Analyzing Medical Personnel's Perceptions of Online Health Rumors

Jeremy Soon Jia Qi, Snehasish Banerjee, Alton Y. K. Chua

***Abstract*—The purpose of this paper is to analyze medical personnel's perceptions of online health rumors as a function of two factors: rumor type, and the presence of counter-rumors. The two types of rumors include dread rumors that warn of dangerous consequences, and wish rumors that inform about potential benefits. Counter-rumors are messages that refute rumors. A total of 60 participants (20 doctors + 20 nurses + 20 medical students) were recruited to take part in an experiment. They were exposed to cancer-related dread and wish rumors—some accompanied with counter-rumors while others without counter-rumors. The participants' perceptions that were examined include intention to trust, and intention to share. These were measured using a questionnaire. A 2 (rumor type: dread, wish) x 2 (presence of counter-rumors: present, absent) factorial analysis of variance was conducted for data analysis. The results indicate that dread rumors were trusted and shared more compared with wish rumors. Besides, counter-rumors were effective in reducing intention to trust and share rumors, especially for dread rumors. Nonetheless, the medically trained participants were generally reluctant to view online health rumors favorably.**

***Index Terms*—Counter-rumor, doctor, health, online rumor, share intention, trust intention**

I. Introduction

RUMORS are unverified information that create unnecessary panic and anxiety among people [1], [2]. They often arise as a result of the public's attempt to collectively make sense of the world. In situations where information is incomplete or unknown, rumors arise as a way to help people fill their knowledge gaps. Based on the emotional needs that rumors express, they are broadly classified as either dread or wish. A dread rumor warns about a potentially negative outcome (e.g., causes of cancer) whereas a wish rumor informs about a potentially beneficial consequence (e.g., ways to cure cancer) [2], [3], [4].

Rumors specifically related to the health domain are quite common. For example, the false rumor that measles-mumps-rubella (MMR) vaccination causes autism is known to hinder MMR eradication [5], [6]. The recent outbreak of the Zika virus has spawned numerous rumors which the World Health Organization actively seeks to dispel through a dedicated website [7]. Meanwhile, medical personnel are dealing with patients who have easy access to health information due to the Internet, which also serves as a breeding ground for rumors. This calls for finding ways to manage online health rumors [8].

On the scholarly front, the focus has been on factors that fuel rumor-mongering on the Internet. Some of these factors include anonymity, lack of effective gatekeeping, and low personal accountability in sharing information online [9], [10]. Additionally, the ways in which rumors are perceived by people could also affect the extent to which such unverified messages spread. In general, Internet users who trust rumors tend to share the entries with others via social media [3], [11].

Another emerging strand of rumor research suggests that rumors spread can be mitigated with the bombardment of counter-rumors. Counter-rumors are messages that deny or refute rumors. Although their practical applications have not been widely explored, their theoretical effectiveness appears promising [12], [13].

Despite such existing scholarly efforts, an understanding about medical personnel's perceptions of health rumors is currently missing in the rumor literature. This research gap is significant because medical personnel play an important role in dealing with patients who are exposed to health rumors on the Internet. How effectively they are able to dispel rumors is largely dependent on their own perception of the unverified information in the first place [3].

Therefore, the objective of this paper is two-fold: to investigate medical personnel's perceptions of online health rumors, and to analyze the role of counter-rumors in shaping such perceptions. For the purpose of this paper, medical personnel include doctors, nurses, and medical students. Perceptions are studied in terms of intention to trust, and intention to share rumors. Both dread rumors and wish rumors are used for investigation.

II. Literature Review

Rumors are information without secure evidence, and with doubt about their veracity. They are commonly classified as either dread rumors that warn about negative outcomes, or wish rumors that inform about beneficial consequences [1], [2], [3], [4].

Varying characteristics of rumors such as their length, or the presence of accompanying images have been shown to

Manuscript received November 25, 2016; revised January 5, 2017, 2017. This work was supported by the Ministry of Education Research Grant AcRF Tier 2 (MOE2014-T2-2-020).

Jeremy Soon Jia Qi is with the Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore 636921 (e-mail: jsoon006@ntu.edu.sg).

