

Infodemic: what physician leaders learned during the COVID-19 outbreak: a qualitative study

Kum-Ying Tham,¹ Qinghui Lu,² Winnie Teo ³

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/leader-2020-000288>).

¹Emergency Department, Tan Tock Seng Hospital, Singapore

²Surgery Centre, Raffles Hospital, Singapore

³Group Education, National Healthcare Group, Singapore

Correspondence to

Dr Winnie Teo, Group Education, National Healthcare Group, Singapore, Singapore; winnie_ll_teo@nhg.com.sg

Received 15 May 2020

Revised 15 June 2020

Accepted 16 June 2020

Published Online First

2 July 2020

ABSTRACT

Background Effective crisis leadership is dependent on the key tasks of sense-making, decision-making, meaning-making, learning and crisis termination. While instant messaging and social media provided abundant and powerful sources of information during the COVID-19 pandemic, the infodemic—an overabundance of information, some of which is inaccurate—has also complicated the tasks of crisis leadership.

Methods A qualitative study was undertaken, using semistructured interviews with physician leaders in the hospital dealing with majority of Singapore's COVID-19 cases. Participants were asked about how they used digital communication tools in their leadership roles before and during the outbreak, and their reflections on the use of these tools. Interviews were audio-recorded, transcribed, coded and subjected to inductive thematic analysis.

Results Twenty-four physician leaders described the adaptations to crisis leadership tasks using digital communication tools. While these tools were useful for rapid collective sense-making, meaning-making was the most challenging because information was posted by others who were faster, competed with their ability to create nuanced versions of a coherent narrative for stakeholders. Leaders also shared the need to balance their relationship with their smartphone and use digital tools to communicate purpose and meaning to and with their staff when face-to-face meetings are not possible.

Conclusions The COVID-19 infodemic has disrupted the key tasks of crisis leadership. For each task leaders on the front line can adopt measures to harness the power of and minimise the risk of damage by instant messaging. Infodemic management must be explicitly included in crisis management training for leaders.

INTRODUCTION

Social media and instant messaging are powerful sources of misinformation in times of crisis, as shown in studies focusing on Weibo in China¹ and Twitter in West Africa² following the 2014–2015 Ebola outbreak. The WHO recognises that for the coronavirus disease 2019 (COVID-19) pandemic, there is 'a massive 'infodemic'—an overabundance of information—some accurate and some not—that makes it hard for people to find trustworthy sources and reliable guidance when they need it'³

On the other hand, leaders can harness these same tools to access and disseminate timely and accurate advice and information. Singapore has a population of 5.5 million and a mobile penetration rate of 154.1%,⁴ and its instant messaging use (77%) is one of the highest in the world.⁵ Cognisant that the prevalence of social media usage may

Summary

What are the new findings

- During the COVID-19 infodemic, physician leaders rely heavily on digital communication tools, in particular instant messaging to carry out key tasks of crisis leadership.
- Leaders find these tools useful for rapid collective sense-making and to facilitate strategic and operational decision-making.
- The ubiquity of digital communication tools poses challenges for leaders who need to create meaningful understanding of the crisis but face competition from others who have alternative narratives and posted them faster.

How might it impact on clinical practice in the near future

- When a crisis happens, leaders must expect, set aside time and adopt effective ways to manage the overabundance of information pushed relentlessly to their smartphones.
- In the era of social media and instant messaging, leadership training must include the use of multiple communication modalities to manage the crisis and infodemic effectively.

render its users vulnerable to misinformation, the Ministry of Health (MOH) has responded by preemptively disseminating information and clarification about the COVID-19 outbreak in Singapore^{6,7} via its social media and instant messaging platforms.

