Health Policy and Technology 7 (2018) 115–118

Contents lists available at ScienceDirect

Health Policy and Technology

journal homepage: www.elsevier.com/locate/hlpt

The spread of medical fake news in social media – The pilot quantitative study

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ARTICLE INFO

Article history:
Available online 27 April 2018

Keywords:
Social media
Misinformation
Health communication
Poland

ABSTRACT

Objectives: Fake news: misinformation and falsehood of health news in social media constitute a potential threat to the public health, but the scope of this issue remains unclear. Our pilot study is an initial attempt to measure a number of the top shared health misinformation stories in the Polish language social media.

Methods: Using the BuzzSumo Application, a range of the top shared health web links in the Polish language social media was assessed during the period between 2012 and 2017. We used the following keywords which were related to the most common diseases and causes of death: cancer, neoplasm, heart attack, stroke, hypertension, diabetes, vaccinations, HIV, and AIDS. Each link was checked for the presence of fake news.

Results: 40% of the most frequently shared links contained text we classified as fake news. These were shared more than 450,000 times. The most fallacious content concerned vaccines, while news about cardiovascular diseases was, in general, well sourced and informative. More than 20% of dangerous links from our material was generated by one source.

Conclusions: Analyzing social media top shared news could contribute to identification of leading fake medical information miseducating the society. It might also encourage authorities to take actions such as put warnings on biased domains or scientifically evaluate those generating fake health news.

Introduction

Misinformation concerning health subject is not a new phenomenon - its roots are probably as old as health care itself. In the pre-media era, this problem was centered on the patient-doctor relation and its context [1]. As a result of the radio and television revolutions, and an exponential increase in the global Internet usage, a potential range of harm was brought to a totally new level [2].

Post-truth phase attracted a lot of attention during the United States presidential election in 2016. Afterwards, 'post-truth' itself was announced the word of the year by Oxford English Dictionary [3]. The term was getting used more frequently along with 'fake news' also in the leading medical journals [3,4]. It was defined as 'news that is intentionally false and could mislead readers' [5]. Two main motives behind fake news were financial and ideological [5]. Public health was confronted with a risk of patients' exposure to the fallacious and misleading information. It was believed that such a phenomenon might affect health literacy and spread medical conspiracy theories. Indeed, it resulted in behavioral changes and is now emerging as a serious threat to the public health [6,7]. However, there has not been published many comprehensive analyses concerning this subject yet. Recently, in Poland, as in many other countries, the Internet has consolidated its role as a source of health-related information, easily overtaking other types of media [8]. In response to these rapid changes, we hereby present a pilot study that is an attempt to measure the volume of shares concerning health fake news in the Polish language social media. We investigated most frequently shared articles using keywords related to diseases regarded as the top causes of death in Poland – cerebral stroke, ischemic heart disease, and cancers (together accounting for >60% of total deaths), prevalent chronic diseases – arterial hypertension and diabetes mellitus (32% and 9,5% of total population, respectively) and additionally – vaccinations and HIV/AIDS [9].

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https://doi.org/10.1016/j.hlpt.2018.03.002
2211-8837/

Methodology

Analysis was performed employing the BuzzSumo Enterprise Application (BuzzSumo Limited, Brighton, United Kingdom) available via its website. 'BuzzSumo is a social media analytics and curation tool for content marketers. It searches the web for the content based on search queries and reports the enquirer on its success, based upon its social likes and shares' (https://app.buzzsumo.com). Since BuzzSumo is user-friendly and free of charges, the authors decided to use this tool to make the study more transparent and reproducible.

The "Most Shared" tool was used to provide data regarding numbers of social media shares of most popular web pages. After introducing a keyword, the application returns statistics of related pages. For each link the BuzzSumo returns the data on volume of Facebook engagements (defined as a total number of likes, comments, and shares in this portal), Twitter (a micro-blogging site), LinkedIn (social media for business and professionals), and Pinterest (visual social media) shares. The further guidance on using BuzzSumo as well as technical details of its search engine have been provided on the producer's website: http://buzzsumo.com/knowledge/getting-started-with-buzzsumo/ and http://help.buzzsumo.com

The data was obtained for ten most commonly shared pages concerning eight keywords ($N = 80$): cancer (in Polish *rak*), neoplasm (*nowotwór*), heart attack (*zawał*), stroke (*udar*), hypertension (*nadciśnienie*), diabetes (*cukrzyca*), vaccinations (*szczepienia*), HIV and AIDS; filtered by time (from the 1st of August 2012 to the 1st of August 2017) and language (Polish). Each link was independently reviewed by two of the authors (PW and WKW). So as to simplify and clarify the studied web links, five categories were introduced according to their content, based on Tandoc, Lim and Ling review [5]. The authors have studied 34 academic articles that employed the term "fake news" between 2003 and 2017 and came up with six different types of these phenomena: satire, parody, fabrication, manipulation, propaganda, and advertising. We adapted and slightly modified their system for the purpose of this research. Since satire, parody, and propaganda apply mainly to the political news (according to their given definitions) and none of these were found in our initial screening of fake medical news, we decided to exclude them from our classification. Thereby, in this research we applied five categories:

(1) Fabricated news – completely fictitious medical facts or events (e.g. stories related to disease negation).
(2) Manipulated news – generally true basic information, but false conclusions or recommendations coming from the over-interpreted or overly extrapolated results (e.g. data from in vitro studies presented as a readily available option for patients).
(3) Advertisement news – stories about diseases, often critical towards conventional therapies, designed to advertise 'miracle products' (e.g. alternative treatments).
(4) Irrelevant news – not directly related to health (e.g. name of the disease used as a metaphor).
(5) Sufficient news – generally true and evidence-based information about the disease.

