



ORIGINAL ARTICLE

Cutting through the noise: unravelling the web of misinformation in surgical social networks



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Medical education;
Misinformation;
Online communication

Abstract

Introduction: Social media, a pervasive platform for real-time communication, harbours both the potential for rapid information dissemination and the risk of spreading misinformation. While it has become an indispensable platform for global communication, concerns arise regarding its role in disseminating healthcare information. This study examines the impact of healthcare-related information on social media, particularly focusing on influential surgical accounts. It investigates the quality of content shared by these accounts and compares it with current scientific evidence.

Materials and methods: A retrospective study was conducted to evaluate the accuracy of information presented on platforms of influential surgical accounts on social media, including YouTube, TikTok, and Instagram. A sample of surgical influencers, encompassing general surgery and subspecialties, was examined. Their content was retrospectively compared against current scientific evidence related to their respective surgical topics.

Results: The evaluation reveals a diverse landscape regarding the accuracy of healthcare information shared by surgical influencers on social media. While some content aligns with evidence-based practices, there is a notable presence of misinformation and inaccuracies. This highlights the potential consequences of social media on healthcare information dissemination, emphasizing the importance of accurate and evidence-based content.

Conclusion: The study acknowledges the significant influence of these accounts, especially among young people, and underscores the need for responsible information sharing in the medical field due to the potential impact of inaccurate content on healthcare decision-making. Surgical influencers often neglect to provide references of evidence-based information and instead rely on personal experience, posing risks of misinformation and ethical concerns on social media platforms.

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PALABRAS CLAVE

Información de Salud;
Redes Sociales;
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Contenido Basado en
Evidencia;
Educación Médica;
Desinformación;
Comunicación en Línea

Navegando a Través del Ruido: Desentrañando la Red de Desinformación en las Redes Sociales Quirúrgicas**Resumen**

Introducción: Las redes sociales, plataformas necesarias para la comunicación en tiempo real, albergan tanto el potencial para la rápida difusión de información como el riesgo de propagar desinformación. Aunque son indispensables para la comunicación global, surgen preocupaciones sobre su papel en la difusión de información del área de la salud. Este estudio examina el impacto de la información relacionada con la salud en las redes sociales, centrándose particularmente en cuentas de influencers con contenido quirúrgico, y analiza la calidad del contenido compartido por estas cuentas.

Materiales y Métodos: Se llevó a cabo un estudio retrospectivo para evaluar la precisión de la información presentada en las plataformas de influencers con cuentas de contenido quirúrgico, incluyendo YouTube, TikTok e Instagram. Se examina una muestra de influencers quirúrgicos, abarcando cirugía general y subespecialidades. Su contenido se compara retrospectivamente con la evidencia científica actual relacionada con sus respectivos temas quirúrgicos.

Resultados: Se encontró un panorama diverso en las cuentas quirúrgicas en las redes sociales evaluadas. Si bien algunos contenidos se alinean con prácticas basadas en evidencia, existe una notable presencia de desinformación e inexactitudes. Esto destaca las posibles consecuencias de las redes sociales en la difusión de información sanitaria, enfatizando la importancia de un contenido preciso y basado en evidencia.

Conclusión: Hay una influencia significativa de estas cuentas, especialmente entre los jóvenes, lo que implica la necesidad de compartir información responsable en el campo médico debido al potencial impacto de un contenido inexacto en la toma de decisiones sanitarias. Los influencers quirúrgicos a menudo descuidan proporcionar referencias de información basada en evidencia y prefieren utilizar experiencias personales, lo que plantea riesgos de desinformación y preocupaciones éticas en las plataformas de redes sociales.

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Introduction

Social media can be defined as the collective of online communication channels that allow real-time, instant, online communication. Carr and Hayes complement this definition by stating that social media are Internet-based, disentrained, and persistent channels of masspersonal communication facilitating perceptions of interactions among users, deriving value primarily from user-generated content.¹ Approximately, half of the world population is considered to be a social media user. Although some studies suggest active users tend to be young, extroverted females, some surveys report roughly 80% of urban population is involved in social media by actions such as texting, browsing and sharing information, streaming, listening to podcasts, and participating in online forums.^{2,3} Although social media spreads information rapidly, it also serves to spread misinformation, rumours or "fake news". Regular consumers tend to gather extra information due to anxiety and other emotional responses when mainstream media does not have enough or fail to deliver information altogether.