Three factors shaped the reaction of staff members of Tan Tock Seng Hospital (TTSH), Singapore towards the outbreak in January 2020. The colocation (across the road from the main hospital building) of the newly opened National Centre for Infectious Diseases in 2019 is a daily reminder to the staff of their responsibility when an outbreak happens. Having been the leading healthcare institution to manage Severe Acute Respiratory Syndrome (SARS)(2003) and Influenza A (H1N1) (2009), TTSH has substantial institution memory and national leadership in outbreak management. The surveillance mechanisms in the Infectious Disease Department and Emergency Department have appreciated the magnitude of the outbreak in China and alerted the leadership of its implications for Singapore. Hence when TTSH was identified as the lead hospital to manage the outbreak⁷ and the need to scale up to outbreak mode was announced (eg, daily meetings between hospital leaders and MOH, changes to 'business as usual' operations),⁸ the decision was accepted quietly by its 9000 staff.



© Author(s) (or their employer(s)) 2020. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Tham K-Y, Lu Q, Teo W. *BMJ Leader* 2020;**4**:201–206.

What took the leaders by surprise was the infodemic faced by staff at the hospital level. During the SARS and H1N1 outbreaks, communication was via hospital town halls, department briefings, emails and MOH press statements. COVID-19 precipitated a tsunami of information and misinformation from multiple sources which was pushed relentlessly to the leaders' smartphones. The addition of social distancing measures constrained the leaders to limit the number of face-to-face meetings and relied heavily instead on digital communication tools. This study focuses on how physician leaders in TTSH carried out the key tasks of crisis leadership—sense-making, decision-making, meaning-making and learning—via digital means to disseminate information, manage misinformation and make strategic and operational decisions.

Theoretical framework

An adaptation of the crisis leadership framework by Boin and colleagues⁹ was used to frame the large number of themes. They proposed five core tasks of crisis leadership: sense-making, decision-making, meaning-making, crisis termination and learning. Sense-making involves collecting and processing information to make sense of the crisis as it happens. It is akin to the information gathering phase when a doctor clerks a patient: in addition to gathering information from multiple sources, the doctor needs to clarify, verify, appraise, prioritise some and discard other information to arrive at a main and differential diagnosis. Sense-making occurs both at an individual level, when a person takes in and processes information to arrive at an understanding of the crisis, or at a collective level, when leaders shape the sense-making processes of their staff by helping to present information that is pertinent to gaining a collective understanding of the situation. Decision-making is to evaluate alternatives, make critical choices and orchestrate people and resources to implement action plans. It is akin to a doctor, having formulated the main and differential diagnoses, deciding on the resources needed, prioritising and executing the investigation and management plans. Meaning-making requires leaders to advance a convincing and meaningful narrative to rally the people, like a doctor who needs to communicate the diagnosis and its implications and translate it into a language that the patient can appreciate and a decision that he/she can co-own. Crisis termination is not applicable because this study is conducted in the midst of the outbreak when its end is not yet in sight. Learning involves the collation and dissemination of lessons learned during the crisis so that leaders can prepare the organisation to respond better in future crises.

METHODS

Study participants

A purposive sampling strategy was used to identify the participants who were physician leaders meeting these criteria: heads of service, medical or surgical departments or chairpersons of the divisions where each division comprised several departments. Potential participants received an email invitation to be interviewed. Consent was obtained for the interview and audio-recording. The institution review board approved this study.

Data collection

In-depth, semistructured, open-ended face-to-face interviews were conducted with individual participants, and they were audio-recorded and transcribed. Participants answered questions covering these broad areas: work-related instant messaging usage before and during the outbreak, and reflections on the use

of these tools (Table 1). The interviews were completed between 2 and 27 March 2020 when Singapore was dealing with its first wave of the outbreak. The interviews were conducted on-site at TTSH by either QL and/or WT. These were stopped when data saturation was reached, that is when concurrent data collection, coding and checking of participants' responses against emergent themes revealed no new categories.

Forty physician leaders were invited of which 35 agreed to the interview. After completing 24 interviews, data saturation was reached and further interviews were unnecessary. The participants' specialties include anaesthesiology, family medicine, internal medicine with several subspecialties, orthopaedic surgery, psychiatry, radiology, surgery and urology. Twenty participants were heads of service/department, while four were chairpersons of divisions. There were eight women and 16 men. The duration of interviews ranged from 24 to 81 min, totalling 17 hours and 51 min and 480 transcript pages. The physician leaders' age ranges from 40 to 59 years, that is they are not digital natives. The size of the services and departments that they lead range from 10 to 170 staff members. Fifteen of them were working in TTSH during the 2003 SARS outbreak.