The veracity of health information found in news was judged by comparing it with 'Interna Szczeklika' - a comprehensive Polish textbook of evidence-based internal medicine. The textbook is updated annually and can be accessed by health professionals without any charge at https://www.mp.pl/interna/.

For purposes of the statistical analysis of this preliminary report, categories 1–3 were gathered together and marked as "fake news" . The interobserver reliability of the content analysis was calculated using Kappa statistics QuickCalcs by GraphPad Software, Inc (La Jolla, USA). A number of observed agreements was as high as 90% with Kappa value = 0.875 (95% CI: 0.838 – 0.912); SE of kappa = 0.019; Weighted Kappa = 0.890. For inconsistent rates, the links were reviewed once again and evaluated after having reached a consensus.

The data was collected and additionally analyzed in Microsoft Excel (Microsoft, Redmond, Washington, USA).

Results

Ultimately, eighty of the most frequently shared pages were reviewed (top 10 in each keyword category). On the whole, Facebook activities accounted for the majority of total shares and engagements (means range: 98–100%). The analyzed topics have attracted public attention with an unequal distribution (total shares, means, in thousands): cancer (34), neoplasm (18), vaccinations (15), heart attack (7), AIDS/HIV (7), hypertension (5), stroke (5) and diabetes (2). The topic most contaminated with fake news was vaccinations (90%), followed by hypertension and HIV/AIDS (both in 70%). Altogether, links containing fake news were shared 451,272 times between 2012 and 2017 and accounted for 40% of the studied material (Table 1). Sufficient news represented only 19% and most of them referred to heart attack and stroke. None of those two diseases' top 10 links were assessed as fake news (thus not included in the Table 1). The rest of the links were marked as irrelevant because they did not contain any medical information (neither true nor false) and referred mostly to celebrity health stories or treatment fundraising announcements.

The most frequently shared link in the studied population was a story of the miracle cancer treatment, which claimed to cure any cancer in just 42 days. This completely fallacious article was shared nearly 65,000 times. The publisher's website was also listed more times in the analysis and its links accounted for 94,000 cumulative shares (21% of all fake news).

Discussion

Recently, public attention was paid to the presence of the biased health information in media, which can undermine trust in healthcare. Our study is an initial attempt to measure the scale of medical fake news in the Polish social media. Identifying the scale and patterns of its stream, we can put forward some recommendations to the regulatory and policy authorities.

In our material, 40% of the links were assessed as fake news. It is worth pointing out that more than 20% of them were generated by a single source, generally abundant of false information. Similar descriptions of diseases and management models were found in several categories. Great part of the shared news was related to alternative medicine, but persistent denial of AIDS or vaccination was also noted.

The Independent's English language search in 2016 demonstrated a huge portion of fake stories, too [6]. The Magazine described pages that contained material discredited by doctors and health authorities. Furthermore, they alluded to Cancer Research UK website containing 'myths' and advised against it [6].

We take into consideration that those who share or read medical misinformation not necessarily have to follow them. Nevertheless, the 2016 poll conducted for BuzzFeed News found that a striking 75% of American adults who were familiar with a given fake news viewed the story as accurate [5]. Study of political fake news revealed that 23% of Americans claimed that they had shared a made-up news story – either consciously or not [10]. It has been thoroughly studied, notably in political sciences, how exposure to fabricated or manipulated information can alter points of view of individuals [11]. Extrapolating this knowledge to the medical field, there is a great concern that previous exposure to certain fallacies

Table 1
The volume of most shared medical fake news links in polish language social media by keywords (2012–2017).

Keyword	Proportion of fake news in top 10 shared links	Aggregated total shares and engagements [N]	Examples of articles' headlines
Cancer (rak)	5/10	200,631	"Cancer dies in 42 days: Austrian juice cured more than 45,000 sick" "We reveal the shocking truth! Cancer is not a disease, but a very profitable business!"
Neoplasm (nowotwór)	2/10	26,348	"It is not the neoplasm that kills half of patients, but chemotherapy - new study suggests" "Every neoplasm can be cured within few weeks"
Diabetes (cukrzyca)	3/10	5641	"Diabetes and overweight - Say goodbye once and for all without great effort and medications" "Diabetes fools the Poles"
Hypertension (nadciśnienie)	7/10	36,362	"Garlic - a natural way to atherosclerosis, hypertension and poor immunity" "Do not take drugs all your life. Natural cure for hypertension and cholesterol"
Vaccinations (szczepienia)	9/10	154,940	"Trump warns: Vaccination for the flu is the biggest scam ever!" "Chemical castration for girls from January - HPV vaccines are coming!"
HIV/AIDS	AIDS 5/5 HIV 2/5	27,350	"HIV virus in Bayer drug" "AIDS was created by the USA"

HPV - Human Papilloma Virus.
HIV - Human Immunodeficiency Virus.
AIDS – Acquired Immunodeficiency Syndrome.
Stroke and heart attack not included in the table (see details in article).

can contribute to the alteration of one's health preferences as well [7].

