#EBUSTwitter

Novel Use of Social Media for Conception, Coordination, and Completion of an International, Multicenter Pathology Study

Marcos Lepe, MD; Pembe Oltulu, MD; Mariana Canepa, MD; Roseann I. Wu, MD, MPH; Amy Deeken, MD; Deepu Alex, MD, PhD; Carme Dinares, MD, PhD; Erika E. Doxtader, MD; Valerie A. Fitzhugh, MD; Jean-Baptiste Gibier, MD; Deepali Jain, MD; Nafiseh Janaki, MD; Alexis Jelinek, MD; Tania Labiano, MD; Vincenzo L'Imperio, MD; Claire Michael, MD; Sanjay Mukhopadhyay, MD; Fabio Pagni, MD; Angel Panizo, MD; Lara Pijuan, MD, PhD; Liza M. Quintana, MD; Sinchita Roy-Chowdhuri, MD, PhD; Albert Sanchez-Font, MD, PhD; Irene Sansano, MD; Jennifer Sauter, MD; Daniel Skipper, DO; Laura S. Spruill, MD, PhD; Vanda Torous, MD; Jerad Michael Gardner, MD; Xiaoyin Sara Jiang, MD

• ***Context.***—**Social media sites are increasingly used for education, networking, and rapid dissemination of medical information, but their utility for facilitating research has remained largely untapped.**

Objective.—**To describe in detail our experience using a social media platform (Twitter) for the successful initiation, coordination, and completion of an international, multi-institution pathology research study.**

Design.—**Following a tweet describing a hitherto-unreported biopsy-related histologic finding in a mediastinal lymph node following endobronchial ultrasound–guided transbronchial needle aspiration, a tweet was posted to invite pathologists to participate in a validation study. Twitter's direct messaging feature was used to create a group to facilitate communication among participating pathologists. Contributing pathologists reviewed consecutive cases of mediastinal lymph node resection following endobronchial ultrasound–guided transbronchial needle aspiration and examined them specifically for biopsy site changes. Data spreadsheets containing deidentified data and digital photomicrographs of suspected biopsy site changes were submitted via an online file hosting service for central review by 5 pathologists from different institutions.**

Results.—**A total of 24 pathologists from 14 institutions in 5 countries participated in the study within 143 days of study conception, and a total of 297 cases were collected and analyzed. The time interval between study conception and acceptance of the manuscript for publication was 346 days.**

Conclusions.—**To our knowledge, this is the first time that a social media platform has been used to generate a research idea based on a tweet, recruit coinvestigators publicly, communicate with collaborating pathologists, and successfully complete a pathology study.**

(*Arch Pathol Lab Med.* 2020;144:878–882; doi: 10.5858/arpa.2019-0297-OA)

The utility of social media as an instrument for education, advocacy, and community development in medicine is well documented, and applications of social media in these spheres are expanding exponentially.[1] The social media platform Twitter (San Francisco, California) has emerged as one of the most widely used sites for a wide range of physicians, including pathologists,[2] because it provides a

Accepted for publication September 19, 2019.
Published online December 17, 2019.

