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The Pitfalls of Using Social Media in the Healthcare System

Yuliana
Universitas Udayana, Indonesia

Abstract:

Social media usage in the healthcare system is abundant nowadays. Besides the prompt actions and reactions, there are also some pitfalls. The pitfalls should be well prevented and recognized. This paper aims to describe the pitfalls of using social media in the healthcare system. This is a narrative literature review. PubMed, Google Scholar, and Science Direct were used for journal searching web. The selected journals were published within 3 years. The summary of the journal search revealed that the pitfalls of using social media in the healthcare system are the possibility of misinformation. When the misinformation was delivered quickly and carelessly to the public, the mess will be difficult to be handled. The prevention step is screening before sharing any health information. Any new information should be compared with the guidelines that are issued by healthcare organizations and professional societies before sharing on social media. In conclusion, preventing pitfalls in misinformation when using social media can be done by screening the information with professional societies and healthcare organization guidelines and screening before sharing.

Keywords: healthcare; professional guidelines; social media.

Introduction

The astonishing growth of social media has had a significant impact on medical practice and research over the past ten years. In addition to offering more affordable options to enhance clinician-patient connection and exchange health-related information and experience, social media also makes it possible to find new sources of medical expertise and information.[1] The positive side of social media is that it provides fast response and quick speed of spreading.[2] Despite some early successes that have been shown, the study of social media usage and analytics to improve health is still in its infancy. Researchers in information systems may be particularly important to the development of the discipline. By referencing multi-disciplinary research, this study suggests a conceptual framework for social media-based health

[1] Maria Polyzou et al., "Addressing the Spread of Health-Related Misinformation on Social Networks: An Opinion Article," *Frontiers in Medicine*, no. May (2023): 1–5, https://doi.org/10.3389/fmed.2023.1167033.
[2] Ahmad Zareie and Rizos Sakellarion, "Minimizing the Spread of Misinformation in Online Social Networks: A Survey," *Journal of Network and Computer Applications* 186 (2021): 1–42, https://doi.org/10.1016/j.jnca.2021.103094.

information management.[3]

There is an increasing fear that the new generation will be vulnerable to misinformation spreading, fake news, or hoax. Social media could be a source of misinformation. Misinformation is easier to spread online than offline due to fast and cheap ways of the access of digital media nowadays. Misinformation is usually spread attractively. The special characteristics of digital media are fast, cheap, and easy to access. Therefore, it's better to understand them wisely and correctly. Sharing information through social media could be done by replication of messages to many people. It hardly needs active participation from the involved people.[4] The misinformation about COVID-19 infection and vaccine has been a lot during the beginning of the pandemic. It shows harmful health impacts on society. Misinformation has to be taken seriously because approximately one-third of the information in social media is categorized as misinformation.[5]The misinformation Response Unit is established to monitor any misinformation on the social media and community forums. This special unit collaborates with approximately 100 community partners in various populations, including the Health Department. The action of counter misinformation is needed to clarify the scientific information and ensure the improvement of health and vaccine equity.[6] How people transmit online information is based on the effect of cultural and cognitive factors. Participants listen to a narrative, and after that, they try to remember and recall the story. This method is called transmission chains. However, misinformation might happen due to a loss of attention. Misinformation tends to happen when online information has high quality and efficiently spread. High quality and efficiently spread means a high velocity of spreading time.[7]

A new epidemic disease (Amendment) Ordinance has been released regarding the safety of the medical community, which is a greatly appreciated development at this time. Hospitals have traditionally been the scene of attacks on doctors. Communication of the Act and the Ordinance at all strategic locations of the hospital to bring to the attention of the general public and the staff. This can be done using banners, signboards, and digital media. It must also address the penal aspects of the Act and the Ordinance, which can deter violence at the hospital.[8] It needs the combined effort of the medical fraternity, media, and the academic community.[9]

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[3] Lina Zhou et al., "Harnessing Social Media for Health Information Management," *Electron Commer Res Appl* 27 (2018): 139–51, https://doi.org/10.1016/j.elerap.2017.12.003.HARNESSING.

[4] Janine Knudsen et al., "Combating Misinformation as a Core Function of Public Health," 2023, https://doi.org/10.1056/CAT.22.0198.

[5] William B Wilkerson et al., "Global Public Health Implications of Social Media Engagement from a Virtual Ed- Ucation Platform to Combat Oncology Misinformation .," *American Society of Clinical Oncology*, 2023, 9976, https://doi.org/10.1200/GO.2023.9.Supplement.