This becomes problematic as it can be used to misguide and spread rumours about people or situations, leading to polarisation, discrimination, and violence.⁴ For example,

during the COVID-19 pandemic, the high demand for information allowed unscrupulous individuals to spread misinformation, resulting in behaviours that detract from personal and community care.⁵ Influencers and high-impact accounts may post unfactual information due to a lack of knowledge or ulterior motives. Some studies report that up to 87% of posts related to healthcare contain misinformation.⁶ However, these social media can also be harnessed to rapidly disseminate useful information. Medical physicians, organisations, patients, and general users can share information about health coverage, services, and medical news while counteracting misinformation from unverified sources. Additionally, there are medical and scientific social networks that publish information through scientific experiment reports and medical literature.⁷

Even though there is a vast amount of information to access through the Internet, people tend not to look at the veracity of the source and are at risk to be exposed to false information, which in the healthcare field can lead to behaviours detrimental to healthcare. This study looks at the most searched and famous sites and accounts related to healthcare and evaluates the quality of the information provided to the public.

Table 1 Influencers and information about their corresponding profile and surgical content.

Account	About it's profile	About it's content
Surgical teaching	Social network: YouTube Subscribers: 69.7 K Videos: 72 Country of origin: United Kingdom Creation date: November 15, 2014. 9 252 178 views	Videos with medical information taken from the Cleveland Clinic, dating with information from 2014 to 2023. They combine CGI animations, expert videos with real-life procedures, and interactive quizzes to complement learning about surgery.
The Modern Surgeon	Social network: Tiktok Subscribers: 63.2 K Likes: 1.8 M Instagram: 5662 followers Youtube: 8.24 K subscribers Videos: 95 Creation Date: March 31, 2022 489 431 views	Videos with social information about what it means to be a surgeon, making a humorous approach and interviews to the world of surgery. Word of mouth evidence from surgeons
StaycurrentMD	Social Network: YouTube Subscribers: 4.35 K Videos: 856 Creation Date: August 23, 2014 491 153 views Instagram: 2629 followers	Educative channel in different platforms and an iPhone and android app, with videos, abstracts, and more, based on <i>Journal of paediatric surgery</i> , Global cast MD videos and podcasts, and worldwide journals
Behind the knife	Twitter: 3591 followers Social network: Twitter Subscribers: 25.561 K Country of origin: United states Creation date: February 2015 Youtube Social network: YouTube Subscribers: 85 K Videos: 192 Creation date: January. 222,018 5 729 803 views	Behind the knife is the worlds #1 surgery education platform. From high-yield education to interviews with leaders in the field, Behind the Knife delivers the information you need to know. Most of their publications are evidence-based and they justify their publications with literature references.
Ron Barbosa MD Facts	Social network: Twitter Subscribers: 30.780 K Country of origin: United States Creation date: November 2011	Content of images, videos and threads on basic topics of general surgery. Explanation of basic concepts of surgical skills and knowledge, especially surgical instruments, giving descriptions of use, characteristics of the materials and appropriate ways of use. All his publications are evidence-based and he justifies his publications with literature references.
Rishi Md	Social network: Instagram. Subscribers: 157 K Post: 678 Country of origin: USA Creation date: April 2012 9 252 178 views	Cardiovascular anaesthesiologist who explains the basic concepts of cardiovascular anaesthesia and critical medicine, with clear and understandable explanations of basic concepts of physiology, anatomy, pharmacology, and pathology applied to the critical care of surgical patients. All his publications are evidence-based and he justifies his publications with literature references.
Drjoe_md	Social network: Instagram and TikTok Subscribers: 150 K Instagram and 1.6 M TikTok	Emergency doctor who explains to the non-medical population basic concepts of medicine, basic health care and clear explanations of the pathophysiology of some signs and symptoms of certain common diseases.

