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# Using Social Media to Create a Professional Network Between Physician-Trainees and the American Society of Nephrology

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Twitter is the fastest growing social media network. It offers participants the ability to network with other individuals. Medical societies are interested in helping individuals network to boost recruitment, encourage collaboration, and assist in job placement. We hypothesized that the American Society of Nephrology (ASN) successfully used Twitter to create a network between participants and itself to stay connected with its members. Tweets from 3 Twitter networking sessions during Kidney Week 2011 were analyzed for content. These messages were used to create a network between all participants of the networking sessions. The network was analyzed for strength and influence by calculating clustering coefficients and eigenvector centrality scores, respectively. Eight moderators and 9 trainees authored 376 Twitter messages. Most tweets by trainees (64%) and moderators (61%) discussed 1 of 3 themes: networking, education, or navigating Kidney Week 2011. A total of 25 online network connections were established during the 3 sessions; 20% were bidirectional. The CC for the network was 0.300. All moderators formed at least 1 connection, but 7 of the 9 trainees failed to make any connections. ASN made 5 unidirectional and 0 bidirectional connections with a low EC of 0.108. ASN was unable to form powerful connections with trainees through Twitter, but medical societies should not be discouraged by the results reported in this investigation. As societies become more familiar with Twitter and understand the mechanisms to develop connections, these societies will have a greater influence within increasingly stronger networks.

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**Key Words:** Network analysis, Social media, Healthcare social media, Medical informatics

## Introduction

Scientific conferences offer important networking opportunities for physicians and medical trainees. Trainees can meet their future colleagues, share ideas with their contemporaries, and solicit advice from senior faculty. Physicians can identify and recruit talented individuals or develop research collaborations. Indeed, even conference organizers use networking sessions to form relationships with attendees. A successful scientific conference is one that not only offers in-depth teaching sessions, but also results in the creation of new scientific partnerships and mentor-mentee relationships. To achieve this goal, conference organizers provide teaching sessions that bring attendees of various backgrounds together. In addition, many organizers now provide dedicated networking luncheons or “wine and cheese” events.<sup>1</sup> In recent years, conference organizers have identified a new method for achieving this goal: social media. Social media provides a medium for interaction among users to share and exchange information and ideas in virtual communities.<sup>2</sup> With social media, the expression of thoughts and ideas are not restricted by personal inhibitions. This feature benefits dialogue, networking, and the free exchange of information, which are the very basis of meaningful interactions at a scientific conference.<sup>3,4</sup> Given this potential, it is no surprise that conference organizers have turned their attention toward online networking.

There are many online instruments, such as Twitter or Facebook, which are highly popular amongst the younger generation of physicians. Twitter is a social media network, more specifically a microblogging

website, which allows users to exchange ideas with a maximum of 140 characters. It is a form of “one-to-many” communication unlike a one-to-one communication seen with e-mail, phone calls, and sometimes Facebook depending on the users privacy settings. Unlike other social networking websites in which user privacy settings limit accessibility, all information posted on the Twitter website is freely accessible by anyone. In addition, the ease of use and the potential to connect with other users who are not your “friends” adds value to the networking possibilities with Twitter. Another unique feature of Twitter is “topic-based communication”, in which tweets (Twitter messages) can be bundled together using “hashtags”. A hashtag is a keyword preceded by “#” that tags tweets that contain it. The hashtag function collates tweets about a specific theme or topic.<sup>5</sup> This allows for topic-based communication and enables users to search for information regarding a topic of interest with ease. For example, “the dialysis talk was exceptional, here is a video

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from the talk *#dialysis*". Other users can type *#dialysis* in the Twitter search bar and have access to this tweet along with other tweets about dialysis. Hashtags make it easy for users to gather information of interest with the simple search. Given all of these advantages, conferences are exploring the potential of Twitter as a tool that allows conference attendees to network with individuals beyond the physical scope and constraints inherent at a live conference.<sup>4-9</sup>

In 2011, the American Society of Nephrology (ASN) began an initiative to integrate social media, such as Twitter, into its annual Kidney Week meetings. It is the first such initiative declared by any medical society. This initiative included organizing 3 separate online networking opportunities (referred to as the *#kidwkstu* Twitter networking sessions) between faculty and medical trainees who were registered to attend Kidney Week 2011. We hypothesized that ASN would successfully integrate social media by creating a strong online Twitter network in which it was the most influential participant.

