

## Mental Health of Healthcare Personnel during Quarantine for Infectious Epidemic--Real-time Data

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### Abstract

**Background:** The 2020 Coronavirus (COVID-19) pandemic has been causing significant fear and anxiety among the general public and demonstrate insufficient preparedness of Healthcare systems. It shed light on front-line Healthcare-personnel who should function and treat others while they share the same stressful situations.

**Objective:** To provide actual real-time data on mood and mental symptoms of Healthcare personnel in quarantined wards during the Chinese-SARS epidemic, in order to support procedures for functioning of personnel during current and future epidemics.

**Setting, Participants and Measurements:** Cross-sectional Study was conducted during the acute exacerbation of the SARS epidemic at quarantined wards by nurses who were embedded and quarantined with the patients. Mood and perceptions of Healthcare-personnel infected (n = 55) and not infected (n = 149) with SARS, as well as those during quarantine "rehabilitation" (n = 62) were compared to SARS patients (n = 96), healthy quarantined students (n = 55) and healthy non-quarantined controls (n = 52). Structured interviews were conducted with the Beck Depression Inventory (BDI), Spielberger's State-Trait inventory, symptoms Checklist-90 (SCL-90) and a situation-specific questionnaire.

**Results:** Healthcare-personnel -- infected and not-infected, suffered as much mood, anxiety and other stress-induced symptoms as their SARS patients. Strictly enforced quarantine amplified personnel's frustration, mental symptoms and mistrust in authorities.

**Limitations:** Data was collected when many patients were assisted by respirators, some could not be included.

**Conclusion:** During acute epidemics front-line Healthcare-Personnel are exposed to same and even more extreme situations as their patients. Their emotional state under tumultuous situations should be of concern.

**Implications:** Mental well-being procedures and enhancement of Mental resilience of Healthcare teams should be an integral component of their preparedness for future disasters.

**Keywords:** Healthcare Personnel; Corona Virus; SARS; Infectious Diseases; Mental Health; Preparedness; Well-Being

### Introduction

The 2020 coronavirus (COVID-19) pandemic has been a top public concern inducing fear and stress among professionals and populations World-wide, especially in areas in which infected travelers and residents were identified.

The World Health Organization (WHO) immediately convened world experts and funders "to set priorities for COVID-19 research".

A collaborative form of the WHO and Global Research Collaboration for Infectious Diseases Preparedness (GLOPID-R) constructed recommendations [1] which included (at the bottom of the list) "integration of social science in the outbreak response", and "...minimize social and economic impact through multisectoral partnerships". Almost simultaneously it was noted that "Timely mental health care for the 2019 novel Coronavirus outbreak is urgently needed" [2]. The USA Centers for Disease Control and Prevention (CDC) is-

sued guidelines for actions and preparation which are updated according to cumulative information [3].

Indeed, emphasis during crisis is, and should be on adequate physical life-saving actions and equipment. However, it should be recognized that during any crisis, may it be infectious, natural or man-inflicted, first responders should treat patients and victims while they are under same life-threatening crisis situations. Their emotional state and well-being are of utmost importance for efficacious management of victims. While it is recognized that crises and the considerable uncertainties associated with their impacts and consequences severely affect mental well-being, there is a lack of actual data on mental health collected at real time on-site during the actual crisis. Obviously, such research is not an acute priority when lives are at stake [4].

Here data collected at real-time during the very acute phase of the 2003 SARS epidemic in China [5] is reported. The implications of Public-Health management of that crisis are of importance because during the first 20 years of the 21<sup>st</sup> century there were several viral epidemics that spread to other countries. Most notable were the 2003 SARS, 2009 N1H1- "Swine Flu", 2012 MERS (Middle East Respiratory Syndrome), 2014 Ebola and now the 2020 Coronavirus (COVID-19). With the enhanced economic and transportation Globalization, Governments and International agencies are preparing (or should be preparing) for next epidemic wave. Data from past occurrences should inform current and future preparedness.

## Methods

### Circumstances and environment

Once the epidemic was recognized, the Chinese authorities in Beijing took extreme measures to curtail it. Patients, suspected patients and contacts were quarantined. Medical personnel from many departments including psychiatry were transferred to Infectious Diseases Hospitals and wards to supplement their staff. Once they arrived, they were also quarantined. Complete isolation of SARS hospitals and facilities was strictly enforced with a new "law of Infectious Diseases" imposed by police and criminal charges. This is in the context of the atmosphere of stress and fear among the general population which may be implied by the flood of treatment-seeking people in Emergency Department reported by the General Hospital to be 5000 per day.

