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Professional Peer Support in Online Health Communities

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Professional Peer Support in Online Health Communities: Evidence from COVID-19 Pandemic

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Abstract

This paper investigates whether and what kind of social support exchange in Professional-only Online Health Communities (POHC). Focusing on the recent fast-growing outbreak—Coronavirus Disease 2019 (COVID-19)— we find that healthcare professionals benefit from peer social support in POHCs, particularly by exchanging emotional support and learning from collective experience-based knowledge. Using the Reddit/r/medicine data, we show that posts' popularity varies depending on the authors' emotions and informativeness. In particular, a post's negative emotion and narrative tone have a significant and positive association with the post's popularity. These findings speak to the important role of POHC associated with healthcare professionals' integrity during the pandemic.

Keywords

Coronavirus Disease 2019, Peer Support, Online Health Communities, Reddit.

Introduction

Healthcare professionals are increasingly getting involved in Online Health Communities (OHC) to exchange information with peers (Stukus et al. 2019). A survey shows that medical professionals use an average of 2-4 hours of online professional networking per week, with an increasing trend, to discuss healthcare policy, promote encouraging behavior, or share experiences with distant colleagues (Courtney 2013; Barreto & Whitehair 2017; Stukus et al. 2019). Healthcare professionals' social engagement in online platforms is also supported by American Medical Association (AMA) as a means for medical students and physicians to exhibit personal expression, foster collegiality, and widely communicate public health messages (A. M. A. Policy 2011).

A great deal of previous research into OHC has focused on these platforms' social impacts on patients (e.g., Yan et al. 2014; Bardhan et al. 2020). For example, big data analysis of online patient communities explains how patients learn about health and exchange social support (De Choudhury et al. 2013; Yan et al. 2014). In other instances, researchers used OHC data for medical monitoring errors, predicting adverse events, and discovering disparities in social support in urban and rural areas (Bardhan et al. 2020, Nakhasi et al. 2012; Goh et al. 2016; Abbasi et al. 2019). This emerging stream of research heavily focused on patient-patient and patient-professional interactions. Hence, it lacks an understanding of Professional-only Online Health Communities (POHCs) and their impacts on healthcare professionals.

POHCs are social networks for healthcare professionals who either have or seek knowledge (Bray et al. 2008). Notably, these communities are different from patient-only and patient-professional communities in terms of topics they discuss, users' motives to join, and probably their social role (Bray et al. 2008). There

is also evidence that healthcare professionals tend to have a higher preference for professional-only communities than those with non-professional members (McGowan et al. 2012). Despite a rich literature highlighting promises and controversies of healthcare social media usage, we only found a few studies on POHCs and their effects on healthcare professionals.

This paper investigates the *social support* that POHCs may provide during a global health crisis for those who are significantly affected by it—healthcare professionals. In particular, we chose to focus on the recent fast-growing outbreak that poses significant issues to healthcare professionals' safety and public health—Coronavirus Disease 2019 (COVID-19). As of June 30, 2020, more than 10M confirmed cases of COVID-19 in the world, including more than 500,000 deaths reported by the World Health Organization (WHO). The United States (U.S.) accounts for more than a quarter of the total number of confirmed cases. The COVID-19 pandemic has had unfortunate physical, economic and psychological consequences for healthcare professionals (Wu et al. 2020). For instance, the pandemic led to the shortage of Personal Protective Equipment (PPE) and a higher risk of infection, increased the risk of layoffs or pay cuts for those who are not directly working with COVID-19 patients, and caused a moral injury by making difficult decisions for COVID-19 patients, to name a few.

Peer support is believed to be the most popular source of support among healthcare professionals in stressful work environments (Hu et al. 2012). A survey-based study shows that 88% of physicians rely on their colleagues' support during the professional hardship, which outnumbers traditional support resources such as the employee assistance program (29%) (Hu et al. 2012). An implication of peer support during a life-threatening global pandemic like COVID-19 is that healthcare professionals interconnect online forums to exchange social support with their peers. However, peer support in online platforms is a mostly unknown phenomenon whose application is highly relevant to the current pandemic; and its potential benefits continue to be sought afterward as a means for improving health outcomes (Wu et al. 2020). Therefore, our paper contributes to the literature on OHC by exploring how POHC can help healthcare professionals during a crisis. More formally, we answer the following research questions:

> **RQ1)** *What kind of peer social support exchange in professional-only online health communities?*
> **RQ2)** *How do professional-only online health communities help healthcare professionals during a health crisis?*

To answer our research questions, we analyze a publicly available dataset retrieved from r/medicine[1], a subreddit on reddit.com. r/medicine is an online community of healthcare professionals who discuss the latest medical advances, ask questions, trade ideas, and share experiences with peers across the globe. As of June 30, 2020, this online community has more than 300K members, and the majority of them are physicians, physician assistants, nurses, and medical students.