WhatsApp and TigerConnect are the predominant instant messaging tools that they use. When the hospital switched to outbreak mode, all of them experienced an exponential increase in the number of chat groups that they were invited to or initiated to deal with the rapidly evolving situation.

Data analysis

Grounded theory is the approach chosen because the use of digital communications in crisis leadership is relatively novel. This approach allows development of a focused, abstract theory to explain the empirical phenomenon. The constant comparative method¹⁰ was employed to code the data. The authors listened to the audio files, read the transcripts and used open codes to classify the participants' statements which were then grouped into second-order codes. Through an iterative process the authors met several times, and using an inductive thematic analysis¹¹ they arranged the codes into generalisable subthemes and then themes. A summary of the themes, subthemes and illustrative quotes is summarised in Table 2. Participants were available through email when clarification about their responses or data interpretation was needed.

RESULTS

Figure 1 presents a model of the tasks of crisis leadership described later. In the model, learning is shown to be embedded in the other tasks, emphasising its central role in informing the other tasks of sense-making, decision-making and meaning-making. The iterative nature of each task is a key feature of the model, and it emphasises how leaders need to constantly take onboard new information and developments throughout the crisis.

Task 1. Sense-making

The plethora of information and misinformation, and the rapidity of their arrival were overwhelming. The interviewees spoke about the measures they adopted to make sense of the information.

Expect the avalanche

The first component is to expect and acknowledge the avalanche of information that comes from multiple sources, as illustrated by this observation:

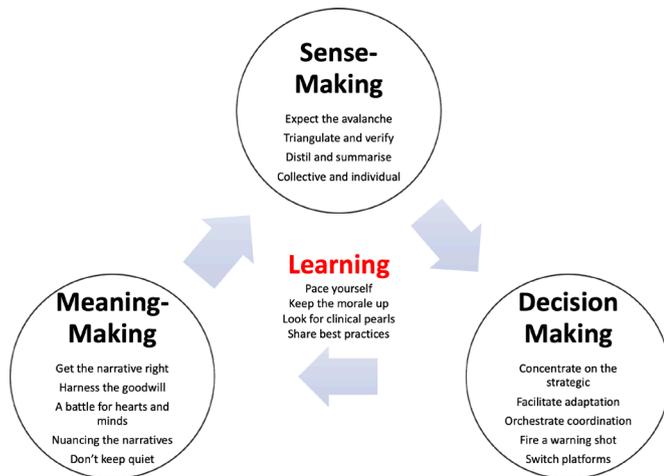


Figure 1 How physician leaders carried out crisis leadership tasks: sense-making, decision-making, meaning-making and learning using digital communication tools.

While instant messaging and social media is useful for information, for quick collective decision, it has its dangers of information overload for the recipient and the leader.

Interviewee 23 (I23)

Triangulate and verify

To ensure that the information is accurate, triangulation and verification are often necessary:

So it does involve a bit of snooping, so I spend some effort asking around to make sure that I get my facts right.

I17

Distil and summarise

With the abundance of information, even when it is accurate, there is a need to sieve out the signals from the noise. Verbs such as ‘condense’, ‘distil’, ‘filter’ and ‘summarise’ are used repeatedly by the interviewees:

Condensing and interpreting. Condensing, summarising ... condensing. Analyse, summarise in condensed form. Then you craft the message.

I05

Collective and individual

The scope of sense-making includes the collective and individual, and appropriate fora are needed especially for collective sense-making, with the bosses and junior staff. As middle-managers, a number of participants reflected that collective sense-making with top management was important to achieve a common understanding with staff members and get their buy-in:

Then we give them feedback that, ‘No I think maybe we should craft it this way because the concerns on the ground or our limitations or what restricts us would be these’. So, I am feeding information from down up.

I10

Task 2. Decision-making

The outbreak brought an onslaught of changes that necessitated many ground-level operational decisions. Many of the interviewees reflected that keeping the big picture in view is equally if not more important.