A clinical trial of Major Depressive Disorder conducted at the Institute of Mental Health of Peking University was disrupted and the investigating team were abruptly transferred to Beijing Hospital for Infectious Diseases. They were trained in screening of potential subjects and in the application of structured diagnostic assessments for the clinical trial and gained experience in strict assessments according to research criteria. During the clinical trial

the group met regularly and became coherent. Upon arrival at the quarantine ward the nurses noticed that many SARS patients developed mental problems while isolated and called their faculty supervisors in the clinical trial for advice. They suggested to systematically assess their colleagues and patients.

The Dean of the Medical School was contacted and facilitated the investigation. He expedited approval by the Committee for Human Research (the local IRB). The study period in the SARS ward was from May 5 to 12, 2003, less than 3 weeks from the initiation of strict central control measures. Study at the Personnel Rehabilitation facility and students' quarantine was immediately thereafter.

### Subjects

Healthcare personnel infected with SARS:  $n = 55$ , (9 males and 46 females, age  $31.9 \pm 9.3$  (s.d.) y) who were infected in the hospital while treating their SARS patients, were quarantined at the same ward.

Healthcare personnel working at acute SARS wards (but not infected): 48 doctors (29 m and 19 f, age  $34.9 \pm 7.8$ y) and 101 nurses (11 m and 90 f, age  $29.7 \pm 7.3$ y). Personnel were required to work at the SARS ward for consecutive 6 hours every day. During this time period they could not take off masks, garments, or protective glasses. All their daily routine activities were closely monitored. Following working shifts, they were accommodated, in quarantine, in an adjoining hotel.

Healthcare personnel at rehabilitation quarantined facility: After working in SARS wards for a month, personnel would be transferred to 2-weeks structured, strictly monitored, quarantine "rehabilitation". 62 physicians and nurses (19 m and 43 f, age  $32.9 \pm 8.6$ y) participated.

University students isolated for quarantine: When a SARS case was identified in a building or in a class, all residents and all classmates were isolated for 2 weeks for quarantine. Meals and other personal supplies were provided by trained personnel. Strict disinfectant measures were applied. The group of university students at quarantine ( $n = 55$ , 9 m and 46 f, age  $28.3 \pm 7.6$ y) had been isolated for 11 days at the time of the investigation.

Patients with SARS: 96 patients (29 m and 67 f, age =  $34.6 + 11.4$  years) who were strictly isolated at Beijing Ditan Hospital for Infectious Diseases.

Healthy controls: ( $n = 52$ , 36 m and 16 f, age  $28.0 \pm 6.0$ y) were physically and mentally healthy volunteers from the community and the Medical University campus who were not hospitalized and at the time of screening did not have any contact with SARS suspected patients. They were assessed as part of the clinical trial. Two psychiatrists (Meng Fanqiang and Liu Jian-cheng) conducted semi-

structured psychiatric interviews (according to DSM IV criteria) for each volunteer. Volunteers who had a family history, current or lifetime history of any axis I mental disorder as well as current physical and neurological disorders, were excluded.

**Assessment instruments**

Self-report questionnaires were used. Patients were assisted by nurses; their responses were verbal and dictated to the nurses.

Beck Depression Inventory (BDI) was previously validated in Chinese [6]. According to previous Chinese norms BDI total score of 0 - 4 is considered as no depression, 5 - 13: moderate depression, 14 - 20: moderately severe depression, and 21 or higher indicates very severe depression.

Chinese validated version of Spielberger’s State and Trait Anxiety Inventories (STAI) [7] was applied for assessment of anxiety. The Chinese version of the SCL-90 was applied for more generalized mental symptoms [8]. The SCL-90 provides a total score as well as mean scores of several mental factors including distress level, somatization, depression, anxiety, hostility and interpersonal sensitivity.

Following initial impression of the quarantined nurses’ research team as well as telephone interviews with SARS patients, their concerns were formulated to a structured self-report of 14 questions related to information on the disease, confidence in authorities, feelings towards family and caretakers, feeling of being overwhelmed, stress, depression, worries and guilt as well as denial. Severity of items was scored from 1-no, to 4-extremely so.

**Statistical analyses**

SPSS statistical package was used for data analysis. For demographic data, frequency analysis was used. Since BDI data had abnormal distribution, Mann-Whitney U and Kruskal Wallis analysis was performed. The STAI groups were compared to each other by student tests.