We synthesized the participants' content using Natural Language Processing (NLP) techniques and Vector Autoregression (VAR). We found that a post with a narrative tone (an indication of experience-based knowledge) and negative emotion has higher popularity than an analytical post or a post with positive emotion during the first spike of the COVID-19 pandemic. One standard deviation increase in the narrative tone of a post during the pandemic is associated with a 52% increase in the number of comments on the focal post. Moreover, a post with negative emotions receives 75% more comments than one with positive emotions. The results of our study shed light on the information usefulness and social support during the COVID-19 pandemic. These findings speak to the important role of POHC associated with healthcare professionals' informational support and emotional support during the pandemic.

Related Literature

Online communities are virtual spaces where individuals come together to converse, exchange information, learn, play, or be with each other (Kraut & Resnick 2012). Online communities gain attention among dispersed online users by creating a wide range of value through network effects (e.g., a larger pool of sellers

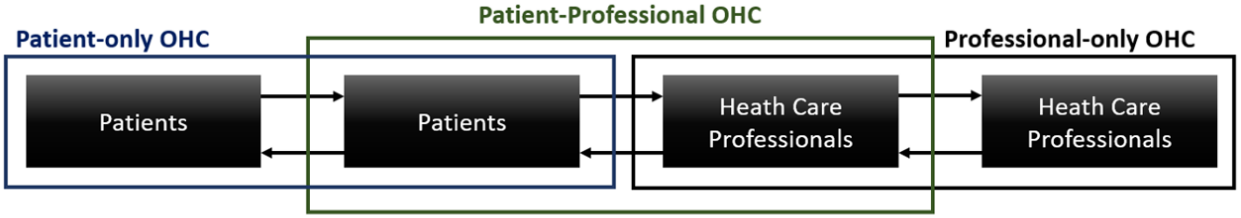
[1] https://www.reddit.com/r/medicine/

and buyers), innovation, knowledge creation, and social support (Faraj et al. 2016). OHC, in particular, gains in popularity among Information Systems (I.S.) researchers probably because of its potential impact on health outcomes and patients' support. To date, literature shows that OHC facilitates patient-patient and patient-physician collaboration, improving patients' wellbeing (Bardhan et al. 2020).

Despite the recent increase in research on OHC, analytics of POHC remains under-explored and, at the same time, an increasingly critical area of health I.T. for improving the quality of patient care (McGowan et al. 2012). Especially considering the interaction between different healthcare entities—patients and healthcare professionals— there is a shortage of research on professional-only platforms regarding the value they create and professionals' behavior on these platforms (see Figure 1).

Initial findings on POHC indicate that, unlike other kinds of OHC, value creation in POHCs usually occurs and evolves around the theme of new environmental circumstances (Bray et al. 2008). As an example, as a result of a health crisis, POHC can facilitate peer support for distress and burnout professionals, especially those from health facilities with no wellness programs to support their employees' mental health (Wu et al. 2020). POHC can also facilitate informational support during a health crisis among dispersed individuals. Knowledge in POHC is often *not textbook* knowledge that can be easily found but the experienced-based knowledge that requires social interactions (Bray et al. 2008). Especially at the time of a crisis, there is a surge in POHCs, likely to access a reliable flow of newsworthy information or exchange social support among healthcare professionals.

Some interesting behavioral nuances are only associated with healthcare professionals' behavior in POHCs. As an example, healthcare professionals in POHCs are proactive knowledge enthusiasts. In this sense, users are not necessarily aware of the knowledge they should know. Instead, they look for knowledge that they may find useful in the future (Bray et al. 2008). Such a dynamic inter-individual knowledge exchange may also seed positive behavioral antecedents.