Concentrate on the strategic

Instant messaging allows rapid information gathering and expedites decision-making. This may be important in allowing leaders to quickly approve operational decisions and focus on strategic decisions. The case of an overnight policy change in personal protective equipment (PPE) for staff performing gastro-intestinal (GI) endoscopy is an example: at a very early stage of the outbreak, reports that viruses were shed from the GI tract were just emerging but not enough to build a convincing case for a higher level of PPE. However, the chairperson of the division and the Infectious Disease physicians recalled that in 2003 the SARS viruses were shed from the GI tract, resulting in spread of the infection. Hence a strategic decision was made to escalate the PPE level even when the evidence was insufficient. This case illuminates two aspects: (i) diligent sense-making (aided by the instant messaging chats) is important to identify issues of strategic importance and (ii) the process of decision-making needs to be sound and expedient, enabled greatly by instant messaging:

One of the weekends, I had this long TigerConnect chat with ID people and Division Chair because we found that half can present with GI symptoms ... we can bounce ideas off and they can reassure us that the risk is low. This is how we started donning N95, PPE for scopes.

I13

Facilitate adaptation

The leaders agree that change and adaptation is crucial for the institution to overcome the outbreak. Bombarded by the vast amount of information, it is tempting to be reactive but many choose to proactively facilitate the adaptation especially when it concerns the work, welfare and well-being of their teams. A department leader, on noticing early signs of physical fatigue among staff, decided to embark on morale-boosting efforts before staff members became demoralised by the constant stress of supporting the outbreak:

There is fatigue setting in ... So, to me now, it’s probably shifting the focus more to how to sustain the workflow, how to maintain morale.

I21

Orchestrate vertical and horizontal coordination

The outbreak does not respect departmental and professional boundaries that are present when it is ‘business as usual’. To respond to the outbreak, the leaders scrambled to form new teams that cut across departmental, divisional and professional boundaries. Instant messaging empowers them to form new chat groups that are virtual teams within hours, a feature that is absent in past outbreaks¹²:

With COVID, I formed this operations group involving manpower of certain groups: the consultant manpower, the medical officer manpower, the chief resident, the in-charge of various groups, and my ops (manager).

I20

Fire a warning shot

The interviewees are at times able to give input to strategic but painful decisions made by top management. Instant messaging allows them to fire a warning shot to their teams to soften the blow a little. A prime example was the leave cancellation policy:

Then I have another chat group that is just the heads, for more sensitive things, like ‘Your leave’s going to be cancelled’. I had to

communicate that a few days before it was formally announced. I told them, 'You cannot let leave be approved. But you can't say it yet, so please do it wisely'.
I23

Switch platforms

The interviewees have schemas when certain events will prompt a move away from instant messaging and a switch to more direct communication. Unanimously, they would choose a meeting or a phone call if it is a confidential matter:

As Head, I am careful because this is still a social platform. If there's something that is confidential, I would not put it on WhatsApp. I will need to talk to the person.
I09

Other events include complex or controversial issues that need discussion and narratives that are at risk of diverging:

When you need to do some probing, or you don't even know what to ask—in a face-to-face meeting, information sharing is more candid and more open.
I19

You need to create a shared mental model. If you think that people have different ideas of the intent and what we need to do, you'd better meet.
I10

Task 3. Meaning-making

Meaning-making in a healthcare institution has three aspects: for patients, staff and the public. The patient-facing narrative is the closest to 'business as usual' because the basic model of care has not changed although delivered through layers of PPE.

Get the narrative right the first time

For the staff and public-facing aspects, the first component in meaning-making is to decide on the narrative and craft it right the first time. If leaders fail to take charge of the narrative, others will fill that void speedily, aided by instant messaging as illustrated by the strategic decision to cancel leave was leaked prematurely:

There is no opportunity—before the Head of Department could explain the leave cancellation policy, people were already comparing with doctors from another (hospital) group who went skiing.
I10

Crafting the first narrative must be a deliberate and urgent collective undertaking because (i) the vast amount of information can drown the core message, (ii) the speed at which instant messaging and social media spread the word and (iii) the reach that these platforms are capable of as observed by the interviewees:

