

## Original article

# Trends of social networks in the American College of Surgeons Clinical Congress and the Congreso Nacional de Cirugía. Analysis of the #ACSCC20 and #CNCirugia2020<sup>☆</sup>

Sergi Sanchez-Cordero,<sup>a,\*</sup> Salvador Morales-Conde,<sup>b</sup> Raquel Sánchez Santos,<sup>c</sup>  
Inés Rubio Perez,<sup>d</sup> Roser Farré Font,<sup>e</sup> Jose Luis Ramos Rodriguez,<sup>f</sup>  
José M Balibrea del Castillo,<sup>g</sup> Julio Mayol<sup>h</sup>

<sup>a</sup>Hospital Universitario de Igualada, Igualada, Barcelona, Spain

<sup>b</sup>Hospital Universitario Virgen del Rocío, Sevilla, Spain

<sup>c</sup>Hospital Álvaro Cunqueiro, Vigo, Pontevedra, Spain

<sup>d</sup>Hospital Universitario La Paz, Madrid, Spain

<sup>e</sup>Fundación Althaia, Manresa, Barcelona, Spain

<sup>f</sup>Hospital Universitario de Getafe, Getafe, Madrid, Spain

<sup>g</sup>Hospital Clínic de Barcelona, Barcelona, Spain

<sup>h</sup>Hospital Clínico San Carlos, Instituto de Investigación Sanitaria San Carlos, Universidad Complutense, Madrid, Spain

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## A B S T R A C T

**Aim:** The objective of this study is to analyze the impact of the congresses of the American College of Surgeons (ACSCC2020) and the National Surgery Congress of the Spanish Association of Surgeons (CNC2020) in virtual format due to the SARS-CoV2 pandemic according to the fingerprint.

**Material and methods:** The Twitter hashtags # ACSCC20 and # CNCirugia2020 were studied to determine tweets, retweets, users and impressions. The data on the accounts with the greatest influence and the historical evolution of the congresses between 2015 and 2020 were analyzed. We used the symplur software to collect and analyze the data.

**Results:** Between 2015 and 2017 there was a consistent increase in the number of tweets, participants and impressions. Between 2018 and 2020, the ACS maintains the number of impressions with the fewest number of tweets. However, the CNC continues to grow and achieves its best metrics in 2020. We found statistically significant differences between the most prolific accounts of the ACSCC versus the CNC ( $P < .002$ ) but there are no differences between the 10 most influential accounts ( $P = .19$ ) or the accounts with the highest number of impressions ( $P = .450$ ).

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\* Corresponding author.

E-mail address: [sergi.sanchezcordero@gmail.com](mailto:sergi.sanchezcordero@gmail.com) (S. Sanchez-Cordero).

*Conclusions:* Virtual congresses generate a global impact through the use of Twitter for the dissemination of knowledge. In the present 2020, the growth of the impact on social networks has been proportionally greater in the CNC than in the ACSCC. However, the ACS virtual congress generated the greatest impact on social networks measured by the number of users, tweets and impressions between 2015 and 2020.

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## Resultados y evolución histórica de las redes sociales en el American College of Surgeons Clinical Congress y el Congreso Nacional de Cirugía. Análisis del #ACSCC20 y #CNCirugia2020

### R E S U M E N

#### Palabras clave:

Twitter

Redes sociales

Impresiones

American College of Surgeons

Clinical Congress

Asociación española de Cirujanos

Congreso Nacional de Cirugía

COVID19

*Objetivo:* El objetivo de este estudio es analizar el impacto de los congresos del American College of Surgeons (ACSCC2020) y Congreso Nacional de Cirugía de la Asociación Española de Cirujanos (CNC2020) en formato virtual por la pandemia SARS-CoV2 según la huella digital.

*Material y métodos:* Se estudiaron los hashtags de Twitter #ACSCC20 y #CNCirugia2020 para determinar tuits, retuits, usuarios e impresiones. Se analizaron los datos sobre las cuentas con mayor influencia y la evolución histórica de los congresos entre 2015 y 2020. Utilizamos el software symplur para la recogida y análisis de los datos.