[6] Knudsen et al., "Combating Misinformation as a Core Function of Public Health."

[7] Alberto Acerbi, "Cognitive Attraction and Online Misinformation," *Palgrave Communications*, 2019, 1–8, https://doi.org/10.1057/s41599-019-0224-y.

[8] Gayathri Kuppuswamy and Uma Warrier, "COVID - 19 and Violence against Doctors – Why a Law Is Needed ?," *J Family Med Prim Care* 10 (2021): 35–40, https://doi.org/10.4103/jfmpc.jfmpc.

[9] Kuppuswamy and Warrier.

This period is sometimes known as "an era of fake news". It means intentionally or unintentionally misinformation could spread rapidly. Besides, powerful amplification might bring tremendous effects. In this case, accurate information may be hard to obtain. There is an increasing trend of health-related misinformation, especially in social media. Theoretical frameworks from network science and psychology were incorporated into studies, and co-citation analysis showed the potential for increased cross-disciplinary cooperation. Most investigations drew from several disciplinary paradigms or experimentation. understanding the role that belief systems have in the purpose to spread misinformation, as well as the susceptibility of various sociodemographic groups to it. To find effective and targeted treatments to stop the spread of health-related misinformation online, additional interdisciplinary research is also necessary.[10] Social media has created a huge difference in big data sets. Therefore, the information spread through social media will have a big impact.[11] Besides the prompt actions and reactions, there are also some pitfalls. The pitfalls should be well prevented and recognized. This paper aims to describe the pitfalls of using social media in the healthcare

Result and Discussion

This is a narrative literature review. PubMed, Google Scholar, and Science Direct were used for the journal search web. The selected journals were published within 3-5 years. The summary of the journal search revealed that the pitfalls of using social media in the healthcare system are the possibility of misinformation. When the misinformation was delivered quickly and carelessly to the public, the mess will be difficult to be handled. The prevention step is screening before sharing any health information. Any new information should be compared with the guidelines that are issued by healthcare organizations and professional societies before sharing on social media. [12] The most common misinformation in healthcare is about immunization/vaccination safety. Social media commonly spread the information not to be vaccinated due to many side effects. However, this action could increase the incidence of infectious diseases such as measles. Therefore, such misinformation needs a systematic review of the literature to prevent the spread of misinformation.[13]

Misinformation

Misinformation is false information (fake news). However, misinformation has no intention to cause any harm. Misinformation can be spread through social media. Fabricated information usually mimics the actual information. Misinformation includes any false information which is spread from the micro- to macro-level. The

[10] Yuxi Wang et al., "Systematic Literature Review on the Spread of Health-Related Misinformation on Social Media," *Social Science & Medicine* 240, no. August (2019): 1–12, https://doi.org/10.1016/j.socscimed.2019.112552.
[11] Sera Whitelaw et al., "Applications of Digital Technology in COVID-19 Pandemic Planning and Response," *Lancet*, no. January (2020).
[12] Wang et al., "Systematic Literature Review on the Spread of Health-Related Misinformation on Social Media."
[13] Wang et al.

steps of misinformation include creation, production, and distribution. Sometimes, the information is reproduced with other misinterpretations.[14] The internet offers great opportunities, it also reduces the costs of generating and disseminating information and enables the spread of disinformation and sensationalism. What was once local can quickly become global, and ideas are no longer limited or held back by geographic location. This has led to several studies on the dissemination of information, the spread of rumors, and the resulting behavioral changes. The spread of disinformation is increasing, but it cuts across all disciplines, including communications, epidemiology, psychology, and computer science.[15]

The depth of misinformation depends on the actor who creates the messages, the durability, distribution, response, and reproduction of the messages. At the micro-level, individuals have some roles in spreading the news. While at the macro level, there will be a cascade and networks of news spreading. Misinformation could circulate. Then, the rumors will vary based on individual perception and importance. Conflicting stories further create ambiguity in the information. Credible information should comprise source and media credibility. The source of credibility is difficult to assess in social media because no form of factual accountability. Bias from the source information could lead to misperception. The views on some information are determined by prior beliefs. Social media might enhance the bias due to unreliable sources of information.