Firstly, we weren't sure what was the greater message ... we weren't sure of what's going on, therefore we felt ok, let's wait, but then in the waiting, I think we didn't communicate.
I06

... if there is something that you are supposed to say and you don't say (it) and there is a gap, that gap would be filled with rubbish or fake news.
I10

Harness the goodwill but take it with a pinch of salt

The hospital proactively fed news and stories to the mainstream media and posted them on multiple online platforms. Fuelled by

instant messaging and social media, the public responded with a phenomenal outpouring of support.¹³ The interviewees acknowledge such support gratefully but some view it with caution:

... if we have such a quick outpouring of support, does it also die out faster? (Now) in the second month, I think the enthusiasm has already started to flag. So, I'm sceptical.
I22

A battle for hearts and minds

For close-knit teams, the interviewees use instant messaging for the personal touch and to validate team-members' contribution:

When my staff went into the outbreak wards, I sent a sentence, 'Take care, stay safe'—then everybody sends to the same person, to take care, and that person feels the support from the entire team, especially when you are not supposed to meet, but (they feel) the warmth and support that comes through the WhatsApp.
I09

At the hospital level, the Staff–Support–Staff^{14 15} team shares tips for mental well-being and post 'good vibes' stories regularly on Workplace@Facebook page. However, the leaders also acknowledge that given the sheer size of the doctor-workforce a persuasive and credible narrative is crucial in this battle for their hearts and minds, in which instant messaging is not designed to deliver:

The entire battle is lost when they don't have confidence—confidence in themselves to do the work, confidence that their Head knows what they're talking about, confidence that the hospital is doing the right thing. And that part is emotional, not entirely intellectual—and that's the part that I find the hardest. What WhatsApp cannot communicate, is the feeling.
I23

Nuancing the narratives

Within the same department, nuanced narratives are needed for different audiences. For example, the rapid-fire exchange of texts between senior doctors takes on the appearance of a quarrel when in reality it is a heated debate on fuzzy scientific findings. Several Heads separate the junior and senior doctors chat groups; this allows the seniors to continue their debates without worrying about misinterpretation from the juniors:

For the seniors, we are mature enough to handle disagreements ... but if you are junior you might say, 'How did they have such disparate opinions, and not reconcile them?' First of all, information-wise, 'who should I believe?' And two: 'are they really fighting?'
I14

Don't keep quiet

The interviewees appreciate that top management must have been inundated with many messages from many groups, but their silence on instant messaging is still poorly tolerated:

Sometimes the key decision leaders/makers in these groups need to say something. If the boss keeps quiet, and allows the rest of us go on, I have this nagging fear that we're just doing our own thing and he's silently endorsing it, or he doesn't know what's going on.
I23

The central task: learning

In addition to the lessons embedded in the aforementioned tasks, the leaders learned specific lessons related to self-care, taking care of their teams, improving patient care and sharing best practices.

Pace yourself

The multidirectional flow of information is demanding and it does not have ‘downtime’. Leaders need to mindfully set aside time to manage information flow, know when and which groups to mute and to pace themselves:

Initially I wasn't sleeping well because information flow was non-stop. Always worried about missing out—FOMO [FOMO: fear of missing out]—because there were a lot of sudden decisions. I still remember receiving a text at 3 am because one of the medical officers was suspected to be infected—something quite urgent. Sometimes I wake up for no reason to check my phone.

I21

Keep the morale up

One interviewee states that his principal role in the outbreak is ‘morale maintainer’ and many speak of ways they use instant messaging and other platforms to encourage their teams. However, they recognise that instant messaging is a poor substitute for a face-to-face meeting to convey confidence:

At critical points, your presence as a leader is important. People look to you not just as a source of information, but also as a source of confidence, because they look at you and they understand—okay, I think he knows what he's talking about.

I23

Look for clinical pearls

Several interviewees are pleasantly surprised at how instant messaging has enabled rapid learning about the new disease and its manifestation by their teams that hardly met. Where junior doctors formed chat groups with their Head, this has enabled dissemination of learning points and discussion about interesting findings. The coalescence of bite-size information about different patients on the group chats led to the emergence of important findings:

We learnt something very important: there were some people who were never positive! We kept swabbing (because) the clinical picture was so suggestive. After a while we realised: if the clinical picture is very suggestive, we really have to mentally treat them as COVID, and then one fine day the swab will become positive.