Patient-only Communities: Online healthcare communities that have gained in popularity among patients by enabling them to connect to the population of patients with similar health problems (peer support among patients). Common motives for the patients are information seeking and social support (Nambisan 2011; Yan & Tan 2014).

Patient-Professional Communities Online Question-and-answer (Q&A) forums have gained in popularity among patients and professionals by providing acceptable quality answers to health-related questions. From the health care professional perspective, interaction in Q&A platforms engage consumers and build reputation (Khurana et al. 2019).

Professional-only Communities (the *focus of this research*) Professional-only Online Health Communities (POHC) devoted to the needs of healthcare professionals. Users usually create implicit knowledge. Hence it allows education and support to flow more effectively (Bray et al. 2008; McGowan et al. 2012).

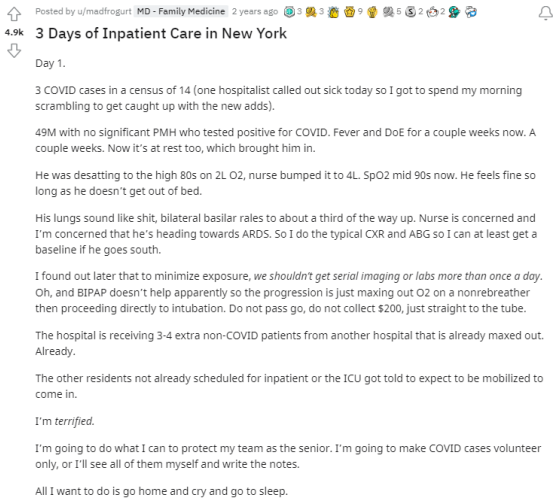
Figure 1 Different Types of Online Health Communities based on the Interaction between Patients and Professionals

Data Sources and R/medicine Statistics during the COVID-19 Pandemic

Using pushshift.io's API, we downloaded all the posts submitted to r/medicine from November 1, 2019, to May 12, 2020 (a total of 28 weeks). During this period, health professionals submitted 8,311 posts to the subreddit. Each observation is associated with a post with a unique identifier and information about the author, author flair (if available), submission date and time, and the number of comments on the post. Figure 2 shows a sample post on r/medicine during the COVID-19 pandemic.

Healthcare Professionals' Engagement in Social Media Increased during the Pandemic

While there is no consensus regarding the exact start day of the pandemic, we chose February 25 (the third week of Feb), when the number of US COVID-19 cases reached ten, as a cutoff point for our analysis. Figure 3 shows the weekly number of submitted posts during our study period. We see that the number of posts increased dramatically when the pandemic affected the U.S. This finding indicates that the COVID-19 pandemic tripled the weekly number of submitted posts on r/medicine, which could signal the potential increase in demand for support among peers (see Figure 3).


Posted by u/madfrogurt MD - Family Medicine 2 years ago

4.9k

3 Days of Inpatient Care in New York

Day 1.

3 COVID cases in a census of 14 (one hospitalist called out sick today so I got to spend my morning scrambling to get caught up with the new adds).

49M with no significant PMH who tested positive for COVID. Fever and DoE for a couple weeks now. A couple weeks. Now it's at rest too, which brought him in.

He was desatting to the high 80s on 2L O2, nurse bumped it to 4L. SpO2 mid 90s now. He feels fine so long as he doesn't get out of bed.

His lungs sound like shit, bilateral basilar rales to about a third of the way up. Nurse is concerned and I'm concerned that he's heading towards ARDS. So I do the typical CXR and ABG so I can at least get a baseline if he goes south.

I found out later that to minimize exposure, *we shouldn't get serial imaging or labs more than once a day*. Oh, and BIPAP doesn't help apparently so the progression is just maxing out O2 on a nonrebreather then proceeding directly to intubation. Do not pass go, do not collect $200, just straight to the tube.

The hospital is receiving 3-4 extra non-COVID patients from another hospital that is already maxed out. Already.

The other residents not already scheduled for inpatient or the ICU got told to expect to be mobilized to come in.

I'm *terrified*.

I'm going to do what I can to protect my team as the senior. I'm going to make COVID cases volunteer only, or I'll see all of them myself and write the notes.

All I want to do is go home and cry and go to sleep.