From the Department of Pathology, Hospital of the University of Pennsylvania, Philadelphia (Dr Lepe); the Department of Pathology, Meram Faculty of Medicine, Necmettin Erbakan University, Konya, Turkey (Dr Oltulu); the Department of Pathology, Rhode Island Hospital, Providence (Dr Canepa); the Department of Clinical Pathology & Laboratory Medicine, University of Pennsylvania Health System, Philadelphia (Dr Wu); the Department of Pathology, Summa Health Systems, Akron, Ohio (Drs Deeken and Jelinek); the Department of Pathology, Memorial Sloan Kettering Cancer Center, New York, New York (Drs Alex and Sauter); Patologia, Vall d'Hebron Hospital, Barcelona, Spain (Drs Dinares and Sansano); the Department of Pathology, Cleveland Clinic, Cleveland, Ohio (Drs Doxtader and Mukhopadhyay); the Department of Pathology and Laboratory Medicine, University of Medicine and Dentistry of New Jersey–New Jersey Medical School, Newark (Dr Fitzhugh); Centre de Biologie, University of Lille, Lille, France (Dr Gibier); the Department of Pathology, All India Institute of Medical Sciences, New Delhi, India (Dr Jain); the Department of Pathology, Case Western Reserve University, Cleveland, Ohio (Drs Janaki and Michael); Patologia, Complejo Hospitalario de Navarra, Navarra, Spain (Drs Labiano and Panizo); the Department of Pathology, University of Milano Biocca, Monza, Italy (Dr L'Imperio and Pagni); Patologia, Hospital del Mar, Barcelona, Spain (Drs Pijuan and Sanchez-Font); the Department of Pathology, Beth Israel Deaconess Medical Center, Boston, Massachusetts (Dr Quintana); the Department of Pathology, The University of Texas MD Anderson Cancer Center, Houston (Dr Roy-Chowdhuri); the Department of Pathology and Laboratory Medicine, Medical University of South Carolina, Charleston (Drs Skipper and Spruill); the Department of Pathology, Massachusetts General Hospital, Boston (Dr Torous); the Department of Pathology, Dermatopathology, Bone & Soft Tissue, University of Arkansas for Medical Sciences, Little Rock (Dr Gardner); and the Department of Pathology, Duke University Medical Center, Durham, North Carolina (Dr Jiang).

The authors have no relevant financial interest in the products or companies described in this article.

Corresponding author: Xiaoyin Sara Jiang, MD, Duke University Medical Center, Box 3712, Durham, NC 27710 (email: jiang009@mc.duke.edu).