## Methods

### Tweets

We investigated the tweets deposited in the Kidney Week networking timeline. Kidney Week is considered the largest international nephrology conference and is held yearly. In 2011, Kidney Week included 3 Twitter networking sessions on October 17, November 3, and November 11, 2011. Each session was conducted for approximately 1 hour, and all messages were deposited in the *#kidwkstu* timeline. This timeline was different than that used for Kidney Week itself— *#kidneywk11*. ASN established these timelines. Tweets deposited in *#kidwkstu* were freely available and accessed on June 5, 2012 for this investigation using a Twitter API.

### Categorization of Tweets by Author

The first and corresponding authors reviewed each tweet and divided them by author type into "moderators" and "trainees". Moderators were self-identified through their tweets and included board-certified nephrology physicians and selected individuals from nephrology fellowships or internal medicine residency programs. If a Twitter user identified himself or herself as a moderator, then they were considered a moderator. These moderators were selected by ASN and were not compensated for their participation. The role of these moderators was predetermined by ASN to help facilitate conversations in the

*#kidwkstu* networking sessions. Trainees included residents and medical students who were registered to attend Kidney Week 2011. All trainees were invited to participate in any or all of the networking sessions. A participant was defined as a Twitter account holder who generated at least 1 tweet during any of the 3 *#kidwkstu* sessions. Tweets authored by individual participants were de-identified in accordance with social media-specific standards. The official ASN Twitter account was *@ASNKidney*, and tweets composed through this account were not de-identified. The authors of this investigation did not participate in any of the 3 networking sessions.

### Categorization of Tweet by Content

Each tweet was grouped into 1 of 4 categories on the basis of its content and in accordance with previously described.<sup>10</sup> The categories were (1) "mentorship," (2) "educational," (3) "physically navigating Kidney Week 2011," and (4) "other" (any tweet that could not be categorized into any of the first 3 categories). The first and

corresponding authors independently classified each tweet. Classification discrepancies were resolved through a committee that included all authors of this investigation. Table 1 contains definitions for each category as well as representative examples.

### Development of Network Map

The Twitter database was queried to establish unidirectional or bidirectional relationships among all participants of the 3 networking sessions. Unidirectional relationships were defined as those in which 1 participant followed another but not vice versa (Fig 1, Scenario 1). Bidirectional relationships were defined as those in which 2 participants followed each other (Fig 1, Scenario 2). These relationships formed the basis for creation of a directed network map.

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### Strength and Influence of Network Map

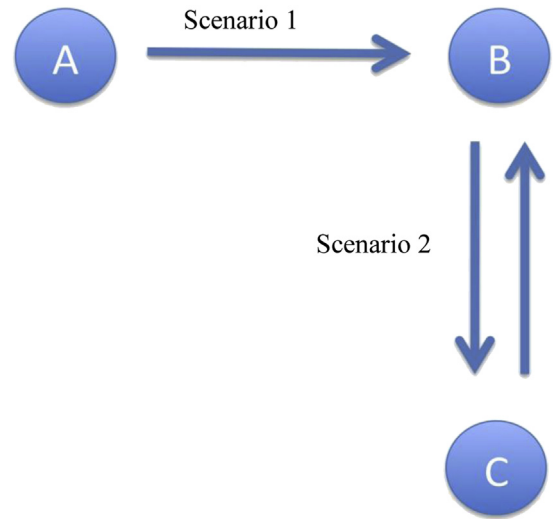
The directed network map was examined for strength and influence. Strength of the network was measured by the clustering coefficient (CC). This dimensionless coefficient, ranging from 0 (*greatest weakness*) to 1 (*greatest strength*), measured the interconnectedness among participants.<sup>8</sup> A strong network was defined as one in which all participants were interconnected with one another. The Bonacich eigenvector centrality score (EC) measured individual participant influence within the network. EC scores are directly proportional to the number and degree

#### CLINICAL SUMMARY

- Medical societies are increasingly using social media to educate and network with healthcare providers and patients.
- Original scientific investigations are needed to properly understand and correctly use social media at medical conferences.
- Twitter is increasingly used to network with younger physicians.
- Social media specialists should be an integral part of all medical conferences to maximize effective use of online tools.

