed into multiple categories; team reduced effect by categorizing ambiguous cases by consensus.

Interesting Links

- Gigatweet (number of Tweets)
<http://popacular.com/gigatweet/>
- Phoenix to Earthlings: I've Landed! Awesome!
http://www.nytimes.com/2008/05/31/science/space/31mars.html?_r=2&partner=rssnyt&emc=rss&oref=slogin
- Student 'Tweeters' his way out of Egyptian jail
<http://www.cnn.com/2008/TECH/04/25/twitter.buck/>
- State Dept to Twitter: Keep Iranian tweets coming
<http://ac360.blogs.cnn.com/2009/06/16/state-department-to-twitter-keep-iranian-tweets-coming/>
- Twitter Vote Report <http://blog.twittervotereport.com/>
- TwitHawk <http://www.twithawk.com/>

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