Figure 2 A Sample Post from r/medicine Subreddit

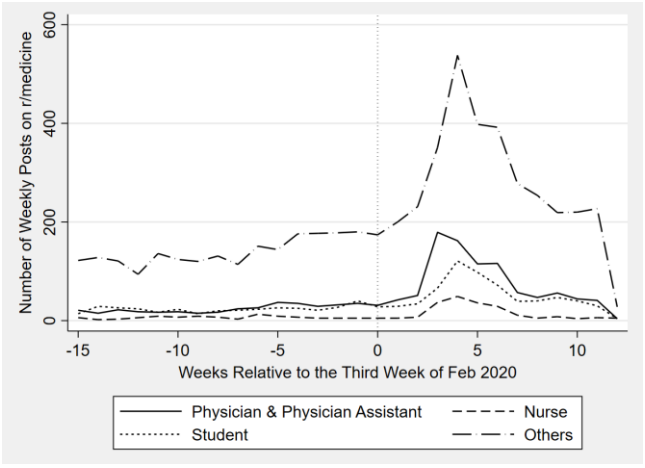


Figure 3 Weekly Number of Posts Before and During COVID-19 the Pandemic

Healthcare Professionals Share Less Narrative and More Emotionally Negative Posts during the Pandemic

We measured each post's narrative and emotional characteristics using a text analytics application called Linguistic Inquiry and Word Count (LIWC). LIWC2015 is a dictionary-based text analytics application in which each world matches with the appropriate word category (Pennebaker et al. 2015). There are approximately 90 output measures for each post that include four summary language variables such as analytical thinking, clout, authenticity, and emotional tone, as well as other linguistic/subjective characteristics such as general descriptor categories, word counts, psychological constructs, personal concern, and language markers (Tausczik & Pennebaker 2010; Pennebaker et al. 2015). Here is a summary of four language variables that we used in our study (our variables of interest are narrative tone and negative emotion, and we only control for clout and authenticity):

Narrative Tone: Posts with high narrative scores tend to focus on personal experiences that are here and now rather than logical and formal conclusions, focusing on the future. For example, in the sample post in Figure 1, using past tense words (e.g., found out) and 3rd person singular and plural words (e.g., he, she, they) are associated with the narrative aspect of the post.
Negative Emotion: Posts with negative emotions tend to have a higher frequency of negative emotional words. For example, "I'm terrified" or "cry" in Figure 1.
Clout: Posts with high clout scores tend to have a higher relative social status, confidence, or leadership.
Authenticity: Posts with high authenticity scores reveal authentic and honest authors, who write in a more personal, humble, and vulnerable way.

It is important to note that these measures are probabilistic like any computerized text analysis program. Also, the measured characteristics provide insights regarding an author's psychological status rather than the content of her post (Tausczik & Pennebaker 2010).

We combined our Reddit data with the daily number of COVID-19 hospitalization in the U.S. based on the COVID-19 tracking project and NYTimes[2]. This dataset provides information about the number of positive COVID-19 cases, current and cumulative hospitalized cases, ICU hospitalized cases, and cases in a ventilator. We focus on the current hospitalized COVID-19 cases since it is the most accurate reflection of the severity of the U.S. crisis and its healthcare facilities.

Using the Vector Autoregression (VAR) model, we look at the association between the pandemic and the change in healthcare professionals' psychological status using language summary variables. In particular, we investigate how healthcare professionals' narrative tone and negative emotions change in the course of the COVID-19 pandemic. We aggregate our data to the weekly level, where each observation has information about the mean narrative tone and negative emotion of posts each week and the weekly average of COVID-19 hospitalized patients. We checked the stationary behavior of our variables and used three-period lags of dependent variables based on the model specification (Dickey-Fuller test, *dfuller* command in Stata). The result of our VAR model is in Table 1.

Table 1 Change in Negative Emotion and Narrative Tone of r/medicine Posts

	OLS	OLS
VARIABLES	Negative Emotion	Narrative Tone
Log (Current Hospitalization)	**0.655****	**-0.333****
	(0.302)	(0.153)
Lag 1 Negative	0.0129	
	(0.0730)	
Lag 2 Negative	0.0160	
	(0.0736)	
Lag 3 Negative,	-0.00884	
	(0.0729)	
Lag 1 Narrative		0.0566
		(0.0715)
Lag 2 Narrative		0.0778
		(0.0715)
Lag 3 Narrative		0.149**
		(0.0711)
Observations	189	189

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Based on this analysis, over six weeks, where the number of hospitalizations jumped from zero to its maximum, we observe a 4% decrease in the predicted average narrative tone and a 9% increase in predicted negative emotion based on the VAR model. Predicted changes in the narrative tone and negative emotion are shown in Figures 4 and 5.