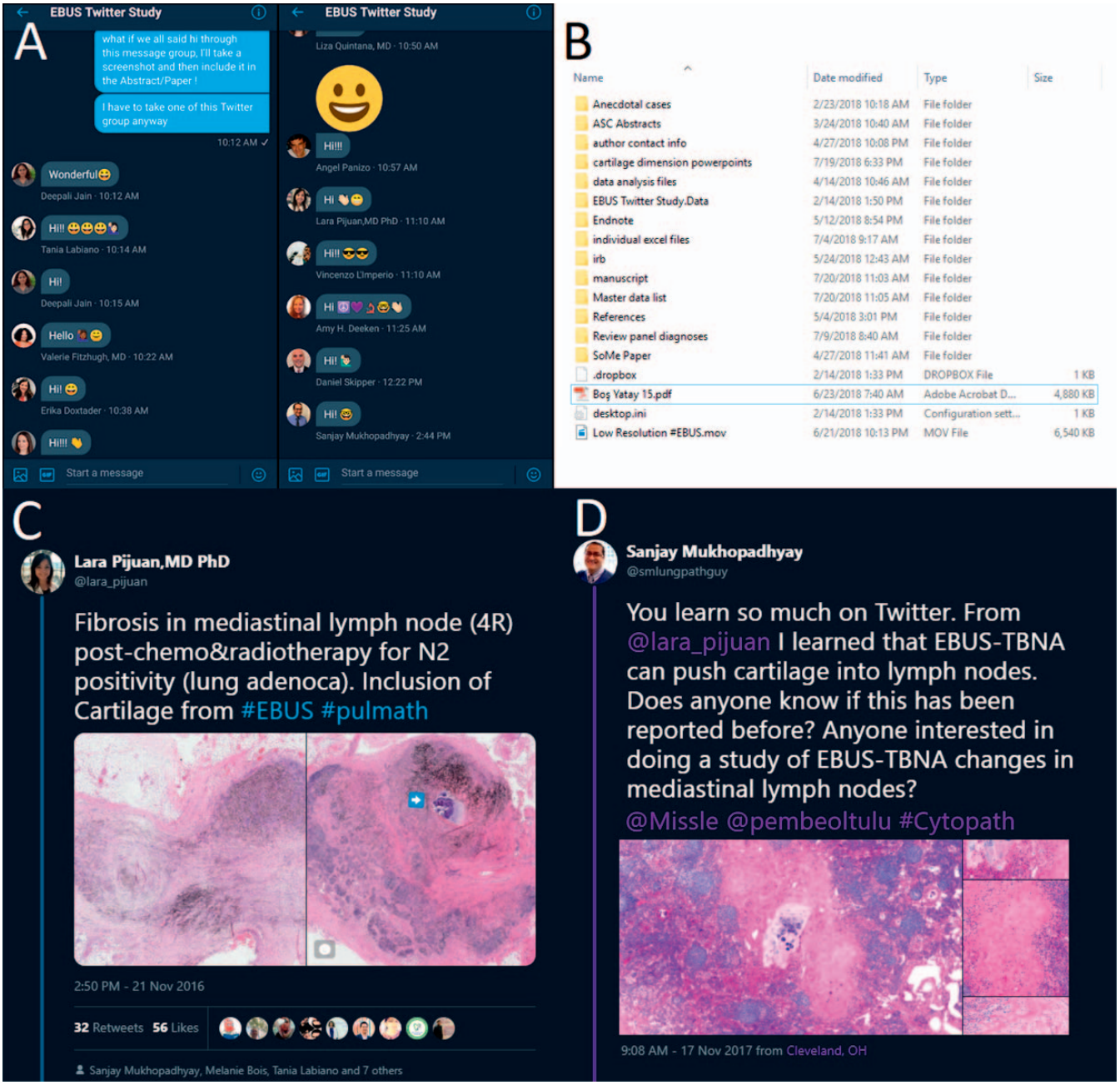

Figure 1. *A, Dedicated #EBUSTwitter messaging group. B, Screenshot of the private folder hosted on the cloud service Dropbox. C, Dr Pijuan's initial tweet about her case: post–endobronchial ultrasound (EBUS) cartilage found within a sampled lymph node. D, Dr Mukhopadhyay's tweet a year after that sparked our interest in starting #EBUSTwitter.*

free, open-access, interactive platform for scientific discussion and sharing of ideas. Twitter is particularly suited for an image-based specialty, such as pathology, because it allows the posting of images, which often spark academic discussion. Twitter offers several advantages for pathologists, including freely accessible educational sessions, such as online journal clubs and global networking opportunities.[3–6]

Despite these advances, the potential of Twitter as a platform for facilitating research studies by pathologists has remained largely untapped. In this manuscript, we describe a novel use of social media in pathology, whereby a formal, international, multi-institutional pathology study was initiated and coordinated entirely online via Twitter.[7] To our knowledge, this is the first pathology study to be carried out online from study conception in full public view on Twitter[7] to study coordination via Twitter's group messaging function (Figure 1, A) to online editing of the manuscript via a private Dropbox (San Francisco, California) folder (Figure 1, B) to publication. The aim of this manuscript is to describe the logistics, benefits, and challenges associated with this novel methodology.

MATERIALS AND METHODS

Study Conception

A timeline of the study is outlined in the Table. The origin of this study can be traced to a tweet by Spanish pulmonary pathologist

Timeline of #EBUSTwitter Study		
	Date	Days Since Conception of Study
Dr Pijuan's tweet describing a case of cartilage in mediastinal lymph node	November 21, 2016	Prior to conception of study
Dr Mukhopadhyay's tweet describing a second case; study proposed	November 17, 2017	Study conception (day 0)
Dr Sauter's announcement of the study, formally inviting participants	November 20, 2017	3
Dr Lepe creates and registers #EBUSTwitter hashtag	November 21, 2017	4
Two abstracts submitted to the American Society of Cytopathology annual meeting	April 29, 2018	163
Both abstracts accepted for presentation at the American Society of Cytopathology annual meeting	June 21, 2018	215
Abstracts published online in the *Journal of the American Society of Cytopathology*	August 15, 2018	269
Main manuscript accepted for publication in the *American Journal of Surgical Pathology*	October 30, 2018	346

and cytopathologist Lara Pijuan (MD, PhD) on November 21, 2016, highlighting a published case report of a hitherto-undescribed biopsy site change, of which she was a coauthor.[8] This report illustrated a tiny fragment of displaced cartilage within a mediastinal lymph node following an endobronchial ultrasound–guided transbronchial needle aspiration (EBUS-TBNA) procedure (Figure 1, C). Two months later, a second tweet by a pulmonary pathologist in the United States who had read the initial tweet described another example of this finding following EBUS-TBNA (Figure 1, D). The idea of a formal study was proposed in the second tweet, leading to an international, multi-institutional study with recruitment of coinvestigators exclusively online (Figure 2).[9]