*Resultados:* Entre 2015 y 2017 hubo un incremento consistente en el número de tuits, participantes e impresiones. Entre 2018 y 2020, el ACS mantiene el número de impresiones con menor cantidad de tuits. Sin embargo, el CNC sigue creciendo y logra sus mejores métricas en el presente 2020. Encontramos diferencias estadísticamente significativas entre las cuentas más prolíficas del ACSCC frente al CNC ( $P < .002$ ) pero no existen diferencias entre las 10 cuentas más influyentes ( $P = ,19$ ) o las cuentas con mayor número de impresiones ( $P = ,450$ ).

*Conclusiones:* Los congresos virtuales generan un impacto global a través del uso de Twitter para la diseminación de conocimiento. En el presente 2020 el crecimiento del impacto en redes sociales ha sido proporcionalmente mayor en el CNC que en el ACSCC. No obstante, el congreso virtual del ACS generó mayor impacto en las redes sociales medido por el número de usuarios, tuits e impresiones entre 2015 y 2020.

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## Introduction

Medical conferences play an important role in the continuous professional development, providing unique learning resources and professional development opportunities, such as self-promotion, networking and face-to-face interaction with attendees and expert speakers.

Social networking has become an integral part of medical education and communication and is considered an essential part of everyday clinical practice and modern research<sup>1</sup>. Social media now provides a platform for sharing and discussing developments at surgical congresses and networking within the surgical community<sup>2</sup>. Several medical specialties have published the benefits of live tweeting during their congresses<sup>3</sup> to complement the barrier of physical attendance<sup>4</sup>. The value of social media for surgical research is increasingly documented<sup>5,6</sup>, and growing communities find their place in surgical specialties such as plastic surgery<sup>7</sup>, and colorectal surgery<sup>8</sup>.

However, the worldwide COVID-19 pandemic has brought about unprecedented changes for healthcare workers and organisations, both in the conduct of their daily work and in opportunities for education, specialised training and networking. Healthcare professionals have had to resort to e-learning, often with a specific focus on COVID-19, and during 2020 many local, national and international congresses, courses and conferences were cancelled altogether, leading to a theoretical decline in learning and professional development<sup>9</sup>.

The American National Congress of Surgery organised by the American College of Surgeons (ACS) and the National Congress of Surgery promoted by the Spanish Association of Surgeons (CNC) are two of the most important national and international congresses that decided to adapt the programme to a freely accessible virtual format in order to be able to hold their congresses despite the pandemic, with an optimal development for their attendees adapted to the digital environment.

There are currently few studies that analyse the impact of the use of Twitter during medical congresses, although most

meetings use social networks to generate dissemination and enhance the value of the conferences<sup>10,11</sup>. No other published study has comparatively analysed the influence of Twitter on attendance and participation at surgical congresses between congresses in different countries.

We hypothesise that conference attendance would be strongly associated with overall Twitter activity as determined by metrics of total tweets, impressions, retweets and replies.

The main objective of this study was to evaluate the use of Twitter in the American and Spanish national congresses in virtual format held in 2020. To do so, we analysed the tweets, retweets and impressions before, during and after the congress according to the official hashtags (#ACSCC2020 and #CNCirugia2020). Secondary objectives included assessing the historical evolution of each individual congress and its impact on Twitter; analysing and comparing the behaviour of the groups of accounts with the highest impact for each congress, and evaluating possible factors contributing to the dissemination of the tweets.

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## Methods

We present this cross-sectional study with data collected on the use of Twitter in the American College of Surgeons (ACS) virtual congress of surgery between 3rd and 7th October 2020 and the national virtual congress of surgery promoted by the Spanish Association of Surgeons (ACS) held from 11th to 14th November 2020.