Table 1 (continued)

Account	About it's profile	About it's content
Doctor.mike	Instagram posts: 122 Country of origin: USA Creation date: April 2022 Social network: Instagram, Youtube and TikTok Subscribers: 4 M Instagram Instagram posts: 853 Country of origin: USA Creation date: February 2012	All his publications are evidence-based and he justifies his publications with literature references. Family doctor who creates content for the medical and non-medical population explaining general concepts of common diseases, and also gives recommendations for primary prevention and health improvement.
Doctor Hoeflinger	Social network: Instagram and TikTok Subscribers: 73.2 K Instagram and 400 k TikTok Instagram posts: 162 Country of origin: USA Creation date: June 2022	Neurosurgeon who creates content for the non-medical population explaining basic concepts of diseases and surgical and non-surgical treatments for neurological pathologies.
Surgery Squad	Social network: YouTube Subscribers: 102 K Videos: 60 Country of origin: USA Creation date: 4 October 2010 38 365 140 views	YouTube channel that creates animated content of doctors explaining different surgical procedures for the medical population including multiple surgical specialties such as ophthalmology, urology, general surgery, plastic surgery, and otorhinolaryngology.

Material and methods

Retrospective study with a random sample of surgical influencers (general surgery and subspecialties). Three of each of their most popular videos will be chosen by their likes and views, and the information will be contrasted with the most up-to-date scientific evidence about their respective surgical topic. Selected platforms were Youtube © 2024 Google LLC, X/Twitter © 2024 X Corp., TikTok© 2024 TikTok, and Instagram © 2024 Instagram from Meta. The Google Chrome ©2024 Google, Youtube © 2024 Google LLC, and Instagram © 2024 Instagram from Meta search bars were utilised using keywords like "surgery", "surgical education", "surgical influencer" and hashtags like #surgicalinfluencer #surgicalpractice #surgicaleducation were also used. Platforms like Youtube © 2024 Google LLC permit to filter search results by Relevance with "View Count" which correlates with viral content. In other platforms, the video authors pin inside their profiles the videos with the most views to make them more accessible for the public to watch. The profile was included if it had at least hundreds of thousands of views in videos, the account had at least 1 million followers or at least 1 million likes. If none of these 3 criteria were met, it was excluded from the selection. Every video was checked to see if it had surgical or medical information, a patient, and medical images or illustrations. If so, patient consent was searched for to appear in the video or references for the information and/or images given and shown in the video were scrutinised in the video description, external links given by the author, author comments, or pinned comments to validate the quality of the information and adherence to patient consent.

Results

View count and number of followers are numbers to take into consideration when asking the virality and spread of informational videos on social media,⁸ which were checked for each influencer and video in the scope of this paper. The selected surgical influencers are the following: Surgical teaching, The modern surgeon, Stay current MD, Behind the knife, Ron Barbosa MD facts, Rishi MD, Dr. Joe MD, Doctor Mike, Doctor Hoeflinger, and Surgery Squad. These accounts have significant followers from social media such as Instagram, YouTube and TikTok, which are currently trending among teenagers and young adults. In the tables, we summarise the metrics of each account, what their profile is about (Table 1) and the content they post while also checking if their content is clinically accurate, referenced, or if it requires any consent (Table 2). All of the accounts have at least one of the 3 following conditions: videos that have at least hundreds of thousands of views, millions of likes, or millions of followers. Approximately, one-third of the posts had patients in it and more than half evidence identity protection and/or consent. Around 43% of the videos had medical illustrations on it and only 5% referenced these illustrations. Half of the videos provide a direct reference or further reading links to medical information while the other half does not.

Discussion

The compilation of these medical influencers and content analysis provided interesting insights, as we can appreciate in Fig. 1. 36.7% of the videos had patients in it and 54.6% had clear evidence of prior consent and/or identity protection. 43.3% of the post had medical related images or illustrations

Table 2 Three most popular videos of "Surgical teaching", "The Modern Surgeon", "StaycurrentMD", "Behind the knife", "Ron Barbosa MD", "Rishi Md", "Drjoe_md", "Doctor.mike", "Doctor Hoeflinger", "Surgery Squad", and their scientific evidence content.