Snehasish Banerjee is with the Wee Kim Wee School of Communication and Information, Nanyang Technological University, Singapore 637718 (e-mail: snehasis002@ntu.edu.sg).

Alton Y. K. Chua is with the Wee Kim Wee School of Communication and Information, Nanyang Technological University, Singapore 637718 (e-mail: altonchua@ntu.edu.sg).

ISBN: 978-988-14047-3-2
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

affect people's perceptions of dread and wish rumors differently [4]. Prior works particularly found dread rumors to be more prevalent, and perceived as being more compelling compared with wish rumors [11]. However, relatively little is known about the ways in which dread and wish rumors related to the health domain are viewed by medical personnel.

In an attempt to reduce rumor spread, the notion of counter-rumors has been proposed in recent years. Specifically, works such as [12] and [13] suggested that exposure to counter-rumors can reduce people's belief in rumors, and their likelihood to spread rumors. However, counter-rumors often do not spread extensively until the original rumors have gained traction on the Internet. By then, counter-rumors could have lost their intended effectiveness because they are divorced from the time and context under which the original rumors emerged [12]. Moreover, correcting entrenched beliefs is always an uphill task. Hence, in the ideal situation, whenever rumors start to spread, counter-rumors ought to be juxtaposed against these rumors, and aggressively propagated too.

This paper seeks to extend previous works by examining how counter-rumors affect intention to trust and share rumors, specifically those related to the health domain, among a specialized target population, namely, medical personnel. Intention to trust is defined as individuals' willingness to believe that the information provided by a given rumor is true [14], [15]. On the other hand, intention to share is defined as individuals' willingness to disseminate a given rumor with others [16], [17].

Previous works have found that people are more likely to share a rumor if they trust it. Dread rumors are shared as a way of defusing one's own discomfort and anxieties. In contrast, wish rumors could be shared to validate one's anticipation of potential satisfaction [11]. People would naturally avoid sharing rumors that they do not trust as it would lead to needless agitation in the case of dread rumors, or disappointment of false hope in the case of wish rumors. It could be interesting to examine how the interplay between the type of rumors—dread or wish—and the presence of counter-rumors affect people's perceptions in rumor-mongering.

III. Research Methods

This paper collected data from 60 participants, divided equally among doctors, nurses and medical students. They were recruited for an experiment using snowball sampling from a public hospital in Singapore.

In the experimental setting, the participants were asked to imagine coming across some eight health rumors, specifically related to cancer, on the Internet. The topic of cancer was chosen because cancer is the leading cause of death in Singapore accounting for 29.70% of deaths in 2015 [18]. Moreover, previous studies on rumors have also studied cancer, making it a viable option for investigation [3].

The eight rumors were randomly chosen from two popular rumor verification websites that included Snopes.com and TruthOrFiction.com. All the chosen rumors were verified to be false by medical experts. The rumors are provided later in the Appendix.

Four of the eight entries were dread rumors while the rest were wish rumors. The dread-wish categorization of rumors was verified with the help of three coders. They familiarized themselves with the definition of dread and wish rumors. Next, they were given the rumors, and asked to annotate the entries as either dread or wish. Unanimous agreement among the coders ensures the validity of the categorization.

Additionally, half of the entries contained rumors only while the other half included rumors followed by counter-rumors that stated, "The above message is a hoax. Please don't spread rumor." To control for order effects and employ counterbalancing, a balanced Latin Square design was employed [19].

For each of the eight entries, the participants' intention to trust rumors, and intention to share rumors were obtained on a scoring scale that ranged from 1 (least likely) to 5 (most likely). Two questions were used to measure intention to trust (Cronbach's $\alpha = 0.92$) while another two questions were used to measure intention to share (Cronbach's $\alpha = 0.96$).

To analyze the interplay between rumor type and the presence of counter-rumors in affecting the participants' intention to trust and share rumors, a 2 (rumor type: dread, wish) x 2 (presence of counter-rumors: present, absent) factorial analysis of variance (ANOVA) was conducted. In the analysis, rumor type (dread = 1, wish = 0), and the presence of counter-rumors (present = 1, absent = 0) were the two independent variables. The analysis was done with intention to trust, and intention to share as the two separate dependent variables.