**Results**

**Participation rates in the study:** Participation rate of personnel in the SARS wards was 84.2%. Quarantined students on campus and controls’ acceptance were 77.5% and 76.3% respectively. Many patients were on respirators and nurses did not take notes of how many patients refused or were unapproachable because of difficult breathing or any other reasons.

**The Ad-hoc questionnaire for the SARS quarantined workers:** Table 1 demonstrates that SARS personnel were mostly concerned with the infectious nature of the disease. Of interest is the lack of confidence in the authorities. Subjects reported they were worried or extremely worried that they have infected their family or might be infectious to medical professionals who were taking care

	No	A little	Yes	Extremely
I have confidence over controlling SARS nationwide	81.3	17.7	1.0	0.0
I know a little about SARS	26.0	55.2	14.6	4.2
SARS is terrible	29.2	64.6	6.3	
I feel lonely and helpless	71.9	21.9	6.3	
I feel being thrown away by family	95.8	3.1		
I have a lot more words to say to my family	20.8	38.5	18.8	20.8
I am dependent on doctors and nurses	2.1	27.1	45.8	22.9
I miss my family very much	9.4	53.1	15.6	20.8
I am worried that I have infected my family	16.7	14.6	24.0	43.8
I am worried that I might be infectious to medical professionals who are taking care of me	8.3	22.9	24.0	41.7
I am being looked down on by others for having SARS	49.0	30.2	10.4	10.4
I don’t know what to do after contracting SARS	63.5	28.1	4.2	3.1
I don’t believe I have contracted SARS	64.6	30.2	2.1	1.0
I feel guilty that I did not prevent myself from SARS	34.4	37.5	9.4	10.4

**Table 1:** Ad-hoc questionnaire for the SARS quarantined workers (%).

of them. Subjects felt highly dependent on doctors. They felt lonely in the ward and missed their family.

**The BDI results:** Table 2 demonstrates that one-fifth of the patients reported severe depression. The rate was not much lower in their treating personnel. Even when personnel were relieved for rehabilitation (that was still quarantined and highly structured), only less than half did not report any depressive symptoms while 13% were still clinically depressed. Rate of depression and its severity was highest among quarantined students. It is of note that none of the controls reported any depression and almost no depressive symptoms (they were all a-priori screened to exclude any DSM disorders).

**Total scores of the SCL-90:** As well as number of positive answers and scores on all factors were significantly higher in all subject groups as compared to controls (Table 3). Both patients and their Healthcare therapists reported similar disturbances. Isolated students had the highest scores. Brief controlled rehabilitation did not improve scores of medical personnel.

Group (n)	Moderately severe to very severe depression (%)	Moderate depression (%)	No depression (%)	BDI total score (mean ± SD)
Medical Personnel				
Physicians in SARS ward (48)	14.6	43.7	41.7	6.77 ± 5.50**
Nurses in SARS WARD (101)	16.9	35.6	47.5	6.60 ± 6.45**
Medical Workers with SARS (55)	20.0	36.4	43.6	7.69 ± 7.34**
Physicians and nurses at “rehabilitation” (62)	12.9	40.3	46.8	6.39 ± 6.27**
Comparison Groups				
SARS inpatients (96)	19.8	42.7	37.5	8.31 ± 8.08**
quarantined students at university campus (55)	20.9	40.4	38.7	8.23 ± 7.22**
Non-institutionalized, healthy controls (52)	0.0	0.0	100.0	1.42 ± 1.58

**Table 2:** Beck Depression Inventory (BDI) in SARS Medical personnel and their patients.

Mann-Whitney test, vs Non-institutionalized control group: \*\*p < 0.01.

Items	Medical Personnel				Comparison Groups		
	Physicians in SARS ward	Nurses in SARS ward	Medical workers with SARS	Physicians and nurses at rehabilitation	SARS inpatients	Isolated students at University campus	Healthy controls
SCL Total	24.87 ± 19.34**	30.22 ± 31.43**	37.57 ± 44.38**	27.87 ± 31.66**	37.72 ± 41.42**	50.90 ± 52.85**	10.92 ± 14.65
No. of positive items	21.00 ± 15.9**	22.34 ± 19.18**	26.51 ± 21.57**	21.19 ± 20.71**	25.92 ± 19.85**	32.89 ± 28.41**	9.88 ± 13.24
Somatization factors	0.28 ± 0.29**	0.37 ± 0.45**	0.60 ± 0.57**	0.37 ± 0.48**	0.60 ± 0.55**	0.41 ± 0.45**	0.10 ± 0.14
Interpersonal sensitivity	0.34 ± 0.36**	0.35 ± 0.39**	0.36 ± 0.52*	0.37 ± 0.42**	0.37 ± 0.51**	0.70 ± 0.75**	0.17 ± 0.28
Depression	0.29 ± 0.26**	0.32 ± 0.41**	0.39 ± 0.49**	0.29 ± 0.40**	0.42 ± 0.53**	0.59 ± 0.63**	0.11 ± 0.22
Anxiety	0.26 ± 0.26**	0.36 ± 0.42**	0.44 ± 0.60**	0.30 ± 0.36**	0.43 ± 0.56**	0.55 ± 0.63**	0.10 ± 0.18
Hostility	0.20 ± 0.25**	0.27 ± 0.42**	0.36 ± 0.59**	0.29 ± 0.43**	0.32 ± 0.52**	0.62 ± 0.78**	0.14 ± 0.36