I19

Share best practices

In addition to helping their teams learn rapidly, instant messaging greatly enables sharing of best practices with doctors in the other hospitals without a large number of positive cases:

... because we put everybody on the (chat) group, we saw certain patterns, and we update the (management) protocols ... compared to last time, now, you can inform and advise your colleagues in the other hospitals and all the positive practices then become promulgated.

I17

DISCUSSION

These findings have extended the knowledge about crisis management by highlighting how digital communications have altered the key tasks of crisis leadership. The physician leaders described the quantity and speed of information made available through social media and instant messaging as a ‘double-edged sword’: a boon and a bane concurrently. Our study offers insights into how leaders can use digital communications effectively in crisis and infodemic management, and it has important implications for

organisational leaders operating in a world that is increasingly dominated by social media and connected digitally.

Crisis and infodemic management are analogous to a doctor's approach and management of a patient with complex problems, such as diligence, discipline and intuition, are necessary. After being overwhelmed initially, they adopted a disciplined approach to quickly make sense of the vast amount of information. Helpful techniques include dedicating time to the task, triangulation and verification, triage, prioritisation and repackaging. These techniques help to bring clarity to the issues that compete for attention and to the messages that need to be sent to their teams and to their bosses. Instant messaging is also a means to carry out collective sense-making because it affords a quick way to gather feedback from the ground and clarify policy implementation with management. The clinical leaders set up chat groups with different members for specific purposes, for example with junior staff for quick dissemination of policy changes, with leadership peers to discuss sensitive matters and with top management for feedback and rapid clarification.

While much of the work of crisis management centres on operational coordination, the leaders realise that by dedicating time and energy to sort through the myriad of problems and focusing on strategic decisions they add value to the organisational response. In this regard, they acknowledge that instant messaging is a tremendous enabler to facilitate the strategic work of leaders: for example, orchestrating coordination, forming strategic alliances across departmental and professional boundaries, helping staff to adapt to the outbreak procedures and giving staff advance warning of difficult decisions.

Meaning-making posed the greatest challenge to the hospital leadership, given the competing narratives offered by the ubiquity of social media. Just like a doctor with difficult news to share, it is a battle for hearts and minds, where the multiple threads in the story must be coherent, the story must be credible and the follow-up actions must be meaningful and connected to the story. It is also a battle of the ‘fastest fingers first’ because the failure to advance a credible account of the unfolding crisis would allow competing narratives to fill the void, sometimes to the detriment of the mission. Some leaders highlight different aspects of the same story to different audiences, so that everyone can relate to the overall mission. They kept in touch and encouraged their teams via instant messaging but realised when more direct forms of communication were needed.

The participants learned many lessons: they realised the need to take care of themselves and have a balanced relationship with their smartphones. They realised that instant messaging was a useful, but not a complete substitute to help keep their teams' morale up and to communicate care. They appreciated that instant messaging enabled rapid learning about the new infection and sharing this new knowledge speedily with far-flung colleagues.

LIMITATIONS

The first limitation relates to the use of a qualitative method whereby (i) the findings are products of the interactions between the researchers, their participants and environment and (ii) it facilitates in-depth exploration of a phenomenon but limits the generalisability of the findings. There are additional limitations specific to our study. We collected data in one healthcare institution where its unique cultural influences, and the advanced technological nature of Singapore's healthcare system and the actors therein, may limit generalisability in other contexts. Next, we have not explored if nursing, administrative and other leaders

would have employed similar techniques in dealing with the infodemic. Lastly, by focusing on mid-level and senior leaders, we do not know how junior staff who are digital natives responded to the acts of crisis leadership elucidated here. Within each of these limitations, however, lie possible avenues for future research: for example, how differently would the digital natives of today manage the crisis and infodemic when they assume leadership positions in the next two decades?