Account	About it's profile	About it's content
Surgical teaching	Social network: YouTube Subscribers: 69.7 K Videos: 72 Country of origin: United Kingdom Creation date: November 15, 2014. 9 252 178 views	Videos with medical information taken from the Cleveland Clinic, dating with information from 2014 to 2023. They combine CGI animations, expert videos with real-life procedures, and interactive quizzes to complement learning about surgery.
The Modern Surgeon	Social network: Tiktok Subscribers: 63.2 K Likes: 1.8 M Instagram: 5662 followers Youtube: 8.24 K subscribers Videos: 95 Creation Date: March 31, 2022 489 431 views	Videos with social information about what it means to be a surgeon, making a humorous approach and interviews to the world of surgery. Word of mouth evidence from surgeons
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Doctor.mike	Social network: Instagram, Youtube and TikTok Subscribers: 4 M Instagram Instagram posts: 853 Country of origin: USA Creation date: February 2012	Family doctor who creates content for the medical and non-medical population explaining general concepts of common diseases, and also gives recommendations for primary prevention and health improvement.

Table 2 (continued)

Account	About it's profile	About it's content	
Doctor Hoeflinger	Social network: Instagram and TikTok Subscribers: 73.2 K Instagram and 400 k TikTok Instagram posts: 162 Country of origin: USA Creation date: June 2022	Neurosurgeon who creates content for the non-medical population explaining basic concepts of diseases and surgical and non-surgical treatments for neurological pathologies.	
Surgery Squad	Social network: YouTube Subscribers: 102 K Videos: 60 Country of origin: USA Creation date: October 4, 2010 38 365 140 views	YouTube channel that creates animated content of doctors explaining different surgical procedures for the medical population including multiple surgical specialties such as ophthalmology, urology, general surgery, plastic surgery and otorhinolaryngology.	
Surgical teaching Youtube	Most popular video: 3 Million views 6.2 K likes	Second most popular video: 2.2 Million views 6.1 K likes	Third most popular video: 2 Million views 7.9 K likes
Surgical topic:	Female Urinary Catheterisation. Everything You Need To Know To Perform This Essential Skill	How to Perform a Breast Examination	How to Perform a Bimanual Exam
Are there patients in the post?:	The performance of the procedure is made in Female Catheter Trainer by Limbs and Things UK	Yes, the performance of the procedure is made in a patient. The face is blurry so it does not show.	The performance of the procedure is made in Female Catheter Trainer by Limbs and Things UK
Is there evidence of consent?	It is not needed	The patient is aware of being recorded and helps with the examination.	It is not needed
Images had references?	No	It does not use images	No
The information had references?	No. In the description, they gave more information and reference the doctor whom performed in the video	No. In the description, they gave more information and reference the doctor whom performed in the video	No. In the description, they gave more information and reference the doctor whom performed in the video
The Modern Surgeon Youtube	Most popular video: 66 K views 87 likes	Second most popular video 31 K views 284 likes	Third most popular video 15 K views 850 likes
Surgical topic:	An Exercise To Improve Hand Tremors	How To HOLD and LOAD A Needle Driver For Suturing	Surgeon Explains Essential Tools For Practising At Home
Are there patients in the post?:	No. It is a performer explaining on himself	No. It is a performer explaining on himself	No. It is a performer explaining on himself
Is there evidence of consent?	It is not needed	It is not needed	It is not needed
Images had references?	It is not needed	It is not needed	It is not needed
The information had references?	No. In the description, they explain the technique used and give a contact for more information	No. In the description, they explain the technique used and give a contact for more information	No. In the description, they explain the technique used and give a contact for more information
StaycurrentMD Youtube	Most popular video: 101 K views 856 likes	Second most popular video: 77 274 views 481vlikes	Third most popular video: 4.35 K views 598 likes
Surgical topic:	Appendectomy Dr. Tamer Ashraf Wafa	Circumcision Gomco Clamp Step by step Demonstration Dr. Tamer Ashraf Wafa	Sistrunk Procedure Thyroglossal Cyst Excision Dr. Tamer Ashraf Wafa
Are there patients in the post?:	Yes, but their identity is hidden	Yes, but their identity is hidden	Yes, but their identity is hidden