**Table 3:** SCL-90 scores in medical personnel.

Mann-Whitney test, vs Non-institutionalized control group: \*p < 0.05, \*\*p < 0.01.

**The Spielberger state and trait anxiety inventory:** (STAI) did not reveal any significant difference of subjects’ groups (39.2± 4.5 -42.6 ± 6.4) as compared to controls (state: 41.3 ±10.4; trait: 40.9 ± 10.9).

**Discussion**

We had a unique opportunity to study Mental Well-Being and concerns of quarantined Healthcare providers and their patients by an embedded local team on-site and at real time during the acute initial spread of a highly contagious viral epidemic.

Most current discussions and recommendations are based on retrospective recollections and post-hoc impressions or outside inquiries [9-14]. The real-time on-site data reported here further illuminate and emphasize the need to learn from past experience and consider the Mental well-being of Healthcare personnel and the emotional impact of quarantine as important components of immediate actions and future planning.

Retrospectively it is apparent that during the initial evolving acute spreading stage of the potentially deadly SARS epidemic, Public Health and government authorities were slow in recognizing the gravity of the threat and in providing accurate information and practical advice to professionals and the Public. Medical personnel who treated infected but still inaccurately diagnosed patients were vulnerable to contract the disease and become patients themselves. As is demonstrated by the COVID-19 pandemic, early recognition of potentially-fulminant epidemic is still problematic. Adequately-aggressive response and containment are subject to political connotations. Persuasion of governments at all levels is beyond the scope of the current report, however side-by-side data of past and current Chinese outbreaks should be illuminating to politicians.

Physical and mental status of Healthcare personnel was similar to their patients. Furthermore, it is demonstrated here that depression, anxiety and other mental symptoms of the “healers”

who were not infected were as prevalent and as severe as those of their patients. Harsh restrictions were imposed on the health providers, "To be on the safe side" and "for their own protection" they were treated as "potentially dangerous patients". Even though the authorities recognized that personnel needed respite from intensive work, personnel in "rehabilitation" were still under strict quarantine and their mental symptoms did not improve. This may suggest that benefits of flexible management of personnel should be weighed versus probable increased risk.

The provision of medical help during acute crisis, when the dangerous situation is still in effect and is unfolding, imposes demands on the professionals who are under the same distressful situation but are required to help their fellows. It should be emphasized that these situations are not limited to infectious epidemics nor to far-away locations. This is demonstrated by the report of a family physician in Missouri, USA immediately following a tornado disaster. He described his own feelings as "confusion, despair, disbelief and disorientation..., they just lost it...it was like being shell-shocked... It's hard to maintain one's emotional composure in that setting" [15]. This subjective account of a still-shaken professional underscores the vulnerability and personal involvement of indigenous Healthcare personnel on-site. It also underscores that the provision of medical help during the crisis, when the dangerous situation is still in effect and is unfolding, may be overwhelming to the distressed professionals in-situ if they are not adequately prepared to manage it.

Mental preparedness of Medical personnel for still-unpredictable disastrous situations is challenging. Epidemic infections are prevalent. The question here is not only "where", with Globalization of transportation and travel the question is "how to prepare anywhere". Common denominators among diversified types of crises should be apparent. Natural disasters like floods, earthquakes, volcano eruptions, tsunamis, tornadoes and wildfires are frequent occurrences in vulnerable developing and developed regions. In many areas the question is not "if" rather it is "when". Even the distinction between un-avoidable natural disasters and Man-Inflicted disasters is not that clear. As was demonstrated by the 2011 tsunami-related nuclear accident in Japan, natural forces may be amplified by man-made actions or mis-actions and vice versa. With all these crises exact timing is unpredictable, but their feasibility is quite high. Therefore, Medical response teams should be identified, designated and well-prepared-physically and mentally.