**Table 1. Types of Twitter Messages With Definition and Representative Examples of Categories Used in Content Analysis of Tweets**

Type of Twitter Message	Definition	Example of Twitter Message Representative of Corresponding Content
Educational	Twitter message that indicates educational information about kidney disease	Late break- tacro better than cyclophosphamide in kids with steroid resistant NS #KidneyWk11 #KidWkStu
Physically navigating Kidney Week 2011	Twitter message that indicates information about events during Kidney Week, planning for events, or maneuvering the conference	In my field, I generally look at session titles and then look further for the speakers. I found looking at topics to be best #kidwkstu
Mentoring	A Twitter message indicating information regarding ways to network and get mentorship	Some asked to talk mentors. They can be a great asset to a career. But how do you find one? Is #kidneywk11 the place? #kidwkstu
Other	Twitter message that fails to include any information about kidney disease, navigating Kidney Week 2011, or networking at the conference	I'm currently doing my PhD looking at sodium reabsorption so have a bias towards renal physiology #kidwkstu



**Figure 1.** Flow of information in a hypothetical Twitter network. Circles represent hypothetical participants. In Scenario 1, Participant A follows Participant B. Therefore, information travels only from the latter to the former. In Scenario 2, Participants B and C follow each other, thereby ensuring that both participants can freely communicate with one another. Participant C must rely on Participant B to communicate with Participant A; however, Participant A cannot communicate with Participant C.

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of connections that each participant has with all of the remaining participants. Influential participants were defined as those with the highest EC score.<sup>10</sup> EC and CC scores are independent of the total number of participants.<sup>11,12</sup>

All analyses were performed using Microsoft Excel 2007 and NodeXL.<sup>13</sup> This research is exempted from institutional review board approval because it analyzes existing publicly available data. The null hypothesis was that ASN created a weak online network and was an un-influential participant within that network.

**Results**

A total of 376 tweets were generated in the 3 separate Twitter chats. There were a total of 8 moderators and 9 trainees who participated in the Twitter chats, accounting for 94% and 6% of the tweets, respectively ( $P < .0001$ ). The total number of trainees who had registered for the live Kidney Week 2011 Program for Medical Students and Residents was 111.<sup>14</sup> Among the registered trainees, only 8.1% participated in the online networking sessions.

Sixty-four percent of tweets authored by trainees and 61% authored by moderators focused on networking, education, or physical navigation of Kidney Week 2011 ( $P = .824$ ). Approximately 18 tweets were authored by moderators in response to one tweet authored by a trainee (17.5:1.0). Table 2 lists the distribution of Twitter messages generated by trainees and moderators on the basis of content.

**Table 2. Number of Twitter Messages Generated by Moderators and Trainees on the Basis of Content**

Content	Tweets Composed by Trainees (n)	Tweets Composed by Moderators (n)	Total
Nephrology related (related to educational content of Kidney Week 2011)	5	29	34
Physically navigating Kidney Week 2011	6	99	105
Mentoring	3	87	90
Other	8	139	147
Total	22	354	376