Results

Table 2 shows our focal model (column 1) and robustness checks (columns 2 and 3). In all three models, the dependent variable is the popularity of posts, measured by the number of comments. Variables of interest are the interaction terms that indicate the narrative tone and negative emotion of posts during the COVID-19 pandemic. In our focal Poisson model, column 1, we only use observations (posts) with more than 25 words. This cutoff is because of the possible bias associated with language variables measures if they are too few words in a post. However, we relax this assumption in our first robustness check (column 2) by showing that our results are robust when using all observations. Finally, we show that our results are robust to an alternative OLS model in the second robustness check (column 3). In all models, we controlled for weeks fixed effects as an indicator for unobservable time trends, word counts of each post, other

[2] Retrieved on 6/10/2020 from https://www.kaggle.com/sudalairajkumar/covid19-in-usa/data?select=us_states_covid19_daily.csv

language summaries of posts (Clout and Authenticity tone), and author flairs (MD, Nurse, PA, PGY, and student). We report robust standard errors in parentheses.

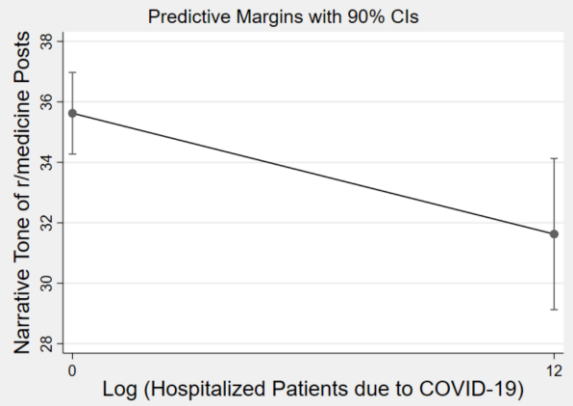


Figure 4 Change in and Narrative Tone of r/medicine Posts during COVID-19

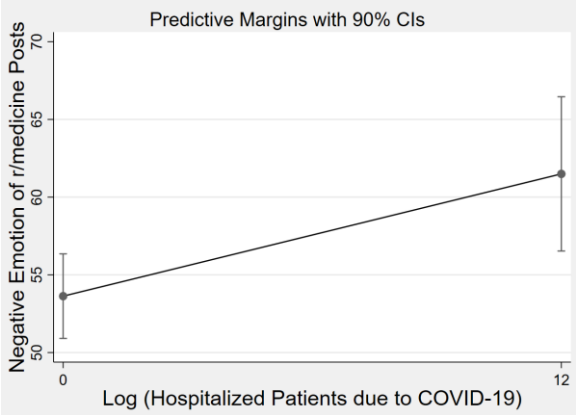


Figure 5 Change in Negative Emotion of r/medicine Posts during COVID-19

In column (1), the significant coefficient on *During COVID×Narrative* indicates the positive association between the popularity of a post, measured in the number of associated comments on the post, and its level of narrative tone, during the Covid-19 pandemic. The estimated effect is quite large, where one standard deviation increase in the narrative tone of a post is associated with a 52% increase in popularity during the Covid-19 pandemic. Moreover, the significant coefficient on *During COVID×Negative* indicates the positive association between the popularity of a post and its level of negative emotion during the Covid-19 pandemic. Accordingly, one standard deviation increase in a post's negative emotion is associated with a 75% increase in popularity during the Covid-19 pandemic. In columns (2) and (3), we show that our results are robust when we include all observations and an alternative OLS model.