Is there evidence of consent?	Not	Not	Not
Images had references?	There are not images used	There are not images used	There are not images used
The information had references?	No. In the description, they explain the surgery shown and give a contact for more information	No. In the description, they explain the surgery shown and give a contact for more information	No. In the description, they explain the surgery shown and give a contact for more information
Behind the knife Youtube	Most popular video: 3.3 Million views 31 K likes	Second most popular video: 1.2 Million views 13 K likes	Third most popular video: 222 K views 2.4 K likes
Surgical topic:	Running Subcuticular Stitch	EASY Central Line Placement (Central Venous Catheter) Behind the Knife - Bedside Procedures	Placing Arterial Lines Like a Pro (radial and femoral) Behind the Knife - Bedside Procedures
Are there patients in the post?:	No, the performer uses its own equipment and materials	Yes	Yes
Is there evidence of consent?	It is not needed	The patient is aware of being recorded and helps with the examination.	The patient is aware of being recorded and helps with the examination.
Images had references?	There are not images used	There are not images used	There are not images used
The information had references?	No. In the description, they explain the technique shown and give a contact for more information	No. In the description, they explain the technique shown and give a contact for more information	No. In the description, they explain the technique shown and give a contact for more information
Ron Barbosa MD Facts	Most popular tweet: 844 k views	Second most popular tweet: 450 k views	Third most popular video: 384 K views
Surgical topic:	Regarding the Aberdeen Knot	Regarding the packing of cavities for hemostasis during surgery	Regarding the technique of 2 handed knot tying
Are there patients in the post?:	No	No	No
Is there evidence of consent?	It is not needed	It is not needed	It is not needed
Images had references?	No	No	No
The information had references?	No	No	No
Rishi Md	Most popular video: 140 K views 4042 likes	Second most popular video: 110 K views 5168 likes	Third most popular video: 104 K views
Surgical topic:	Gastric Residual Volumes (GRVs)	Saphenous vein graft (SVG)	Mask Ventilation before paralysis?
Are there patients in the post?:	No	No, but a human vain post-surgery is shown	No
Is there evidence of consent?	It is not needed	No	It is not needed
Images had references?	No	No	No
The information had references?	No	No	No
Drjoe_md	Most popular video 27.2 M views 1.2 M likes	Second most popular video 18.8 views 2.4 M likes	Third most popular video 16.7 M views 893.3 k likes
Surgical topic:	¿Finger Gangrene or fake?	Spooky ER doctor story	Police taser effect
Are there patients in the post?:	No	No	Yes

Is there evidence of consent?	No	No	No
Images had references?	No	It is not needed	No
The information had references?	No	No	No. In the description, a summary was provided
Doctor.mike	Most popular video	Second most popular video	Third most popular video
Surgical topic:	Medical general knowledge	Medical general knowledge	Medical general knowledge
Are there patients in the post?:	Yes	Yes	Yes
Is there evidence of consent?	No	No	No
Images had references?	There are not images used	There are not images used	There are not images used
The information had references?	No. In the description, they explain the topic shown	No. In the description, they explain the topic shown	No, In the description, they explain the topic shown
Doctor Hoeflinger	Most popular video: 2.6 M views	Second most popular: video: 962 K views	Third most popular video: 500 k views
Surgical topic:	A day in a neurosurgeon life on Trauma call	5 Questions with a neurosurgeon	Letter to the graduating class of 2023 about alcohol awareness
Are there patients in the post?:	No	No	No
Is there evidence of consent?	It is not needed	It is not needed	It is not needed
Images had references?	It is not needed	It is not needed	It is not needed
The information had references?	No	No	No
Surgical topic:	Laparoscopic Appendectomy Surgery	Laparoscopic Gastric Bypass Surgery	C-Section Surgery
Are there patients in the post?:	Yes	No. Animated audiovisual production is used	Yes
Is there evidence of consent?	No	No	No
Images had references?	No	No	No
The information had references?	No. In the description, they explain the technique shown and give a contact for more information	No. In the description, they explain the technique shown and give a contact for more information	No. In the description, they explain the technique shown and give a contact for more information
Surgical topic:	Laparoscopic Appendectomy Surgery	Laparoscopic Gastric Bypass Surgery	C-Section Surgery

and none of these images had clear evidence of a reference for those illustrations. Finally, no post provided an actual reference but 50% of the posts provide a way to further read or inform about the topic presented. A lot of information, including medical and surgical topics, are available for the general public, medical students, and doctors. Although with prior medical knowledge, medical practitioners may discern and view these posts critically, the general population with no medical background can be exposed to vague and in some cases fake medical news. Also, due to lack of medical knowledge, there is a risk to misunderstand and misinterpret the information provided.⁹ Patient protection is also crucial. Respecting cadaveric and in vivo practices can be challenging due to insensitive and/or non-consensual posting from medical practitioners which is also a risk while trying to provide information in social media.¹⁰