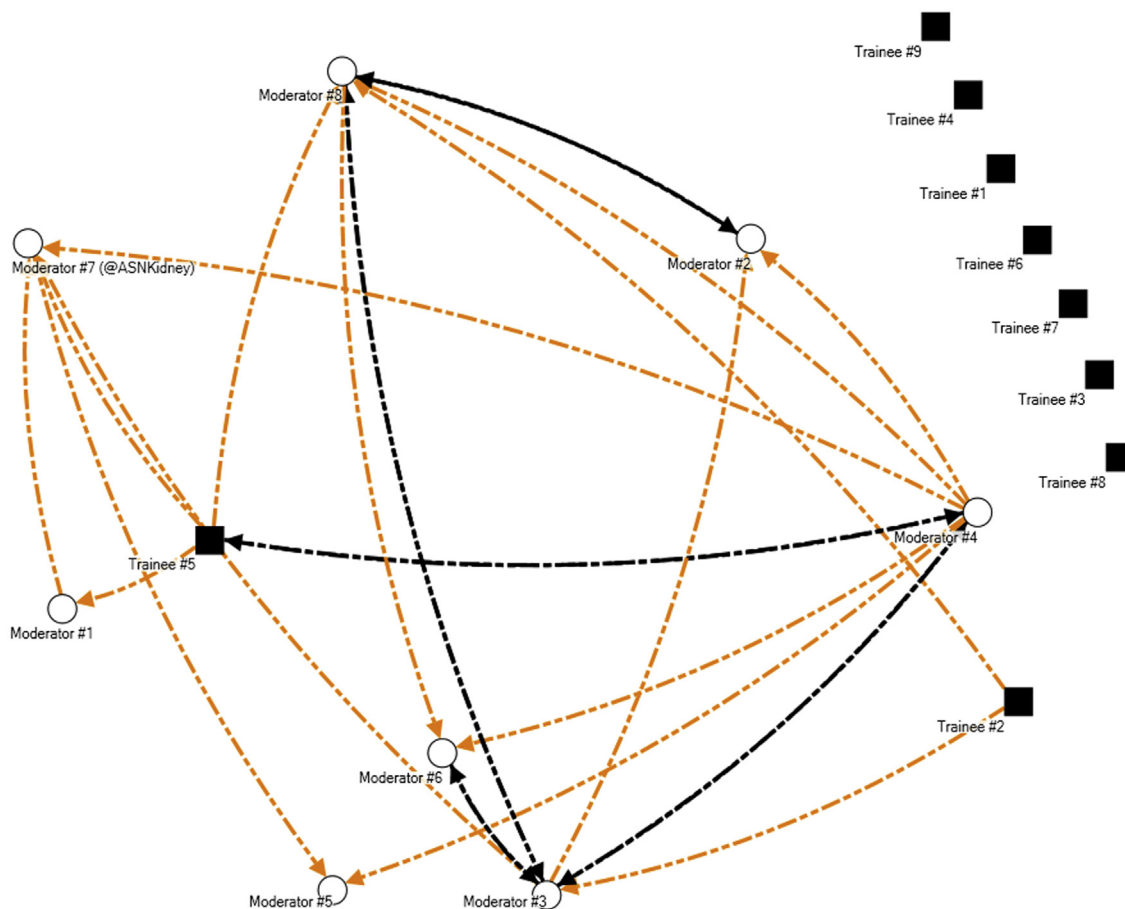
The mean and median CC for the network were 0.300 and 0.267, respectively. Moderator #4 had the greatest influence in the network (EC = 0.159) amongst all participants. Of the 25 total connections established between the 17 participants in the #kidwkstu networking sessions, 5 were bidirectional (20%, lower than the proportion of unidirectional connections;  $P < .0001$ ). Seven of the 9 trainees (trainee #1, #3, #4, and #6-9) failed to establish any connections with any participant (Fig 2). All 8 moderators established at least 1 connection with another participant; 6 established a connection with only 1 of 2 trainees (trainee #2 and #5). ASN (moderator #7) formed 5 unidirectional and 0 bidirectional connections. Among the 9 trainees, none formed connections with each other,

and only 1 (trainee #5) established a connection with ASN. ASN had an EC score of 0.108 (Table 3).

### Discussion

On the basis of this investigation, we were unable to reject the null hypothesis. The data suggest that ASN created a weak network and was not the most influential participant within that network. Moreover, the combined Twitter networking sessions were characterized by poor trainee participation.