We analysed the activity of the congresses according to the hashtags #ACSCC2020 and #CNCirugia2020 promoted by the organising entities and registered in Symplur Upland, CA, USA (<http://www.symplur.com/>), a web platform designed by researchers at Stanford University that provides detailed information on Twitter activity around a registered hashtag “#”, to be captured and analysed as part of its HealthCare Hashtag Project. The temporal distribution and the accounts that generated them are also known. The content of the hashtags can refer to a disease, a health topic or, more frequently, the name of an event, a congress or a scientific community.

A time period for data collection was established. For the American National Congress of Surgery (ACSCC) held between 3rd and 7th October, data collection took place between 2nd and 15th October. For the National Congress of Surgery (CNC) held from 11 to 14th November, data collection took place between 16th October and 15th November. The data collection period for the CNC included a three-week period prior to the congress in which virtual colloquia were held as part of the congress programme. The American College of Surgeons (ACS) and the Spanish Association of Surgeons (AEC for its initials in Spanish) developed for the first time an independent virtual platform with free access for attendees where all the congress activity was focused due to the COVID-19 epidemic that discouraged face-to-face meetings. Likewise, the data corresponding to the 2015–2019 editions of the National Congress of Surgery and the American College of Surgeons Clinical Congress were retrospectively collected according to the official hashtags registered on the Symplur platform.

The following parameters were collected: number of participants, number of tweets, tweets per participant, tweets per hour and impressions. Tweets are the activity generated by an account on its profile and retweets are the reposting of one's own or another person's tweet. Impressions are a measure of impact defined by the number of times a post has been seen on users' timeline or homepage; they are obtained by the formula: number of tweets × participant × total followers during the period evaluated.

The most influential participants (as measured by Symplur) are individuals or organisations with established profiles whose social networks are very large. The most prolific participants and those with the highest number of impressions are also collected. An influencer is a person who has credibility on a specific topic with the ability to mobilise opinions and create reactions in their followers. They are opinion leaders and media figures within an area or sector<sup>12</sup>. These users were very active in using hashtags, mentions and promoting conversation among participants<sup>13</sup>.

We rank the most influential users according to Symplur's algorithm. SymplurRank is an algorithm developed by Symplur to accurately identify and rank the true influencers of any health conversation. This algorithm ranks influencer accounts by measuring the number of quality mentions received and giving them a final score. The quality of a mention is determined by the account that made the mention and that account's own influence on the topic in question, its position in the health sector and its overall influence on health social networks.

Descriptive data are presented in absolute numbers and percentages. Twitter data and congress attendance were analysed annually, not cumulatively, and then compared by year. IBM SPSS statistical software, version 22 (SPSS, Chicago, IL, USA) was used for data analysis. Statistical significance was defined as  $P < .05$ . Data analyses were conducted on publicly available information. Twitter users included in the analysis agree to participate in accordance with Twitter's general terms and conditions of use<sup>14</sup>.

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## Results

According to the results collected for the hashtag #ACSCC20, the number of participants was 3244. The Twitter activity measurements were a total of 10,418 tweets, an average of 33 tweets/hour, 3 tweets per participant and 81.130 million impressions. For the hashtag #CNCirugia2020 the number of participants was 478. The activity measurements on Twitter were a total of 3088 tweets, an average of 18 tweets/hour, 6 tweets per participant and 13.237 million impressions (Table 1). The busiest day was 12 November, with a total of 698 tweets.

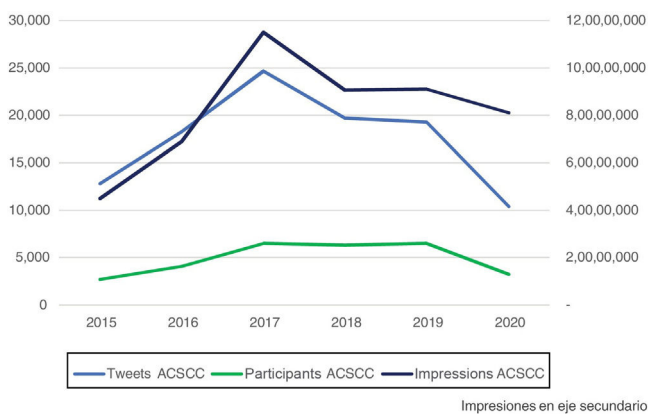
User activity was calculated using the ratio of active users, which is the quotient between users and the activity generated through tweets during the congress (Table 1). In 2020, the ratio of active users for the ACSCC was 3.21 tweets/user, and 21.76 tweets/user for the CNC. On the other hand, the ratio of active congress participants has been calculated for each congress, and the ratio of active congress participants is the quotient between those registered for the congress and the tweets