IV. Results

Table I presents the descriptive statistics pertaining to the participants' (N = 60, age in years = 25.28 ± 3.83, professional experience in years = 2.78 ± 3.80) intention to trust and share rumors. In particular, intention to trust dread rumors in the presence of counter-rumors (1.15 ± 0.36) was lower than that in the absence of counter-rumors (1.65 ± 0.86). Similarly, intention to share dread rumors in the presence of counter-rumors (1.08 ± 0.34) was lower than that in the absence of counter-rumors (1.42 ± 0.72).

Besides, intention to trust wish rumors in the presence of counter-rumors (1.10 ± 0.41) was lower than that in the absence of counter-rumors (1.17 ± 0.41). However, intention to share wish rumors in the presence of counter-rumors (1.08 ± 0.36) was similar to intention to share wish rumors in the absence of counter-rumors (1.08 ± 0.36).

The factorial ANOVA indicated a statistically significant interaction between rumor type, and the presence of counter-rumors in affecting intention to trust; $F(1, 476) = 19.44$, $p < 0.001$. The simple effect of rumor type—F(1,

TABLE I
Descriptive Statistics (Mean ± SD)

Rumor type	Counter-rumor	Trust	Share
Dread	Present	1.15 ± 0.36	1.08 ± 0.34
	Absent	1.65 ± 0.86	1.42 ± 0.72
Wish	Present	1.10 ± 0.41	1.08 ± 0.36
	Absent	1.17 ± 0.41	1.08 ± 0.36

ISBN: 978-988-14047-3-2
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

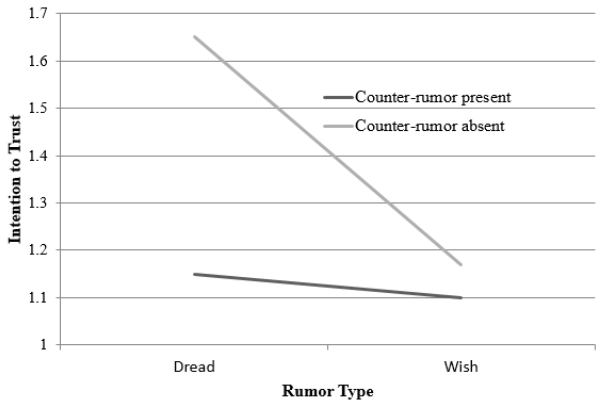

Fig. 1. Interaction plot for intention to trust.

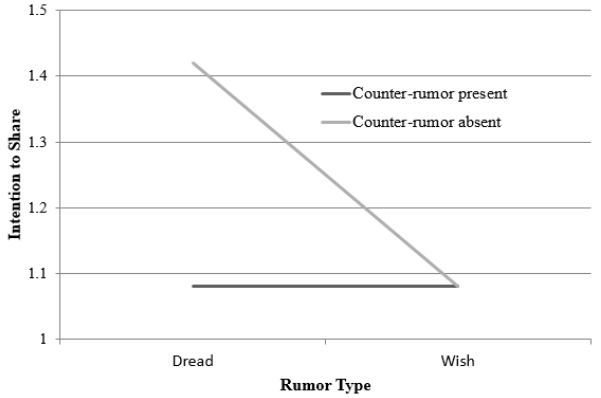

Fig. 2. Interaction plot for intention to share.

476) = 28.34, p< 0.001, and that of the presence of counter-rumors—F(1, 476) = 32.00, p < 0.001—were also statistically significant. Fig. 1 presents the interaction plot for intention to trust rumors.

Likewise, the factorial ANOVA indicated a statistically significant interaction between rumor type, and the presence of counter-rumors in affecting intention to share; F(1, 476) = 15.47, p < 0.001. The simple effect of rumor type—F(1, 476) = 14.71, p < 0.001, and that of the presence of counter-rumors—F(1, 476) = 16.24, p < 0.001—also emerged as being statistically significant. Fig. 2 presents the interaction plot for intention to share rumors.