CONCLUSION

Our study has shown that instant messaging can be harnessed in every task in crisis management—sense-making, decision-making, meaning-making and learning—that has been disrupted by the rise of social media. We believe that lessons learned from the physician leaders in our study would be invaluable in training future leaders in managing the infodemic as part of crisis leadership training.

Contributors All three authors conceived and designed the study. QL and WT collected the data. All authors conducted the data analysis. K-YT drafted the initial version of the manuscript. All authors contributed to interpretation of the data and critically revised the manuscript, had full access to the data in the study and can take responsibility for the integrity of the data and accuracy of the data analysis. K-YT is the guarantor.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval This study was approved by the National Healthcare Group Domain Specific Review Board (Approval no. 2020_00175). All participants have given informed consent before taking part in this study.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information. No additional data or information is available.

Author note A summary of the results of this study will be sent to the research participants.

This article is made freely available for use in accordance with BMJ's website terms and conditions for the duration of the covid-19 pandemic or until otherwise determined by BMJ. You may use, download and print the article for any lawful,

non-commercial purpose (including text and data mining) provided that all copyright notices and trade marks are retained.

ORCID iD

Winnie Teo <http://orcid.org/0000-0003-4592-6344>

REFERENCES

- Ye X, Li S, Yang X, *et al.* The Fear of Ebola: A Tale of Two Cities in China. In: Shen Z, Li M, eds. *Big data support of urban planning and management. advances in geographic information science*. Cham: Springer, 2018: 113–32.
- Oyeyemi SO, Gabarron E, Wynn R. Ebola, Twitter, and misinformation: a dangerous combination? *BMJ* 2014;349:g6178.
- World Health Organisation. Novel coronavirus (2019-nCoV) situation report – 13, 2020. Available: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200202-sitrep-13-ncov-v3.pdf?sfvrsn=195f4010_6 [Accessed 14 Apr 2020].
- Infocomm Media Development Authority, Singapore. Mobile penetration rate, 2019. Available: <https://data.gov.sg/dataset/mobile-penetration-rate> [Accessed 13 Apr 2020].
- Steup M. 4 million Singaporeans say WhatsApp is their most-used APP, 2018. Available: <https://www.messengerpeople.com/whatsapp-is-singaporeans-most-used-app/> [Accessed 13 Apr 2020].
- Ministry of Health, Singapore. Updates on COVID-19 (coronavirus disease 2019) local situation, 2020. Available: <https://www.moh.gov.sg/covid-19> [Accessed 14 Apr 2020].
- Legido-Quigley H, Asgari N, Teo YY, *et al.* Are high-performing health systems resilient against the COVID-19 epidemic? *Lancet* 2020;395:848–50.
- Paulo DA, Lim AM, Yip C, *et al.* Inside Singapore's COVID-19 screening centre, on the front line against the disease, 2020. Available: <https://www.channelnewsasia.com/news/cnainsider/inside-singapore-covid-19-screening-centre-defence-disease-ncid-12656312> [Accessed 19 Apr 2020].
- Boin A, Hart P, Stern E, *et al.* *The politics of crisis management: public leadership under pressure*. Cambridge: Cambridge University Press, 2005.
- Strauss A, Corbin J. *Basics of qualitative research: techniques and procedures for developing grounded theory*. Thousand Oaks, CA: Sage, 1988.
- Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77–101.
- Boin A, Kuipers S, Overdijk W. Leadership in times of crisis: a framework for assessment. *Int Rev Adm Sci* 2013;18:79–91.
- Hariz B, Toh WL. Coronavirus: initiatives to show support for front-line medical staff, 2020. Available: <https://www.straitstimes.com/singapore/initiatives-to-show-support-for-front-line-medical-staff> [Accessed 29 Apr 2020].
- Kurohi R. *Hospitals ramp up programmes providing support for staff*. Singapore: The Sunday Times, 2020: A12.
- Goh CT. COVID-19: guarding against burnout, compassion fatigue and trauma in frontline healthcare workers, 2020. Available: <https://www.channelnewsasia.com/news/singapore/covid-19-guarding-against-burnout-trauma-ttsh-ncid-frontline-12669280>