Misinformation and health

False information tends to spread faster and farther than true information. Misinformation causes negative effects. The controversy might be amplified. For example, the controversy about cancer treatment and vaccines. Misinformation might decrease the vaccination rate among the population. Infodemic is a new term to describe the true information and misinformation that spreads very quickly.[16] Therefore, health misinformation needs urgent and greater action from health providers.[17]

Health misinformation is any false health-related information based on scientific and evidence-based medicine. Contradictive and uncertain information might change the evidence. However, responding to misinformation is quite difficult because it is affected by psychological factors such as cognitive biases and emotions. Limited health literacy makes the difficulties in understanding the correct information. Furthermore, the tremendous volume and diversity of social media increase the difficulties in screening the information. Responses to the misinformation should be timely and evidence-based to prevent devastating

[14] Wang et al.
[15] Wang et al.
[16] Sander Linden, "Misinformation: Susceptibility, Spread, and Interventions to Immunize the Public," *Nature Medicine* 28, no. March (2022): 460–67, https://doi.org/10.1038/s41591-022-01713-6.
[17] Wen-ying Sylvia Chou, Anna Gaysynsky, and Joseph N Cappella, "Where We Go From Here : Health Misinformation on Social Media," *AJPH Perspectives* 110 (2020): 273–75; Elaine O Nsoesie and Olubusula Oladeji, "Identifying Patterns to Prevent Misinformation during Epidemics the Spread Of," *Harvard Kennedy School Misinformation Review* 1, no. April (2020): 1–8.

consequences. The social media that are often used are Instagram, WhatsApp Messenger, Twitter, YouTube, etc.[18]

There are four types of health information regarding the COVID-19 pandemic, i.e. transmission, vaccine, treatment, and prevention. The proliferation of misinformation is determined by the culture, the matter, and the dynamics of the network.[19]

Misinformation could come from the spatial, network, temporal, or cross-platform dynamics mode of spread. The way of the information spread determines the dissemination of misinformation speed.[20] Furthermore, political, psychological, and scientific background also affect emotion and cognition in digesting misinformation. Value affirmation might be effective for defending against strong confirmation bias.[21] However, the browsing of negative information might enhance fear level and confirmation bias.[22] Misinformation might have some insidious consequences. Misinformation could enhance the impression that there is no suitable consensus related to the information given. This condition leads to apathy, mistrust, and confusion. People might disengage from browsing health information. As a consequence, the individuals might make a wrong decision that is detrimental to themselves.

Identification factors that enhance the susceptibility to misinformation

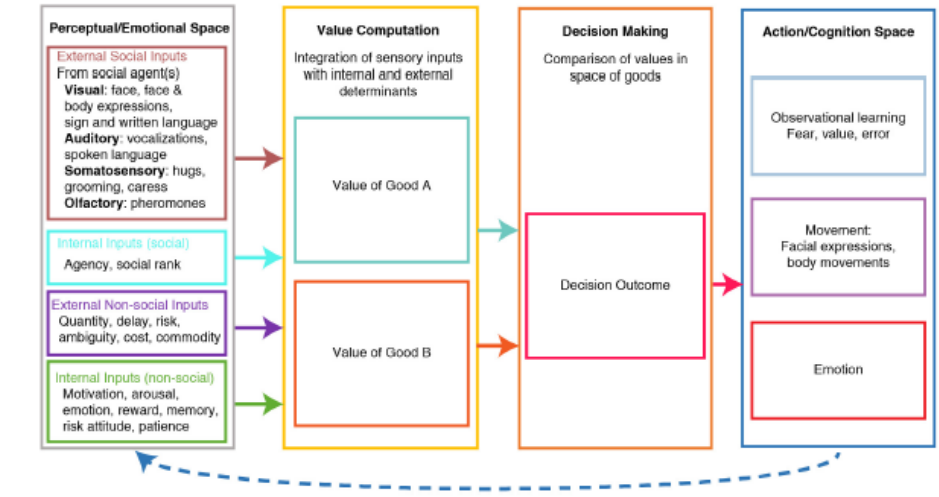
Some factors that contribute to the susceptibility to misinformation are a lack of access to evidence-based information, a conspiracy mindset, and limited health literacy. Specific strategies will be needed to intervene in the group problems. Intervention is better using a credible source of information based on the vulnerable community's acceptance. Legislative ways are used to remove harmful misinformation such as moderation standards of the platforms and rumor management efforts. Increasing health literacy is also another way to improve health awareness and prevent misinformation.[23] Different media/platforms which have less regulation are often used as the source of health misinformation media spreading. For instance, when WhatsApp develops new regulations in limiting the spread of information, the hoax spreader will move to other platforms. Unverified medication or under-evaluation treatments might be published as the potential treatment. This