V. Discussion

Three findings are gleaned from the results. First, medical personnel are unlikely to view online health rumors, either dread or wish, favorably. This is evident from the low mean scores for intention to trust and share as shown in Table I. The scale used for the scoring system ranged from 1 to 5, and none of the mean scores exceeded two. Unsurprisingly, intention to trust and share online health rumors among medical personnel as identified in this paper seemed lower compared with that among the general populace as found in previous works such as [3], [4], and [12]. This finding supports the proposition that medically trained persons are less likely to buy into health rumors vis-à-vis the general public. Given that this paper is one of the earliest to investigate medical personnel's perceptions of health rumors, it contributes to the literature by confirming their role in curbing the spread of unverified health-related messages on the Internet.

Second, medical personnel are more likely to trust and share dread rumors vis-à-vis wish rumors. Perhaps, the medically trained participants recruited in the experiment were confident of their knowledge about how to treat cancer. Hence, they were hardly taken in by wish rumors promising miraculous cures for cancer. On the other hand, dread rumors were trusted and shared perhaps because the participants adopted a better-safe-than-sorry approach [20]. When there is insufficient knowledge about an issue, one should take care to avoid harm. This finding is consistent with prior works such as [11] that found dread rumors to be trusted more compared with wish rumors.

Third, counter-rumors are effective in reducing people's intention to trust and share rumors. This is consistent with recent previous works [12], [13]. In addition, it was found that the presence of counter-rumors lowered intention to trust and share by a greater margin for dread rumors vis-à-vis wish rumors. This finding augments previous research by highlighting that counter-rumors perhaps work better in the case of dread rumors than for wish rumors.

VI. Conclusion

The paper examined medical personnel's perceptions of health rumors—dread and wish—in the presence, and in the absence of counter-rumors. An experiment was conducted by recruiting doctors, nurses, and medical students. The results indicated that the medically trained participants were unlikely to trust or share rumors. Nonetheless, they seemed relatively more likely to trust and share dread rumors vis-à-vis wish rumors. Moreover, counter-rumors were effective in reducing trust and share intention particularly for dread rumors.

On the scholarly front, this paper is significant as it examines perceptions of online health rumors among medically trained participants. The results lent support to previous works on the effectiveness of counter-rumors in reducing intention to trust and share rumors.

On the practical front, this paper highlights the role that medical personnel can play in curbing the effect of health rumors. Medical experts could issue counter-rumors to refute rumors on the Internet [13]. Websites that allow seeking medical information could use counter-rumors as educational materials to alleviate unnecessary panic and anxiety among patients and caregivers.

The findings need to be interpreted in the context of the paper. Since it recruited medically trained participants in Singapore via snowball sampling, the findings may not be easily generalizable. Furthermore, the rumors chosen for the experimental setting were related to cancer. These limitations could be addressed in future research to further broaden the rumor literature.

ISBN: 978-988-14047-3-2
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

APPENDIX

The eight cancer-related rumors used in the experiment are as follows:

Rumor 1 (dread): Soy food products are linked to thyroid cancer.

Rumor 2 (dread): Drinking cold water after meals will lead to cancer.

Rumor 3 (dread): The ingredient sodium lauryl sulfate poses a significant cancer risk to shampoo users.

Rumor 4 (dread): Freezing plastic water bottles causes them to release carcinogenic dioxins into the fluids they contain.

Rumor 5 (wish): Lemons can help ward off and cure cancer.

Rumor 6 (wish): Asparagus has miraculous cancer-fighting properties.

Rumor 7 (wish): The fruit from the graviola tree is a miraculous natural cancer cell killer.

Rumor 8 (wish): Kerosene can be used to cure cancer and other blood diseases.

REFERENCES

[1] N. DiFonzo, and P. Bordia, "Corporate rumor activity, belief and accuracy," *Public Relations Review*, vol. 28, no. 1, pp. 1-19, 2002.

[2] N. DiFonzo, and P. Bordia, "Rumor, gossip and urban legends," *Diogenes*, vol. 54, no. 1, pp. 19-35, 2007.

[3] N. DiFonzo, N. M. Robinson, J. M. Suls, and C. Rini, "Rumors about cancer: Content, sources, coping, transmission, and belief," *Journal of Health Communication*, vol. 17, no. 9, pp. 1099-1115, 2012.