Belief in medical myths or conspiracy theories undoubtedly have its impact upon individual behavior, which was investigated in a comprehensive study done by Jolley and Douglas [12]. The authors found that anti-vaccine conspiracy claims significantly contributed to the reduction in vaccination rates [12]. Oliver and Wood in their research proved that about half of Americans believe in at least one medical conspiracy theory. These people were more likely to avoid health care and refuse to be vaccinated. They also reported buying farm organic food and use of herbal supplements [13].

Although the presented data shows mainly dismal perspectives, some optimistic conclusions can also be drawn. In our study stroke and heart attack links were generally correctly reported and of high quality. This may be a result of the extensive cardiovascular prevention and promotion campaigns, which had been launched in Poland [14]. Moreover, on the basis of well written cardiovascular articles, potential new insights into journalistic storytelling about health-related topics can be obtained. Even though only a minority of top shared links in our study was based on current medical evidence, it is worth taking a closer look at these successful stories educating the society. These were predominantly attractive video materials, e.g. narrating how diabetes develops as well as a neat spot regarding how to maintain proper diet captured in a kitchen (nearly 5500 shares). Another example was a viral video of a street event about mitigating the stigma of being HIV positive (shared 21,600 times). These findings are consistent with previously reported higher users' engagement to videos than other types of health-related posts (at least on Facebook) [15].

The battle over fake news in medicine is an emerging issue for public health authorities. Promising solutions rely on transformation of social media since administrators are getting more and more sensitive about fake news issue [6]. Some effective actions on correcting misleading stories were also reported [2], even though false belief is often hard to debunk from a psychological perspective. 'People who generate arguments supporting misinformation struggle to later question and change their initial attitudes and beliefs' - conclude authors of the meta-analysis on efficacy of countering misinformation [16].

Some limitations of our study must be stated. Firstly, BuzzSumo app is a relatively new and still developing tool. In spite of having been designed as a tool for social media management, it still lacks a proper validation in medical sciences. [17,18]. This should be regarded as a major weakness of this research. Many other social media analytic tools are available, but with similar restrictions. Secondly, the validation issue applies to the fake news classification system as well. While their typology was sufficiently described in a descriptive study [5], for the purpose of more in-depth research this limitation needs to be addressed with a more sophisticated statistical approach. Additionally, the fake news search for the purpose of this report was rather preliminary and therefore, by definition, not extensive. As a result, some top shared articles could have been overlooked. We used only direct terms, ruling out synonyms and other grammar expressions for the same topics. More linguistic flexibility and systematic approach to searching (e.g. PRISMA-like [19]) should be adopted in the full study.

Studies that follow not only should adopt methodological considerations mentioned above, but also pay more attention to behavior of the users such as duration of the reading time or a number of total shares coming from one user. A background flow pattern of the top shared links is also of high importance: are fake news freely spread through general social media environment or rather the majority of shares circuit in a so-called "echo chamber" - between the same clusters of users – which was suggested by one study [20].

Conclusions

Public health authorities, non-governmental organizations, and their collaborators from the Internet technology sector should consider results of this study as some of our conclusions could be introduced to public health regulations.

Actions could be taken to scientifically evaluate sources of the most frequently shared medical myths. As shown above, some topics were generally free of fake news, whereas others were extremely biased and filled with fallacies. Thus, an extensive educational campaign (not only in social media) for the latter should be implemented.

Such analysis of social media could make a significant contribution to the management of web sources publishing medical misinformation. We demonstrated a peculiar tendency - some sites represent a major part of overall shares focusing on barely few popular topics, such as vaccines or HIV/AIDS. In these particular cases, targeted blockage or simply a warning sign for specific pseudoscientific domains might be introduced. Restrictions put on these websites may significantly reduce the overall share of dangerous information. Furthermore, the providers of search engines and browsers could set lower priority for these sites to diminish a number of total web visits.

Undoubtedly, further research in this field (with both qualitative and qualitative approaches) is needed in order to develop effective and socially acceptable tools.

Acknowledgment

We would like to thank Tomasz Klepinowski who had made style, grammar, and vocabulary corrections.

Author Statements

Funding

No funding was obtained for the purpose of this research.

Competing interests

The authors have no conflict of interest to declare. All listed authors have contributed significantly to the work, have read the manuscript, attest to the validity and legitimacy of the data as well as its interpretation, and agree to its submission.

Ethical approval

Ethical approval was not required as this study did not involve any individuals. No personal data was accessed and it did not put anyone at risk.

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