**Table 1 – Historical evolution of tweets, participants, impressions and ratios per congressman and user per year.**

Year	[0,2–3]Tweets		[0,4–5]Participants in Twitter		[0,6–7]Impressions		[0,8–9]Ratio of active users (tweets/participant)		[0,10–11]Ratio of active congress attendees (tweets/attendee)	
	ACSCC	CNC	ACSCC	CNC	ACSCC	CNC	ACSCC	CNC	ACSCC	CNC
2015	12,800	483	2700	102	45,000,000	830,000	4.74	4.74	2.41	10.61
2016	18,300	3049	4100	398	69,100,000	5,800,000	4.46	7.66	1.58	3.3
2017	24,700	2028	6500	345	115,100,000	4,700,000	3.8	5.88	1.07	2.77
2018	19,700	5200	6300	830	90,700,000	9,600,000	3.13	6.27	1.07	1.48
2019	19,300	2329	6500	528	91,100,000	4,740,000	2.97	4.41	1.03	2.14
2020	10,418	10,400	3244	478	81,130,000	13,237,000	3.21	21.76	9.25	5.84

generated during the congress Table 1). In 2020, a ratio of 9.25 tweets/congress participant was generated in the ACSCC and a ratio of 5.84 tweets/congress participant in the CNC. The busiest day was 5 October, with a total of 2345 tweets.

According to data collected by Symplur and published in the article by Santarone et al.<sup>15</sup>, between 2015 and 2017 the ACSCC saw a steady and significant increase in the number of tweets: from 12,800 in 2015 to 18,300 in 2016 and 24,700 in 2017. However, in 2018 and 2019, tweets dropped significantly to 19,700 and 19,300, respectively. Impressions reflected a similar trend, with a progressive increase and a peak of activity in 2017 of 115.1 million, up from 45 million in 2015 and 69.1 million in 2016. However, impressions dropped significantly by 24 million impressions from 2017 to 2019 (from 115.1 million to 91.1 million) despite the growth in participants: from 2700 in 2015 to 4100 in 2016 and approximately 6500 in 2017–2019 (Fig. 1). Still, the 2020 ACSCC continues to show a decreasing trend in the number of impressions, with a total of 81.130 million in 2020 compared to 91.1 million in 2019. The number of users and the number of tweets shows a more notable decrease: from 6500 participants in 2019 to 3244 in 2020, and from 19,300 tweets in 2019 to 10,400 tweets in this congress in virtual format. This represents a 45% drop in the number of

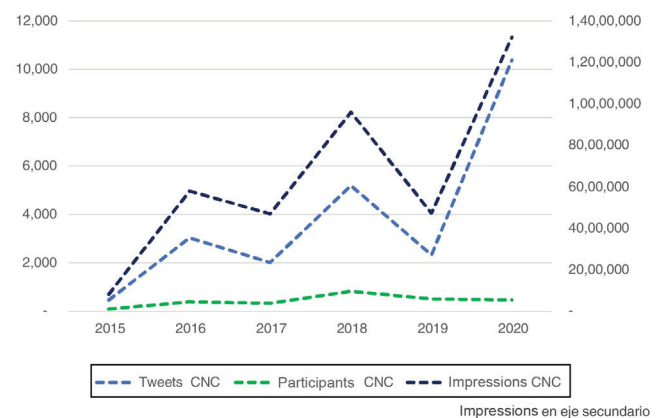


**Fig. 1 – Evolution of the number of tweets, participants and impressions of the ACSCC between 2015 and 2020. There is a growth in tweets and impressions until 2017. Subsequently, the number of tweets falls, but the overall number of impressions is maintained. The number of participants is stable over the years.**

participants and a 40% drop in the number of tweets, although the overall impact of the congress on the networks in terms of number of impressions has been maintained.