[4] A. Y. K. Chua, and S. Banerjee, "Analyzing users' trust for online health rumors," in *Lecture Notes in Computer Science: International Conference on Asia-Pacific Digital Libraries*, R. B. Allen, J. Hunter, and M. L. Zeng, Eds. Switzerland: Springer International Publishing, 2015, pp. 33-38.

[5] M. Fadda, M. K. Depping, and P. J. Schulz, "Addressing issues of vaccination literacy and psychological empowerment in the measles-mumps-rubella (MMR) vaccination decision-making: A qualitative study," *BMC Public Health*, vol. 15, no. 1 [Online], 2015. Available: http://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-015-2200-9

[6] H. J. Larson, L. Z. Cooper, J. Eskola, S. L. Katz, and S. Ratzan, "Addressing the vaccine confidence gap," *The Lancet*, vol. 378, no. 9790, pp. 526-535, 2011.

[7] World Health Organization, "Emergencies: Dispelling rumours around Zika and complications," [Online], 2016. Available: http://www.who.int/emergencies/zika-virus/articles/rumours/en/

[8] P. Hartzband, and J. Groopman, "Untangling the Web—patients, doctors, and the Internet," *New England Journal of Medicine*, vol. 362, no. 12, pp. 1063-1066, 2010.

[9] B. Doerr, M. Fouz, and T. Friedrich, "Social networks spread rumors in sublogarithmic time," in *Proc. Annual ACM Symposium on Theory of Computing*, 2011, pp. 21-30.

[10] D. Liu, and X. Chen, "Rumor propagation in online social networks like Twitter: A simulation study," in *Proc. IEEE International Conference on Multimedia Information Networking and Security*, 2011, pp. 278-282.

[11] R. L. Rosnow, J. H. Yost, and J. L. Esposito, "Belief in rumor and likelihood of rumor transmission," *Language & Communication*, vol. 6, no. 3, pp. 189-194, 1986.

[12] P. Ozturk, H. Li, and Y. Sakamoto, "Combating rumor spread on social media: The effectiveness of refutation and warning," in *Proc. IEEE Hawaii International Conference in System Sciences*, 2015, pp. 2406-2414.

[13] Y. Tanaka, Y. Sakamoto, and T. Matsuka, "Toward a social-technological system that inactivates false rumors through the critical thinking of crowds," in *Proc. IEEE Hawaii International Conference in System Sciences*, 2013, pp. 649-658.

[14] L. V. Casaló, C. Flavián, and M. Guinalíu, "Understanding the intention to follow the advice obtained in an online travel community," *Computers in Human Behavior*, vol. 27, no. 2, pp. 622-633, 2011.

[15] N. J. Webster, T. C. Antonucci, K. J. Ajrouch, and S. Abdulrahim, "Social networks and health among older adults in Lebanon: The mediating role of support and trust," *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, vol. 70, no. 1, pp. 155-166, 2015.

[16] J. C. So, and N. Bolloju, "Explaining the intentions to share and reuse knowledge in the context of IT service operations," *Journal of Knowledge Management*, vol. 9, no. 6, pp. 30-41, 2005.

[17] S. Taylor, and P. A. Todd, "Understanding information technology usage: A test of competing models," *Information Systems Research*, vol. 6, no. 2, pp. 144-176, 1995.

[18] Ministry of Health Singapore, "Statistics – Singapore health facts: Principle causes of death," [Online], 2016. Available: https://www.moh.gov.sg/content/moh_web/home/statistics/Health_Facts_Singapore/Principal_Causes_of_Death.html

[19] J. V. Bradley, "Complete counterbalancing of immediate sequential effects in a Latin square design," *Journal of the American Statistical Association*, vol. 53, no. 282, pp. 525-528, 1958.

[20] M. L. DeKay, D. Patiño-Echeverri, and P. S. Fischbeck, "Better safe than sorry: Precautionary reasoning and implied dominance in risky decisions," *Journal of Behavioral Decision Making*, vol. 22, no. 3, pp. 338-361, 2009.

ISBN: 978-988-14047-3-2
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)