[18] Chou, Gaysynsky, and Cappella, "Where We Go From Here : Health Misinformation on Social Media."
[19] Nsoesie and Oladeji, "Identifying Patterns to Prevent Misinformation during Epidemics the Spread Of."
[20] Chou, Gaysynsky, and Cappella, "Where We Go From Here : Health Misinformation on Social Media."
[21] Raymundo Báez-mendoza et al., "Neuronal Circuits for Social Decision-Making and Their Clinical Implications," *Frontiers in Neuroscience* 15, no. October (2021): 1–21, https://doi.org/10.3389/fnins.2021.720294.
[22] Pauline Dibbets and Cor Meesters, "Disconfirmation of Confirmation Bias: The Influence of Counter-Attitudinal Information," *Current Psychology* 41 (2022): 2327–33.
[23] Chou, Gaysynsky, and Cappella, "Where We Go From Here : Health Misinformation on Social Media."

kind of information is included in health misinformation.[24] The proposed methods for preventing misinformation are blocking-based methods and clarification-based methods. In blocking-based methods, the network structure is changed. The clarification-based method aims to enhance the awareness of users. The true information is spread abundantly.[25]

The factors affecting the decision-making process

The factors that affect the decision-making process are internal psychological cues. These special cues integrate with social and environmental information process during an interaction. Individual decisions are often determined partly by observing others' decisions. A decision can affect the subsequent decision by others. Subjective preferences in a common scale determine the decision-making of individuals. Every people have their subjective valuations and the valuations guide the decision making process. Some disciplines that affect the decision-making process are neurobiology, psychology, ethology, philosophy, ecology, mathematics, and neuroeconomics. Neuroeconomics is the combination of neuroscience and economics, including behavioral economics. Figure 1 shows the schema of the decision-making process. The combination of sensory information, subjective value, also internal, and external determinants build the pathways to the decision-making process. After making decision, the next steps are comparing the values and transforming the choice into action. [26]



[24] Nsoesie and Oladeji, "Identifying Patterns to Prevent Misinformation during Epidemics the Spread Of."
[25] Zareie and Sakellarion, "Minimizing the Spread of Misinformation in Online Social Networks: A Survey."
[26] Báez-mendoza et al., "Neuronal Circuits for Social Decision-Making and Their Clinical Implications."

Figure 1. The schema of the decision-making process[27]

The role of the brain in the decision-making process

The structures of the brain involved in the decision-making process and information cognition are the cortical and subcortical structures. The specific structures involved are the amygdala, the superior temporal sulcus, the anterior insula, the striatum, the orbitofrontal cortex (OFC), the prefrontal cortex (PFC), and the anterior cingulate (ACC). The somatosensory system has an essential role in giving information about actions or intentions.[28] The decision-making process is made based on the way of interpretation. The interpretation of evidence depends on sociocultural beliefs and attitudes.[29] The different characteristics of beliefs and attitudes contribute to the possibility of bias.[30] Confirmation bias could happen due to the tendency to see the new evidence as a confirmation of theory or belief. Individual characteristics such as age, gender, location, income level, and education level form beliefs and biases.[31] Confirmation bias is also known as ascertainment, observer, or confirmatory bias. Observer tends to emphasize someone's hypothesis due to no contradiction found with the observers' belief. Therefore, confirmation bias is a type of psychological bias because beliefs, preconceptions, and preferences affect the decision-making process.

Confirmation bias determines opinions, beliefs, and web search behavior. Individuals with poor health literacy show bias in webpage selection. The time spent on webpage selection is equal to the degree of health literacy. The longer time spent, the higher degree of health literacy is. Imprecision and misconception might raise confirmation bias. Confirmation bias leads to overconfidence and contradiction (i.e. overlooked or ignored). In healthcare, confirmation bias causes errors and inaccurate diagnoses. Improper treatment might happen due to this error. Therefore, any aspect of the study that needs human judgment is prone to confirmation bias. Confirmation bias might be overcome by doing multiple and independent checks on many studies across various laboratories and expert consultation. Blinding (single or double) is very essential for increasing the reliability of the study result.[32]