Social media plays a pivotal role in sharing specialised information among surgical specialists, residents, surgical journals, and professional organisations amongst others. Analysing social media metrics, such as social graphs and altmetrics, is crucial for enhancing information exchange within digital surgical communities. Platforms like Twitter, Facebook, Instagram, and YouTube provide free access to content and help identify influencers, communities, trends, and behaviour patterns related to surgery.¹¹ For instance, a 2021 study by Elson et al. on Twitter identified 88 influencers in general surgery, most of whom were board-certified and predominantly female, with Canada being the prevalent country.¹² Another study by Varady et al. highlighted the top 100 orthopaedic influencers on Twitter, primarily board-certified surgeons from the United States, who demonstrated high academic productivity measured by

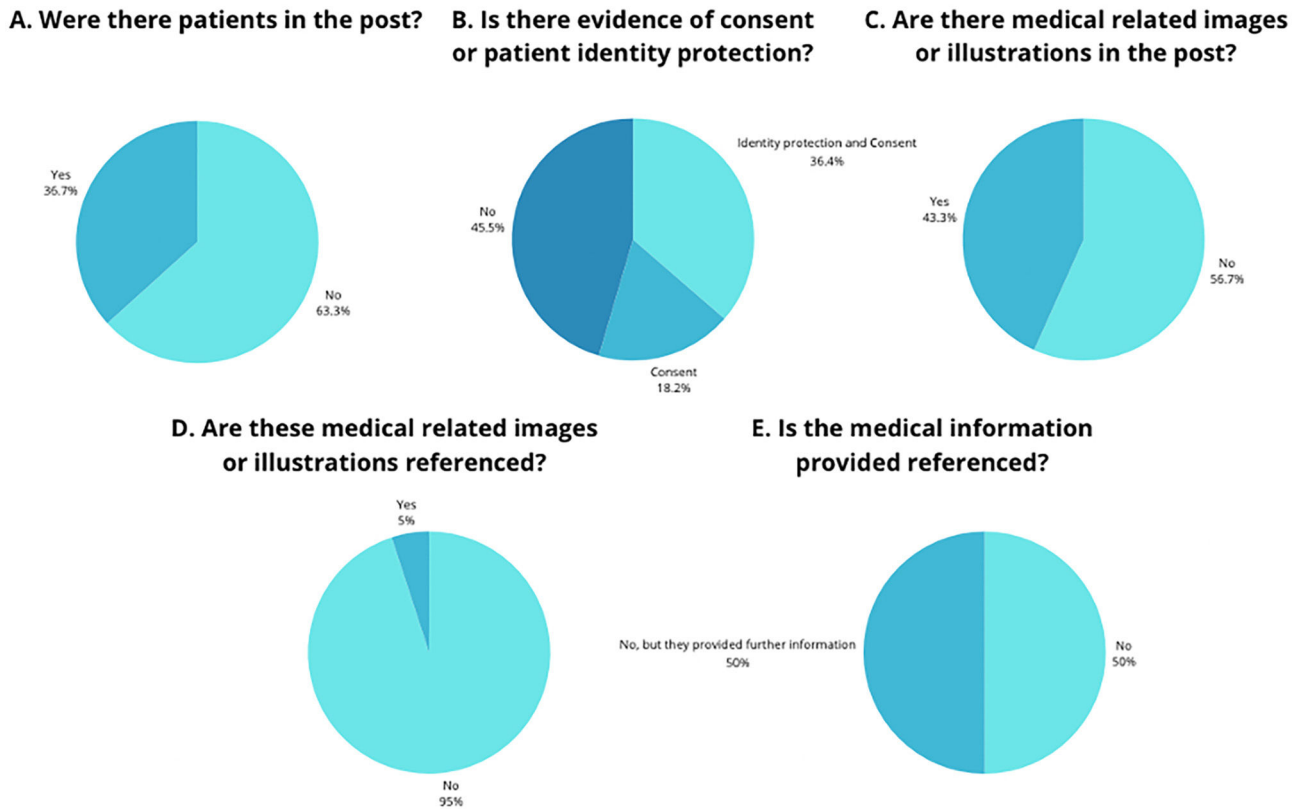


Fig. 1 Pie chart illustrating the main results. A) Whether the post had a patient in it or not. B) Whether the posts that had patients in it also have evidence of consent, patient identity protection or not. C) Whether the post had medical-related images in it or not. D) Whether the post with prior images in it had reference for its illustrations or not. E) Whether the posts with medical information provide references for the information provided. Source: Self elaborated.

the h-index. However, 22% of these top influencers were not orthopaedic surgeons, raising concerns about potential misinformation influencing patient perceptions and expectations.¹³ Similarly, Miller et al. identified 75 main influencers in otolaryngology on Twitter, mostly otolaryngologists from the United States, with significant academic impact.¹⁴ In the realm of plastic surgery, Alhusaini et al. found that exposure to social media is associated with increased negative body image, concerns and a heightened interest in cosmetic surgery among those with negative perceptions. Nearly half of the 1064 participants in their study were under 25, predominantly female, and expressed an increased desire for cosmetic surgery due to social media advertisements or publications, emphasising the influential power of social media trends, influencers, and advertisements.¹⁵ When evaluating content quality in general surgery and its specialties, ethical considerations such as privacy, accuracy, transparency, responsibility, and impact on patient care are paramount for individuals seeking surgical and medical information on these platforms.¹¹

When using social media metrics such as Twitter, YouTube, and Instagram, we were able to employ objective values like the number of views for each video and the number of subscribers to the accounts. We identified a group of influencers frequently visited by the community for quick information on various topics in general surgery and its specialties. Instagram was the most used platform for