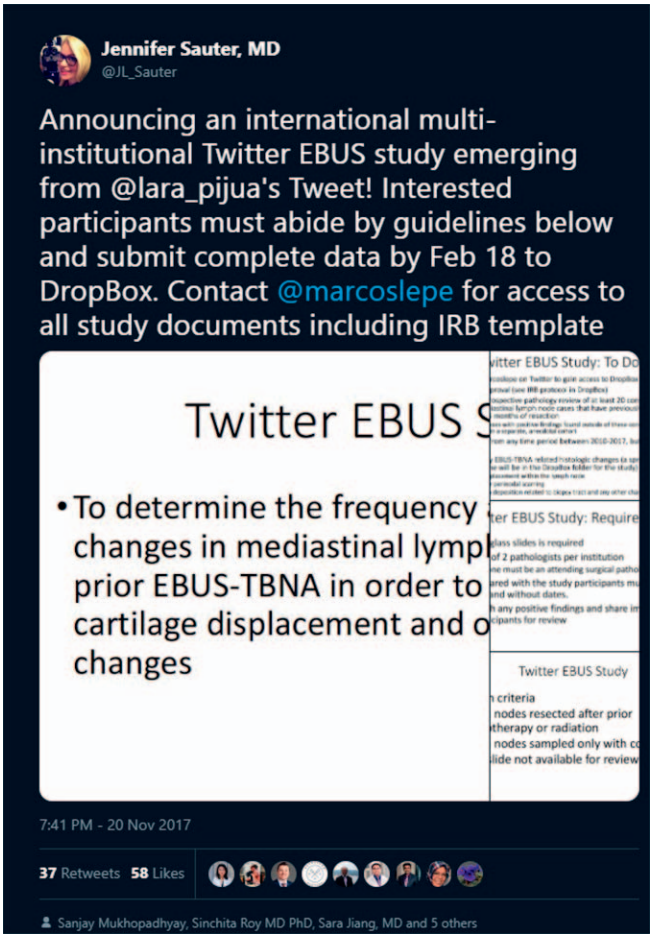

Figure 2. *Dr Sauter's tweet announcing the study along with the study criteria and instructions on how to participate.*

Study Design

Pathologists worldwide were invited to participate in the study via a tweet containing a few simple instructions.[9] All study communication occurred via Twitter either by using the hashtag #EBUSTwitter[10] or through the direct messaging function (Figure 1, A). All communication between pathologists involved in the study occurred via this direct messaging group, including clarification of methodology, follow-up questions regarding submitted data, deadline reminders, and questions regarding the manuscript, among others.

We anticipated that a study that involved so many institutions would require differing amounts of work in creating an Institutional Review Board (IRB) approval request document, so we created a generic version that could then be tailored to each institution; this document was placed in our Dropbox folder (Figure 1, B). For those authors who were based in countries without IRB, the local ethics committee or equivalent reviewed the study, where required, and these authors followed the same procedures as all other authors to de-identify the data they generated.

After obtaining IRB approval from their respective institutions (if required), contributing pathologists retrospectively reviewed 20 consecutive mediastinal lymph node resections following sampling by EBUS-TBNA, and examined them specifically for biopsy site changes. Each case was assigned an arbitrary study case number (ie, Lepe case 1, Lepe case 2, etc), and deidentified data were entered into Excel spreadsheets and uploaded to a private folder using an online file hosting service (Dropbox). Deidentified photomicrographs of lymph nodes with suspected biopsy site changes were uploaded and submitted for central review by 5 experienced pathologists from different institutions.