Most tweets (64%) authored by the trainees were about mentoring, education, or navigation. These topics are important for trainees who want to fully experience Kidney



**Figure 2.** Directed network map of the #kidwkstu networking sessions. Orange arrows indicate unidirectional connections with arrowheads indicating the participant who is being followed. Black arrows indicate bidirectional connections.

**Table 3. Individual Participant Metrics**

Participant	Tweets ( <i>n</i> )	Eigenvector Centrality	Connections With Trainees (Unidirectional or Bidirectional) ( <i>n</i> )
Moderator #1	43	0.044	1
Moderator #2	4	0.095	0
Moderator #3	76	0.142	1
Moderator #4	35	0.159	2
Moderator #5	12	0.058	0
Moderator #6	24	0.095	0
Moderator #7 (@ASNKidney)	84	0.108	1
Moderator #8	76	0.140	2
Trainee #1	1	0.000	0
Trainee #2	1	0.061	0
Trainee #3	8	0.000	0
Trainee #4	2	0.000	0
Trainee #5	6	0.097	0
Trainee #6	1	0.000	0
Trainee #7	2	0.000	0
Trainee #8	1	0.000	0
Trainee #9	1	0.000	0

Week 2011. Moreover, topics such as mentoring and education play an important role for young trainees who are considering nephrology as a career. ASN is the lead organization to attract trainees toward a career in nephrology, providing travel grants, hosting live networking seminars, and interacting with young physicians on social media help accomplish this goal.<sup>15-17</sup> Social media interactions are critical because they allow ASN to form and maintain relationships with trainees long after Kidney Week has concluded.<sup>18</sup> Only 8.1% of all registered trainees participated in the Twitter networking sessions, a rate that appears low, but greater than the 1.4% participation by physicians at Kidney Week 2011.<sup>10</sup> Also concerning is the disproportionate number of trainees and the tweets they generated. Despite having a similar number of moderators and trainees, the latter composed only 6% of all tweets. There was an overwhelming amount of moderator activity during these sessions—a prerequisite for a successful Twitter networking session. However, neither registered trainees nor those that participated in these networking sessions took advantage of this benefit.

We could not reject the null hypothesis despite ASN playing an important role in every step leading up to and during the networking sessions. Indeed, ASN (1) chose Twitter to host its online networking sessions, (2) recruited a diverse and active group of individuals to

moderate the sessions, (3) preselected trainees to attend Kidney Week 2011, and (4) actively participated in the sessions. We expected that these efforts would have yielded a strong network with significant influence by ASN.

The directed network map reveals the most and least influential participants in the network. Influential participants are those who compose meaningful tweets that convince other participants to form a connection with them. Although ASN (moderator #7) generated the most tweets of any moderator (nearly 1 of every 4 messages), it had the fourth highest EC score. Because the number of tweets authored was correlated with the EC score ( $r = 0.69$ ), the low EC score for @ASNKidney reflects the poor quality of its tweets. These trainee-ASN connections are vital for both groups. For trainees, Twitter connections allow them to keep abreast of breakthroughs in nephrology from the leading nephrology society. For ASN, these connections allow it to attract future physicians into nephrology and keep them aware of the society's mission, activities, and leadership. Indeed, other reports have indicated a cost benefit for large organizations to connect with individuals through social media compared with connecting by telephone, e-mail, or postal mail.<sup>19,20</sup>

The results of our investigation are contrary to our initial hypothesis and to the results presented in other

**Table 4. Potential Areas of Improvement With Social Media Networking at Scientific Conferences**

Potential Area of Improvement	Recommendations
Lack of knowledge of microblogging	1. Educating the audience through tutorials at the beginning of conferences 2. Educating the audience via online videos on the conference website
Lack of leadership	Education of session hosts and moderators before the conference
Lack of organization	Introducing "media representatives" to help coordinate and organize social media events
Lack of advertising	1. Defining roles of media representatives and moderators 2. Social media desk to help attendees get familiar with web application and smart phone usage 3. Making the official hashtag available before the beginning of the conference



investigations. Life scientists have been increasing their use of Twitter to network with each other since 2008.<sup>21,22</sup> Thirty-seven percent of orthopedic surgeons on Twitter use it for professional purposes and 66% of them are considered “young” in age.<sup>22</sup> Indeed, plastic surgeons are increasingly using Twitter to network with patients who desire aesthetic surgery—anywhere from 9% to 46% depending on geographic location.<sup>23</sup> Finally, college instructors who use Twitter to connect with students actually foster network connections among those very students—a finding that was not replicated by ASN in the 3 networking sessions described in this investigation (Fig 2).<sup>3</sup>