At the CNC, the years 2015–2018 have shown an increase in Twitter usage with a less consistent trend in terms of: a) number of tweets: 483 in 2015, 3049 in 2016 and 2028 in 2017; b) number of participants: 102 in 2015, 398 in 2016 and 345 in 2017; and c) impressions: 830,000 in 2015, 5.8 million in 2016 and 4.7 million in 2017, respectively. The data shows a peak of activity in 2018, with 830 participants generating 5200 tweets and a total of 9.6 million impressions. However, last CNCirugia2020 grew more than sixfold in the number of tweets: from 2329 in 2019 to more than 10,000 in 2020. Impressions have increased from a total of 4.7 million in #CNCirugia2019 to more than 13 million in #CNCirugia2020, despite a 9.4% drop in the number of participants (Fig. 2).

Tables 2 and 3 summarise the demographics of the participants on Twitter. The 10 most influential #ACSCC20 accounts according to Symplur’s algorithm had an average score of 64.6 (±17.4). However, the 10 most influential accounts generated an average of 5.9 million (±4.3 million) per account and a total of 73.7% of the congress’ total impressions. Among the 10 most prolific accounts of the congress, a total of 2300 tweets were generated, an average of 230 (±170.5), accounting



**Fig. 2 – Evolution of the number of tweets, participants and impressions of the CNC between 2015 and 2020. We observe a growth in the number of tweets and impressions over the years. The number of participants remains stable over the years.**

**Table 2 – Most influential, most prolific accounts and those that generated the highest number of impressions. The top 10 most influential accounts of #ACSCC20 generated an average of 5.9 million ( $\pm 4.3$  million) per account and a total of 73.7% of the total impressions of the congress.**

[0,1–6]#ACSCC20					
[0,1–2]Most influential		[0,3–4]Most prolific		[0,5–6]Most impressions	
***AmCollSurgeons	100	***pferrada1	654	***juliomayol	12,900,000
***Swexner	83	***TomVargueseJr	335	***pferrada1	11,300,000
***pferrada1	79	***juliomayol	297	***NeilFlochMD	9,300,000
***TomVargheseJr	64	***SWexner	227	***AmCollSurgeons	7,800,000
***juliomayol	63	***PipeCabreraV	185	***TomVargheseJr	7,300,000
***pturnermd	58	***Cirbosque	163	***Swexner	4,300,000
***PipeCabreraV	53	***MISIRG1	137	***JosephSakran	2,500,000
***NeilFlochMD	51	***AmCollSurgeons	119	***NEJM	1,500,000
***Cirbosque	49	***1980_welsh	94	***Cirbosque	1,500,000
***WomenSurgeons	46	***arwmd	87	***WomenSurgeons	1,400,000

Source: Symplur.

**Table 3 – Most influential, most prolific accounts and those that generated the highest number of impressions. The 10 most influential accounts generated an average of 1.2 million ( $\pm 2.4$  million) impressions per account and a total of 86.9% of the congress's total impressions.**

[0,1–6]#cncirugia2020					
[0,1–2]Most influential		[0,3–4]Most prolific		[0,5–6]Most impressions	
***aecirujanos	100	***aecirujanos	389	***juliomayol	7,700,000
***cncirugia2020	93	***cncirugia2020	265	***aecirujanos	3,500,000
***smoralesconde	82	***cjGomez	234	***Some4Surgery1Tl	379,000
***juliomayol	76	***Some4Surgery1Tl	183	***CelestinoGutirr	369,300
***raquelsanchezdr	74	***juliomayol	173	***cjGomez22	265,500
***cjGomez22	69	***rafagdiaz gobbo	120	***cncirugia2020	212,300
***rafagdiaz gobbo	63	***smoralesconde	108	***smoralesconde	208,700
***InesRPsurg	60	***raquelsanchezdr	108	***raquelsanchezdr	149,500
***Cesar_Ginesta	59	***Wigorita	63	***coloproctoac	102,500
***aecformacion	56	***CelestinoGutirr	44	***rafagdiaz gobbo	98,200

Source: Symplur.

for 70.8% of the total activity. These accounts are independent and are listed in [Table 3](#).