RESULTS

A total of 24 pathologists from 14 institutions in 5 countries participated in the study within 143 days of study conception. The pathologists who collaborated on the social media (#EBUSTwitter) aspect of our study are represented in Figure 3. Together, the contributing pathologists collected and analyzed a total of 297 cases. The time interval between study conception and abstract submission was 163 days. The interval between study conception and acceptance of the manuscript for publication was 346 days. A unique feature of this study was that the entire sequence of events (from the tweet that initiated the study to abstract submission and acceptance, to acceptance of the manuscript) is documented online in the form of tweets that are easily accessible to the public.

Of note, most participants in this study did not meet face to face "in real life" (offline). Participating pathologists reported that, on average, each author had met only 3 other coauthors in this study offline. Eight participants reported meeting only 1 other coauthor offline. The hashtag

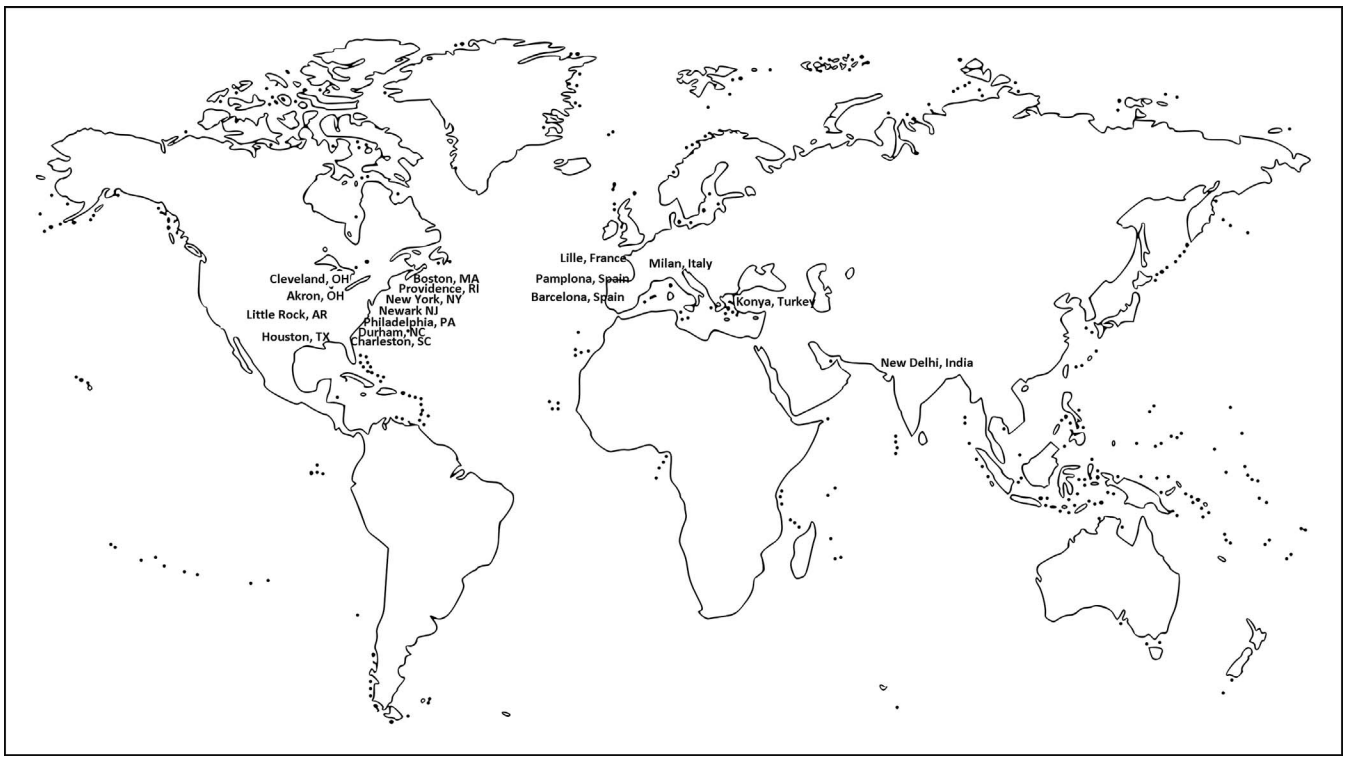

Figure 3. *#EBUSTwitter author international collaborator map.*

#EBUSTwitter created 249 000 impressions (potential tweet-views) and more than 100 tweets. The pathologic findings of our study are published separately.[11]

