



Medical misinformation in mass and social media: An urgent call for action, especially during epidemics

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Grounded in solid epidemiologic investigations and rigorous statistical approaches, evidence-based medicine has now been widely recognized as the mainstream pathway leading to correct clinical practice, development of guidelines and ensuring patient safety, while protecting society from medical misconceptions and malpractice.¹ Over the last 15 years, numerous studies have analysed the standards and quality of scientific research—a field known as *meta-research*²—to improve the rigour of evidence-based medicine.

While efforts have been made by the scientific community to defend and promote robust biomedical research methods, the standards in the communication of health-related and even purely medical information to lay audiences have been poorly investigated; this is even more problematic when we consider the tremendous power of mass and social media in the rapid transmission of information. These communication channels can have both a positive and a negative impact on those who seek health-related and medical information in the mass and social media, thus acting as *double-edged swords*. Unfortunately, available data suggest that the quality of health and medical information provided to the public at large is predominantly of low value, with tobacco- or vaping-related information representing perhaps excellent examples of misinformation.³⁻⁵ Thus, as the use of mass and social media has been growing exponentially in recent times, scientists have called for an urgent action to prevent public dissemination of unsubstantiated health-related and even purely medical information.⁶

To provide a real-world example of the consequences of medical misinformation in the media, we consider a tragedy

that took place in Greece recently. According to the Greek newspapers, a middle-aged man from rural Greece was sentenced to serve a jail term for murdering his brother, with whom he had a disagreement on the use of a traditional *medicine* to be used in the treatment of their sibling's cancer. More specifically, the murderer was using *frapelia* (a word derived from *frapé*—a coffee-based drink; and *elia*—olive leaves), a popular fruit juice in Greece to help his sibling fight the neoplasm in lieu of proper chemotherapy. This case received massive media coverage on the *healing properties* of *frapelia*, including a 30-min special in the Greek national television discussing the drink's anticancer properties. As a consequence, the government banned the dissemination of this hoax as rapidly as possible. Interestingly, similar cases on claims of *alternative therapies* have been observed in other countries; for example, in Italy, the *Di Bella Multitherapy* (also known as *Di Bella Case*) in patients with cancer raised much public concern and the intervention of the Ministry of Health.⁷

While the *frapelia case* was an unprecedented single event, it offered valuable lessons that warrant anthropological (*meta-ethnography*) research at the primary or secondary research (*meta-synthesis*) level. Indeed, cases like this illustrate how unsubstantiated medical facts can turn into a *viral* thread with serious consequences at the population level. In the *frapelia* example, we can point out several factors that may have contributed to its popularity. First, this product had an important symbolic meaning in the *collective sub/unconscious* of the region; olive leaves were granted as a prize for glory in ancient Greece. The

semantic contrast between cancer, commonly associated with *battle* and *defeat*, and olive leaves, associated with *victory and glory*, could have supported a belief in the therapeutic properties of frapelia. Second, as traditional medicinal products tend to be perceived as miraculous, the cognitive association between *nothing to win* from cancer and *nothing to lose* from trying a natural product with no apparent side effects could further explain the rationale behind the murderer's actions. Third, the conviction that olive leaves have antineoplastic properties may be rooted in a faulty generalization—a common cognitive bias—from the well-known anti-atherogenic and anti-inflammatory effects of olive oil products.⁸ This is even more problematic if we consider that the evidence provided in nutritional epidemiology studies is often quite weak.⁹ Fourth, such beliefs may also be rooted in erroneous extrapolations from in vitro findings—in this case, regarding the antitumor properties of the phenolic compound oleuropein¹⁰—interpreting them wrongly as robust, clinically relevant information.

Contemporary medical concepts and scientific breakthroughs may also be subject to misunderstandings and misinterpretations; let us consider the so-called precision or personalized medicine as an example. Precision medicine takes into account the patient's genetic and epigenetic make-up, environment and lifestyle choices, to offer tailored therapeutic interventions. Searching more into the roots of human psychological traits, perhaps we could find an atavistic human zeal for individualized *secret therapy regimens*. Regardless, efforts are currently taking place for the use of magisterial drug preparations to manufacture therapeutic agents that are specific to a single patient's needs; likewise, initial attempts for the so-called *patient-customized* genetic therapies are underway.¹¹ However, the complete individualization of therapy may be a fallacy (for further discussion, see¹²). Conceptually, given that the individual genetic variation has not been deciphered, any genomics-based therapeutic decisions would still require clustering of patients into subgroups, not as individuals.¹³ Thus, the enthusiasm with which advances in this field are often covered in the communications media should be taken with caution, especially considering the broader context of lack of standardization in medical terminology.¹⁴

In the light of these examples, could there be any short- or long-term solutions to the growing problem of the broad dissemination of unsubstantiated *medical* information? First, we propose to create national observatories (either as independent units or under the auspices of national councils for radio and television) to ensure that mass media are broadcasting only well-documented robust medical information. This is especially relevant for the geriatric population that may not have other available sources of information. Second, we suggest educating high school students on health issues, fundamental biostatistics and basic genetics. Education could help

create more knowledgeable healthcare and precision medicine consumers, who will be able to discriminate solid from weak evidence. Introducing the concept of *citizen-systematic reviewer*—a perhaps broader concept than the *Cochrane citizen scientist*¹⁵—in universities, irrespectively of the major field of study, would empower future generations to systematically extract, analyse and synthesize information on their own. The latter is particularly important, considering the delicate balance between the role of physicians as health experts and the current trends on patient-centred (rather than paternalistic) approaches in health care, as well as the need for obtaining a well-informed ethics consent. Third, we suggest creating a certification service for assuring the credibility and robustness of medical information. By doing so, we could use machine learning approaches, followed by professional manual curation, to monitor health-related and medical content in social media. Moreover, we should address the issue of laymen access to medical information; open-access preprint repositories, open-access articles per se, academic medicine lectures, medical education podcasts and even biomedicine-related online journal clubs, as well as *tweetorials*,¹⁶ are just a mouse click away for most people.¹⁷ Others have proposed a number of measures to enforce fact-driven, science-based public policies, for example through creating public policy fellowships for scientists.¹⁸ Collectively, we all need to understand how nonexpert audiences may misunderstand or misinterpret this kind of information.

Importantly, the medical and scientific community should be especially prepared to address any kind of so-called *fake news* and misconceptions during rapidly emerging settings (eg, epidemics or pandemics), such as the ongoing coronavirus-19 (COVID-19) infection. Although in such cases, the mass media and social networks might play important, positive roles in helping estimate the magnitude of an epidemic/pandemic and in promoting public health protective measures against the spread of the infection,¹⁹ they can also cause social anxiety and confusion of a potentially higher ultimate cost for the society.²⁰

In summary, if left unaddressed, mass and social media dissemination of medical misinformation can have devastating consequences. Cognitive biases, symbolic representations and misconceptions of basic medical terminology can all exacerbate mass media misunderstanding and transmission of false medical information. Here, we have proposed several ways by which the education system, the civil society and the healthcare providers should monitor and tackle this issue, which can be particularly pressing in the setting of epidemics or pandemics.

CONFLICT OF INTEREST

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