The 10 most influential accounts of #CNCirugia2020 according to Symplur's algorithm generated an average of 73.2 ( $\pm 14.8$ ). Furthermore, the 10 most influential accounts generated an average of 1.2 million ( $\pm 2.4$  million) impressions per account and a total of 86.9% of the total impressions of the congress. The 10 most active accounts generated a total of 1687 tweets, an average of 168 ( $\pm 104.7$ ), accounting for 48% of the total activity.

If we compare the results between the accounts with the highest interest in each congress, we see that there are no statistically significant differences between the accounts with the highest number of impressions ( $P = .450$ ) or the 10 most influential according to the Symplur algorithm ( $P = .198$ ). However, there are statistically significant differences between the most prolific accounts ( $P < .002$ ) of the ACS congress (2298 tweets) and the CNC (1687 tweets) ([Table 4](#)).

Finally, according to Symplur's algorithm, the official accounts @AmCollSurgeons with 67,600 followers (as of 27 January 2021) and @AECirujanos with 9448 followers (as of 27 January 2021) are the most influential accounts for their respective events. The @AmCollSurgeons, with a total of 119

tweets, generated an impact of 7.8 million impressions. The @AECirujanos generated 3.1 million impressions on the recent #CNCirugia2020, with a total of 389 tweets, twice as many impressions (1.7 million) as on the previous #cncirugia2019.

## Discussion

The complexity of the year 2020 due to the SARS-CoV-2 pandemic and the adaptation of the congresses to the virtual environment has generated the highest activity in number of tweets and retweets registered in a national surgical congress during the CNCirugia2020. During the months of October and November, the American and Spanish national congresses were held virtually with the official hashtags #ACSCC2020, #CNCirugia2020 with a remarkable impact on social networks. Our study shows that in the ACSCC there is an increasing trend between 2015 and 2017, followed by a decrease in activity between 2018 and 2020. In the CNC there is an increasing impact between 2015 and 2020 of the activity generated on Twitter, with a peak of activity at the 2018 national congress.

One of the determining factors in the reduction of overall activity at the ACSCC could be the decrease in social activities

**Table 4 – Comparison between the top 10 accounts of each congress (mean and SD). Mann-Whitney test. There are statistically significant differences between the most prolific accounts of the ACSCC and CNC congresses.**

	[0,2-4]Outstanding accounts of #ACSCC20 y #CNCirugia2020		P
	ACSCC Mean (SD)	CNC Mean (SD)	
Top 10	64.6 (17.5)	73.2 (14.86)	.198
Influential	5,980,000 (4,324,555.2)	1,298,500 (2,475,673.1)	.450
Prolific	2298 (170.5)	168.7 (104.7)	.002

Data obtained from Symplur.

that generated tweets with little scientific content but which included the conference hashtag, as shown in the article by Sharp et al.<sup>2</sup> The exceptional nature of the events, the high workload and the possibility of accessing the conference from any device has meant that most of the professionals registered at the congress have maintained their daily healthcare activity while combining their presence at the congress by greatly reducing their contribution on twitter.

By calculating the ratios of active users and congress participants with activity on Twitter, we can see that over the years the activity produced has been maintained during the ACSCC and has shown increasing results in the CNC. The decrease in participation, impressions and tweets does not translate in this case into lower activity ratios. The exceptional nature of this year, together with the holding of two congresses in virtual format with free access, has boosted the ratios of congress participants with activity in both congresses. In the same way, the effort made by the AEC to encourage the use of social networks for the dissemination of its scientific content has produced a ratio of active users 5 times higher than in most previous years.