DISCUSSION

To our knowledge, this is the first time that a pathology study has been conceived and executed from start to finish on a social media platform. The use of Twitter and other online tools as platforms for facilitating academic collaboration offers several advantages, including public documentation of key research ideas, rapid recruitment of collaborators from geographically disparate locations worldwide, public commentary from clinicians and other pathologists regarding the importance and validity of the project, convenient real-time communication between pathologists in different time zones, and the inclusion of pathologists in nonacademic and in resource-poor academic settings who may not have access to academic scientific collaboration via traditional routes. This study was particularly inclusive in that it was relatively inexpensive to carry out and any pathologist with a microscope and a smartphone could participate.

This type of collaboration is facilitated by recent advances in technology, such as cloud storage and faster Internet speeds (either through Wi-Fi or 4G LTE), which allow the rapid transmission and sharing of high-fidelity data among pathologists around the globe in the form of high-quality photomicrographs or data sets. Social media platforms, such as Twitter, facilitate relatively rapid recruitment of multiple participants worldwide and allow them to analyze cases from their local institutions in parallel with others. The inclusion of pathologists of different backgrounds and from different practice settings generates a wide array of ideas, opinions, and visions, contributing to the diversity of such studies. The participation of pathologists from different time zones allows coauthors to work on manuscripts around the clock. Twitter's direct messaging function facilitates communication between study authors (Figure 1, A) using a single location for all study communication that can be accessed at each author's convenience, rather than cluttering up personal or work-related email inboxes with several messages daily. We found Dropbox to be a convenient tool for sharing and editing documents, and modifying manuscripts in real time, especially given the involvement of several authors in different time zones. However, not all participating institutions allow access to Dropbox on workplace computers, which limited access for some participants who could only use Dropbox from their personal computers or handheld devices. An additional aspect of this study that facilitated participation is the ability to perform it and incur no expenses, because of the retrospective nature of this histologic review of currently available materials. This point should be taken into consideration if future collaborations are being considered.

At the same time, we do acknowledge that there are challenges associated with an online platform where public tweets are openly accessible to all. The prospect of being "scooped" by sharing a novel research idea publicly prior to publication may cause consternation for some investigators. Privacy concerns may dissuade others. Although our study was mainly histologic, and we took great precautions to ensure that no patient-identifying information was collected or shared, this approach might not be suitable (or possible) for other types of studies that require extensive collection of clinical data. This method may also not be suitable for more complex study designs, involving as it is difficult-to-control variables across multiple institutions. The authors' interactions with their respective institutional ethics committees or IRB (to attain approval) were subject to a range of different

experiences; some institutions quickly recognized the minimal risk associated with this histologic study and expedited approval, whereas others imposed onerous and complex requirements that precluded provision of study data in a timely manner. This is a point that must be taken into consideration when engaging in such a study, that is, there may be willing participants who are held back by complex legal and institutional requirements.

One author was not able to contribute cases to the study because of an inability to complete the IRB approval process in the given time frame. The nature of this study—having multiple institutions in different countries and time zones—meant that we had to set a deadline to start collecting data. Most IRB approvals occurred before the set deadline, except for this 1 instance where IRB approval was not completed because of that specific institution's processes.

One of the authors (J.G.) has previous experience in gaining IRB approval for a different type of project using social media to survey patients. He found that contacting the IRB to discuss the details of the project prior to submitting a protocol was a helpful way to build rapport, ease concerns about the project, and learn what details need to be included in the written IRB protocol to minimize delays and to maximize the chances of approval. These experiences underscore the need to communicate and engage with institutions about the role and potential of social media to serve as an extension of traditional academic and research pursuits. There needs to be education and awareness brought to our peers in terms of what exactly can be accomplished with social media and what steps can be taken to facilitate research while ensuring that protected health information is kept secure.