sharing information, while longer videos were found on YouTube, and more informal information was posted on Twitter. The literature search showed the most studied social media was Twitter. Most influencers relied on their own knowledge for content, which lacked citations, creating a gap in the quality of the information conveyed, especially for users without clinical training who might not understand it correctly. Although most content was produced with high-quality production, the absence of scientific sources raises questions about its accuracy and poses ethical implications for the audience.

Various limitations arise when considering the development and selection process of the study. First of all, the study presents a selection bias which means that participants of the study have been selected by the researchers taking into account content, popularity, views, and social metrics. Also, the intervention has been studied in a less-representative sample population, in this case, social media and entertainment platforms contain a massive and increasing number of influencers which means it is necessary to include a greater number of the population to extrapolate results and access more accurate information with a narrower confidence interval. Furthermore, taking into account that medical content published on social media promotes easy and understandable learning with full access to all types of public, topics involving surgical techniques or approaches are less frequent and viral. Through the data

collected, it is visible that those with a greater reach in social metrics introduce an approach of entertainment and general medical knowledge that does not consider surgical approaches as the main focus.

This study reveals a concerning trend among surgical influencers on social media: a widespread neglect in referencing credible sources, while also having a preference for personal anecdotes over evidence-based information. This casts doubt on the reliability of their content and poses a risk of spreading misinformation. Additionally, ethical issues arise from the depiction of patients without formal consent, potentially leading to legal ramifications and undermining patient privacy, which is a cornerstone of medical ethics. Despite the crucial role these influencers play interconnecting the medical community with the public, there is a pressing need for them to adopt more responsible practices by incorporating proper citations and ensuring patient consent. This would enhance content credibility and adherence to ethical standards. The findings call for a vigilant, evidence-based approach to online medical education and advocate for a collaborative effort between healthcare professionals and influencers to elevate the quality and integrity of healthcare information on social media, ultimately aiming to improve public health, population literacy, and trust in medical content online.

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Conflicts of interest

There is not conflict of interest.

Ethical committee

Due to the characteristics of the study, declarations about an ethical committee are not necessary.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT in order to improve grammar and redaction. After using this tool/service, the authors reviewed and edited the content as needed and also take full responsibility for the content of the publication.

Declaration of competing interest

There is not conflict of interest.

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