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[27] Báez-mendoza et al.
[28] Báez-mendoza et al.
[29] Ritu Agarwal et al., "Socioeconomic Privilege and Political Ideology Are Associated with Racial Disparity in COVID-19 Vaccination," *PNAS* 118 (2021): 1–3, https://doi.org/10.1073/pnas.2107873118/-/DCSupplemental.Published; Báez-mendoza et al., "Neuronal Circuits for Social Decision-Making and Their Clinical Implications."
[30] Jaime J Castrellon et al., "Social Cognitive Processes Explain Bias in Juror Decisions," *Social Cognitive and Affective Neuroscience* 18, no. 1 (2023): 1–11, https://doi.org/https://doi.org/10.1093/scan/nsac057.
[31] Meiyu Pan and Alyssa Ryan, "The Impact of Conformation Bias on Perceived Health Risk of Using Public Transit: An Evaluation during the Pandemic," *Journal of Transport and Health* 25 (2022): 2020–22.
[32] Masaki Suzuki and Yusuke Yamamoto, "Characterizing the Influence of Confirmation Bias on Web Search Behavior," *Frontiers in Pscyhology* 12, no. December (2021): 1–11, https://doi.org/10.3389/fpsyg.2021.771948.

Similar to other professions, the medical sciences are susceptible to many kinds of bias. Even though addressing the origins of bias is an essential part of arriving at accurate conclusions, bias in health research continues to be a very sensitive topic that can affect the attention and outcome of investigations. One of the most common types of bias that impairs the validity of health studies is misclassification, often known as information bias. It results from the process used to collect or verify study measurements. This work intends to broaden discussions on bias issues as well as improve comprehension of information bias in experimental and observational research study designs. Identifying the types of bias can help lessen the consequences of bias and the need for adjustment.[33]

Any deliberate mistake made during the planning, execution, or analysis of a study is known as bias. Bias in health studies can come from either the method used to choose the study's participants or the method used to gather or measure the study's results. These are referred to as selection bias and information bias, respectively. The impact of bias on the reliability of medical research findings can vary. Bias can cause over- or underestimates of risk parameters as well as erroneous estimations of the association in epidemiological research. Making sound judgments requires identifying the sources of bias and how they affect the results. Misclassification, another name for information bias, is one of the most prevalent types of bias that impairs the validity of research. Bias can be divided into several types such as social desirability bias, self-report bias, recall bias, measurement error bias, misclassification, and confirmation bias.[34] Recall bias happens when the participants fail to recall past events. Recall bias is mostly found in the retrospective cohort or case-control studies. Minimizing recall bias can be done by asking for a short recall period than a long one. Measurement error bias can be minimized by ensuring the validity of the instrument before the study begins.

The source of information

Self-reporting data is usually used in health studies. However, self-reported data are mostly unreliable due to self-reporting bias. Therefore, self-reporting data could result in a wider range of responses. The sources of bias are recall period, social desirability, or selective recall. Preventing pitfalls in misinformation when using social media can be done by screening the information with professional societies and healthcare organization guidelines and screening before sharing. The validation method is an important item to be considered when sharing any data. Multiple data sources and using more than one validation method could increase the reliability of the study result.[35] The source of the error could come from the environment, device inaccuracy (improperly calibrated devices), or self-reported measurement. The error from those sources is called measurement error, imprecision, measurement bias, or instrumental error. This type of error is found in observational and experimental

[33] Alaa Althubaiti, "Information Bias in Health Research: Definition , Pitfalls , and Adjustment Methods," *Journal of Multidisciplinary Healthcare* 9 (2016): 211–17.
[34] Althubaiti.
[35] Althubaiti.

studies. The result of the studies which contain error is inconsistent, biased, and inefficient.[36]

The type of adjustment for measurement error bias depends on the type of error. If the errors are systematic, calibration methods are used. Reliable data use some calibration methods. The methods are reference measurements from previous studies, adjustment methods, or simple mathematical tools. Some statistic software packages (e.g. the Stata and R Software Package) have some features for adjustments in managing random measurement errors.[37] Other methods of bias adjustment are regression calibration, simulation-extrapolation, and instrumental variable approach. Replication is useful for minimizing errors in epidemiologic studies. Replication is important in estimating the measurement error variance and applying the adjustment of the statistical approach. Measurement error bias is difficult to detect when the information about the measuring instrument is limited. Blinding is another way to ensure the validity of the data. The process of blinding may involve participants, clinicians, and/or assessors.[38]

Any evidence and data should be evaluated objectively, especially through special education and training programs. However, this program will be ineffective if bias is not well managed. Bias could also come from the external pressure in obtaining a fast result. The validity will be decreased when the decision or conclusion is taken in a rush. Therefore, the type of study protocol determines the possibility of bias. Concluding should quantify the inevitable bias and the possible sources. A well-planned study will result in a good conclusion. However, measurement error bias is difficult to handle due to imperfect devices and algorithms. Measurement instruments should be calibrated to ensure a higher level of accuracy before using them for data collection.[39]