We recognize the potential risks of undertaking such a research project entirely online, yet steps can be taken to prevent the accidental exposure of protected health information (for specifics, please see the main #EBUSTwitter study paper).[11] The sharing of deidentified data in spreadsheets is not a unique aspect of this online collaboration, because such sharing is common in conventional multi-institutional collaborations or even when all study pathologists belong to the same institution. In our study, we ensured that no identifiers (including dates) were present before spreadsheets were uploaded to the cloud; even after upload, documents in the cloud were closely monitored for compliance.

In summary, this study demonstrates that social media can serve as a platform for generating a research idea, recruiting collaborators from widely disparate geographic locations and practice settings with a wide range of resources, and rapidly implementing and completing a multi-institution pathology study leading to publication in an indexed, peer-reviewed journal. This novel use of multiple technologic tools provided by social media platforms can potentially facilitate research on a global scale.

References

1. Cohen D, Allen TC, Balci S, et al. #InSituPathologists: how the #USCAP2015 meeting went viral on Twitter and founded the social media movement for the United States and Canadian Academy of Pathology. *Mod Pathol*. 2017;30:160–168.

2. Isom J, Walsh M, Gardner JM. Social media and pathology: where are we now and why does it matter? *Adv Anat Pathol*. 2017;24(5):294–303.

3. Fuller M, Gardner JM, Crane GM, et al. # PathJC: the founding and success of the first Twitter pathology journal club. Paper presented at: United States and Canadian Academy of Pathology 2017 Annual Meeting; March 4–10, 2017; San Antonio, TX.

4. Ortega JL. The presence of academic journals on Twitter and its relationship with dissemination (tweets) and research impact (citations). *Aslib J Inf Manage*. 2017;69(6):674–687.

5. Ke Q, Ahn YY, Sugimoto CR. A systematic identification and analysis of scientists on Twitter. *PLoS One*. 2017;12(4):e0175368.

6. Hayon S, Tripathi H, Stormont IM, Dunne MM, Naslund MJ, Siddiqui MM. Twitter mentions and academic citations in the urologic literature. *Urology*. 2019; 123:28–33.

7. Mukhopadhyay S (@smlungpathguy). You learn so much on Twitter. From @lara_pijuan I learned that EBUS-TBNA can push cartilage into lymph nodes. Does anyone know if this has been reported before? Anyone interested in doing a study of EBUS-TBNA changes in mediastinal lymph nodes? @Missle @pembeoltulu #Cytopath. https://twitter.com/smlungpathguy/status/931569851331764224. Posted November 17, 2017.

8. Pijuan Andújar L (@lara_pijuan). Fibrosis in mediastinal lymph node (4R) post-chemo&radiotherapy for N2 positivity (lung adenoca). Inclusion of Cartilage from #EBUS #pulmpath. https://twitter.com/lara_pijuan/status/800833905599266816. Posted November 21, 2016.

9. Sauter J. (@JL_Sauter). Announcing an international multi-institutional Twitter EBUS study emerging from @lara_pijua's Tweet! Interested participants must abide by guidelines below and submit complete data by Feb 18 to DropBox. Contact @marcoslepe for access to all study documents including IRB template. https://twitter.com/JL_Sauter/status/932816176459153408. Posted November 20, 2017.

10. Lepe M (@MarcosLepe). #EBUSTwitter is registered!!! @smlungpathguy @JL_Sauter @Sara_Jiang @Sinchita_Roy @JMGardnerMD @pembeoltulu @limperio_v @LizaMQuintana @VandaTorousMD @tlabiano @lara_pijuan @NJanakiMD @AmyHDeekenMD @RoseannIWu @r. https://twitter.com/marcoslepe/status/937132512475860992. Posted December 2, 2017.

11. Doxtader EE, Pijuan L, Lepe M, et al. Displaced cartilage within lymph node parenchyma is a novel biopsy site change in resected mediastinal lymph nodes following EBUS-TBNA. *Am J Surg Pathol*. 2019;43(4):497–503.