Table 2 Popularity of Posts with Narrative Tone and Negative Emotion

	(1) Poisson	(2) Poisson	(3) OLS
VARIABLES	Num of Comments		Log (Num of Comments)
Word Count	0.000860***	0.000980***	0.00215***
	(0.000102)	(0.000121)	(0.000180)
During COVID-19	-1.616***	-0.319	-0.618***
	(0.419)	(0.277)	(0.0930)
Narrative	-0.00617**	-0.00260*	-0.00129*
	(0.00270)	(0.00142)	(0.000727)
During COVID×Narrative	**0.0138*** **	**0.00515*** **	**0.00208** **
	(0.00313)	**(0.00188)**	**(0.000954)**
Clout	0.0136***	0.00373*	0.00201**
	(0.00373)	(0.00226)	(0.000920)
During COVID×Clout	-0.00255	-0.00319	-0.00166
	(0.00491)	(0.00310)	(0.00107)
Authentic	0.00316	0.000779	0.000594
	(0.00259)	(0.00125)	(0.000557)
During COVID×Authentic	-0.00251	-0.00255	-0.000673
	(0.00367)	(0.00198)	(0.000678)
Negative	0.118	-0.0706	-0.159***
	(0.150)	(0.118)	(0.0490)
During COVID×Negative	**0.563*** **	**0.423** **	**0.159** **
	(0.179)	**(0.169)**	**(0.0617)**

MD	0.697***	1.428***	1.354***
	(0.136)	(0.155)	(0.0895)
Nurse	0.446***	1.232***	1.262***
	(0.138)	(0.120)	(0.134)
PA	0.0801	0.932***	1.344***
	(0.350)	(0.284)	(0.236)
PGY	0.733***	1.836***	1.953***
	(0.247)	(0.156)	(0.161)
Student	0.382**	1.392***	1.229***
	(0.178)	(0.176)	(0.106)
Constant	2.608***	2.172***	0.931***
	(0.346)	(0.221)	(0.0818)
Observations	2,386	8,311	8,311
Weeks FEs	YES	YES	YES

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Conclusion

A growing body of research finds evidence about the increasing trend of using social media by healthcare professionals and also regarding the positive impact of healthcare professionals' peer support on patients' health outcomes (Bray et al. 2008; Courtney 2013; Barreto & Whitehair 2017; Stukus et al. 2019). However, despite such a growth in the use of OHC, scholars lack an understanding of the values that online communities can bring to healthcare professionals. We addressed this gap by investigating POHC and its associated value for healthcare professionals. We mainly looked at the POHC deliberation during a recent health crisis—the COVID-19 pandemic—where we discussed that POHCs served as a powerful tool to improve peer social support among healthcare professionals.

Through mining the data from the r/medicine subreddit (from Reddit.com), our paper offers a glimpse of how POHCs support their users during the COVID-19 pandemic. We show that POHCs develop mutual peer support among healthcare professionals, one that is without the necessity of physical copresence. On the one hand, such reciprocal social support provides emotional support (the feeling of appreciation) for healthcare professionals who undergo high levels of occupational stress. On the other hand, it gives professionals experience-based knowledge, that is, the knowledge that cannot be found in textbooks.

Experience-based knowledge and emotional support provided by POHC during the pandemic can also improve patient health. Literature finds evidence that caring for patients during the pandemic depends on providers' mental and physical health and the integrity of the health care system to take adequate and prompt action at the time of a health crisis (Wu et al. 2020). To this end, peer emotional and informational support in POHC may also improve healthcare outcomes for patients.

The results of our study need to be understood in light of some limitations. First, this research does not engage with the actual impact of online peer support in POHCs on healthcare professionals' mental health. The main reason is that finding the relationship between POHC adoption and the impact on a focal user requires richer datasets, enabling us to follow each individual's behavior before and after receiving support from her peers. Unfortunately, our dataset has only a few observations per individual and only over a short period during the COVID-19 pandemic. Hence, we leave this here as a potential direction for future research to find a causal relationship between POHC adoption and healthcare professionals' mental health. Second, our dependent variable in this research is the number of comments on the focal post. Here we intuitively assumed that the higher number of comments (popularity) is associated with higher support. Notably, this issue is not unique to our research, as it can be found in many studies that approximated popularity and support based on the number of likes and comments. However, we anticipate that our result is conservative, considering that peer support increases during the pandemic's work-related stressors (Hu et al. 2012).

Finally, this work presents an initial step towards our objective to understand professional-only platforms by providing insights into how POHCs generate value and motivate professionals to adopt these platforms. We hope this work will spur additional interest in understanding the role of POHC in professionals' mental health and patients' health outcome.

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