Three limitations deserve specific mention. First, we were unable to perform a time-lapse network analysis of these sessions. Our analysis was performed 7 months after the last networking session. Serial analyses over time would have allowed us to understand the evolution (or decay) of the network, providing greater information about the network created by ASN and its influence. It is possible that the network may have increased in strength (higher CC) and/or that @ASNKidney had a greater influence (higher EC score) during the intervening time period. However, given the initial poor participation by trainees (only 9 of 111 trainees participated and only 6% of all tweets were from trainees), we suspect that serial analyses would not have had an effect on our final conclusions. Second, our investigation was limited by Twitter’s privacy settings. Twitter allows users to send direct messages to one another. These messages are considered private and unavailable for research. It is possible that trainee participation was greater than measured because of the direct messaging feature of Twitter. However, given that direct messages can only be sent between users that form bidirectional connections, we surmise that the number of direct messages would not have greatly altered our results. Finally, we are unable to compare these results with Twitter chats conducted by other medical societies. Although it is known that the American College of Cardiology (@ACCinTouch), the American Society of Clinical Oncology (@ASCO), and the Academy of Orthopedic Surgeons (@AAOS1), among others, have an active Twitter presence, data regarding their effectiveness at using Twitter for networking with members and/or trainees have not been published.

Two strengths also deserve mention. First, we applied the EC score and CC to this network. Despite a low participation by the trainees, the EC score and CC are independent of network size.<sup>11,12</sup> As a result, and unlike conventional scientific analyses that rely heavily on large sample sizes, the EC score and CC are the appropriate measurements to quantify the strength and influence, respectively, of small networks.<sup>11,12</sup> Second, EC and CC scores offer greater insight into the quality of a network than simply analyzing the number of

followers one has on Twitter. Followers on Twitter do not indicate the degree of connectivity or influence that any one follower has in relation to all others. As a result, this simple metric would not elucidate the characteristics of Twitter networks.

This study recognizes a challenge in increasing trainee/resident participation via Twitter. Our results should not discourage conference organizers from using Twitter. Despite the nascence of the field of scientific research in social media, there are some opportunities for improvement. Given the poor participation from trainees at Kidney Week 2011, it is possible that attendees were not aware of how to use or were not familiar with the networking advantages of Twitter. Perhaps because of this unfamiliarity, educating the audience is critical to achieving more Twitter activity. Also important is education of session hosts or moderators to monitor tweets and respond to user opinions, concerns, and feedback, which will eventually lead to improved participation from trainees.<sup>24</sup> We also suggest introducing “media representatives” for conferences who can organize social media events and play a key role in promoting the use of Twitter during conferences. These media representatives would be trained individuals with an extensive knowledge of Twitter and its networking capabilities that can assist all participants and conference organizers in the meaningful use of Twitter. Table 4 summarizes some of the potential ways that online participation at conferences can be improved.

## Conclusions

In its first attempt, ASN was unable to form powerful connections with trainees through Twitter. Despite Twitter’s increasing popularity as an online networking instrument, the society could not recreate the number and type of connections that other nonmedical organizations have reportedly achieved. We surmise that more organizations will use Twitter to create strong influential networks as the value of such connections becomes increasingly evident. Medical societies, including ASN, should not be discouraged by the results reported in this investigation. Indeed, scientific research in social media is a nascent field, limiting our ability to develop “best practice” guidelines. Nevertheless, we believe that as societies become more familiar with Twitter and understand the mechanisms to develop connections, these societies will have a greater influence within increasingly stronger networks.

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