Preventing misinformation

Preventing misinformation is done by giving active education to the public. Verified information should be provided to the most affected group. The collaboration between WhatsApp and WHO is making bots for informing the latest development of the COVID-19 pandemic. The information given includes protection, travel advice, and myths. The public health staff should be more proactive in educating populations, especially about the possible harmful effects of misinformation. Therefore, health misinformation needs to be included in the curriculum for the public. People are taught how to find, validate, and comprehend information from trusted websites before adopting any information in social media. This is essential because the public has a critical role in limiting information spreading.[40] Fact-checking and debunking misinformation are useful to counter

[36] Althubaiti.
[37] Althubaiti.
[38] Althubaiti.
[39] Althubaiti.
[40] Nsoesie and Oladeji, "Identifying Patterns to Prevent Misinformation during Epidemics the Spread Of."

health misinformation. The approaches are by correcting a myth and exploring the facts about any information given as depicted in Figure 2. However, the success of the debunking process depends on the quality of the debunking, the time, and the prior ideologies and beliefs of individuals.[41] Accurate, complete, and comprehensive are the three main characteristics of true information. These characteristics are very essential for the evaluation of any information given, including in social media.[42]

There are some suggestions in preventing misinformation based on the study of Thompson and Lazer as follows: improving health literacy, strengthening the online signal, and increasing the accuracy and correction by the advance of technology. Using the internet in collaboration with physicians is a powerful way to discrete myths and facts. Browsing the health information on the internet shows the active participants of the patients. Patients will have better communication with the doctors.[43]

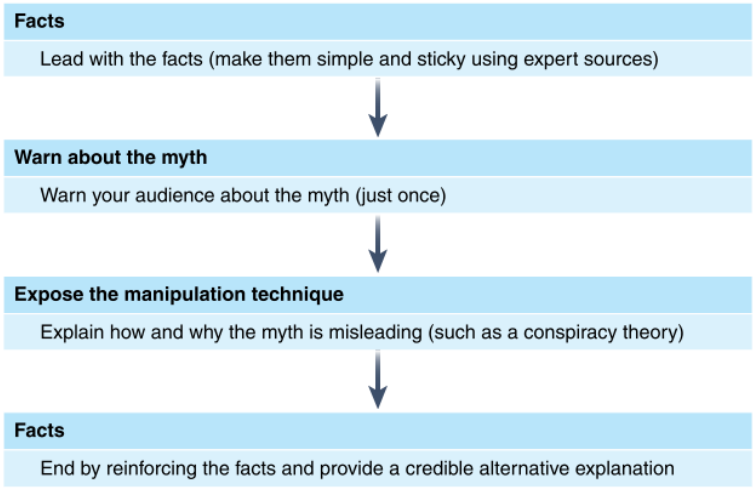

Figure 2. The ways of debunking misinformation[44]

Wikipedia as one of the health online websites, is trusted as a source of health information. However, the articles inside should be updated to give a better comprehensive understanding. The belief in misinformation can be reduced by giving a piece of evidence-based information. All health communicators such as scientists, health practitioners, and governmental bodies should use social media as tools for spreading truthful information and clearing misinformation. [45] The information on the internet is very abundant. Therefore, we cannot evaluate all of the online information. We have limited cognitive capacity and time. However, motivation is

[41] Linden, "Misinformation: Susceptibility, Spread, and Interventions to Immunize the Public."
[42] Briony Swire-thompson and David Lazer, "Public Health and Online Misinformation: Challenges and Recommendations," *The Annual Review of Public Health* 41 (2020): 433–51.
[43] Swire-thompson and Lazer, "Public Health and Online Misinformation: Challenges and Recommendations."
[44] Linden, "Misinformation: Susceptibility, Spread, and Interventions to Immunize the Public."
[45] Swire-thompson and Lazer.

enhanced if the topic is related to our health. The challenge in screening the truth of online information is that internet data has undergone rapid changes.[46]

Conclusion

In conclusion, preventing pitfalls in misinformation when using social media can be done by screening the information with professional societies and healthcare organization guidelines and screening before sharing. There might be some biases in the information sharing. Therefore, human judgment needs to be taken into account. Increasing the awareness of the possible pitfall should begin at the early stage when reading information before sharing. Analyzing the possible sources of bias is critical because bias cannot be easily avoided.

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[46] Swire-thompson and Lazer.

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