Social media attracts a lot of attention from academic surgeons, journals and surgical societies because of the visibility it generates and the global network it can influence. Virtual congresses allow global access and interaction with surgeons worldwide in real time, enriching the congress experience and interaction with personalities who cannot attend in person. Twitter is currently the most widely accepted social network for the dissemination of knowledge at medical congresses. Even so, the widespread use of podcasts, YouTube and blogs raises the need to adapt our knowledge dissemination by using all available technological tools.

The development of virtual congresses due to the SARS-CoV-2 pandemic has led to the emergence of international accounts that generate great impact during the development of the congress. This study analyses the most influential accounts and allows us to detect profiles of surgeons with great activity in national congresses whose global impact and influence extends beyond the limits of their territory. These surgeons are the ones who generate the most tweets, but they also top the lists of tweets with the most impressions. An example of this is @juliomayol, who in the American congress has achieved a total of 12.9 million impressions with a total of 297 tweets. If we divide the total number of impressions by the number of tweets, @juliomayol has a ratio of more than 43,300 views per tweet published at the ACSCC. At the national surgery congress, it reached a total of 6.9 million and 173 tweets, with a ratio of 39,800 views per tweet published,

making it the account with the greatest influence at both congresses.

Undoubtedly, the CNC and ACS are the two most important national surgical congresses in each country; however, the difference in magnitude between the two and the digital footprint of each makes comparison between the two events difficult.

We found some limitations in this study. Firstly, the most accurate measure of the magnitude of the reach of congresses on social media is not established. In addition, tweets generated with congress content that do not include the official hashtag are not counted in the measurements. Even so, this study quantitatively and qualitatively accounts for the use of social media at a national AEC surgery congress, and is the first to compare two national congresses in virtual format in two different countries.

Another of the study limitations is the difference between the data collection periods. The National Congress of Surgery organised a series of colloquium talks as a pre-congress course that generated congress-related activity in the month prior to the congress with the aim of increasing virtual participation during the congress. Even so, the absolute data for the national congress does not exceed the American national congress, a bias that does not dilute the difference between the two congresses. For the National Congress of Surgery, the rest of the collection periods are from the month prior to the congress and the dates of the congress, except for the 2019 congress, where the collection dates are focused on the days of the congress. On the other hand, we do not have the data collection periods for the rest of the years prior to 2020 for the ACSCC congress.

The growing impact of the use of social media at medical congresses improves the training and education of surgeons globally. Virtual congresses generate global impact through the use of Twitter for knowledge dissemination. However, efforts must continue to sustain this growth with high scientific value.

Despite the convenience and abundance of information on the internet, face-to-face medical conferences remain irreplaceable. It is likely that the combination of online platforms with face-to-face learning materials can improve education and professional training in surgery and the other medical specialties.

Finally, the digitalisation of medical congresses, interaction through digital platforms and the creation of collaborative research networks in social networks raises the need for scientific societies to include training for residents in order to take advantage of a global community that is growing

exponentially, eliminating barriers to the dissemination of knowledge and improving the training of surgeons and the health of their patients.

## Conclusion

In conclusion, with the data obtained in this study, the National Congress of Surgery in virtual format has increased its impact on Twitter. However, the virtual congress of the American College of Surgeons has not managed to generate a greater reach in the metrics collected. The ACS virtual congress has generated greater social media impact as measured by the number of users, tweets and impressions between 2015 and 2020. Twitter activity during the ACS and ACS national congresses has been increasing until 2017. In the current 2020, the growth in social media impact has been proportionally higher at the CNC than at the ACSCC. Among the most prolific accounts there are differences in the number of tweets. However, there are no significant differences between the accounts with the highest impact. Even so, the ACSCC has much higher absolute reach numbers than the CNC.

## Conflict of interests

The authors have no conflict of interests to declare.

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