Operational suggestions for future teams' training and preparedness may be drawn from our non-intentional situation. We had trained and had a functional clinical- research team in place for another on-going study. They became embedded in the quarantine ward by an emergency Government order.

The team's attitude and skills, their tribulations, complaints and symptoms as well as resilience, initiatives and improvisation under acute stress demonstrate important optimal attributes of the indigenous crisis-intervention team that should be implemented in other emergency situations. Physicians and nurses were all members of the local community and were fully immersed in the local culture. The local coordinator and the team knew each other well and developed a group-spirit. They were proficient in physical exams, physical interventions and structured Psychiatric interviews and were comfortable with meticulous procedures, close monitoring and accurate reporting. They had the administrative and moral support of the hospital and academic hierarchies. Communication channels were maintained by phone despite difficulties. The team were embedded and well-intertwined with the management and general medical groups with whom they shared same institutional cultural attitudes and same experiences. When they were requested to collect data, they responded enthusiastically and saw it as a challenge that needed to be solved, the investigation was in addition to the required clinical duties.

Our team's experience and data suggest that maintaining constant sustainable communication with the outside professional familiar environment and own family are of utmost importance. Lack of and inconsistent information is demoralizing as are regulations that are not sufficiently explained and justified. The quarantine experience across all groups suggests that risk and benefit of quarantine of treatment teams should be evaluated based on data and facts and be flexible according to changing circumstances.

The un-intentional experience of our team suggests that training for pre-determined functions allowed for efficient performance under stress. This data may be interpreted as resilience of the investigating team vis-à-vis the rest of the treating Healthcare personnel of which they were members.

High feasibility of future occurrences coupled with unpredictable timing require every response team to be resilient, flexible and well-prepared. A-priory resilience may be enhanced on two levels. Team members should be screened by culturally sensitive procedures. For future implementations available questionnaires (i.e. Connor-Davidson resilience Scale-CD-RISC) [16] may be adapted and expanded. As would be the case for any team of first responders, mental and physical health responders should be screened and identified as having high resilience to stress, non-vulnerability to mental symptoms, ability to adapt and improvise under stress as well as stamina. Selection procedures for such personality traits are applied in several military units in several countries and may be adjusted to civilian situations.

Following selection, resilience should be amplified, boosted and maintained by repeated practice. It is apparent that in most in-

stances response and treatment teams would be Primary Care Providers, Emergency and/or Infectious Diseases experts. Therefore screening, enhanced resilience and awareness of possible mood and behavior effects of stress should be part of preparedness of these teams as a preventative measure prior to the emergencies.

Guidelines for mental well-being of treatment teams during emergencies have been recently suggested [17]. Methods to enhance resilience have been previously suggested [18]. It is undisputed that well-being of providers is essential for efficacious care, it should also be established that their well-being under stress depends on their resilience and this should be enhanced prior to next disaster.

The preventative pre-stressors mental preparedness should be better conducted by clinicians who can share with trainees their own experiences. Preferably these should be local or hospital-based Internists or PCPs. Psychiatrists and other mental health professionals should be available during the preparedness and crisis but should only be in an advisory role. Emphasis is on positive adaptation and utilization of strengths and not on any anticipation of perceived trauma nor anticipation of Post-traumatic Stress disorder (PTSD).

Of utmost importance is the need to apply past data as those which are reported here for future models and practice. This is routinely done by epidemiologists [19], it should be applied for mental well-being and planning during extreme conditions.

## Conclusion

Focus on mental well-being of Healthcare providers is of utmost importance for their functioning under stress and for efficacious care of their patients.

Considering at least 5 wide-spread epidemics during the recent 20 years it is reasonable to predict that more such potentially disastrous occurrences will happen in the near future. Therefore: It is suggested that in addition to the current guidelines for procedures for mental health response following disastrous events [17]. Well-being clinical procedures should be developed and implemented for pre-stressor preparedness. Procedures should not be limited to physical protective gear and protocols.

Resilience abilities should be amplified, and team members should be familiar with any anticipated action as well as be able to improvise if needed.

As part of preventative measures, local teams should be embedded among local populations in areas that are prone to crises. Such teams should be pre-formed and headed by a local Primary Care Provider (PCP) or Internist. Indeed, prospective installment, training and enhancing resilience of embedded teams in vulner-

able locations is easier in theory than practice. However, feasibility of initiation and budgeting of operational preparedness in anticipation of next physical disasters are higher when the impact of the current one is fresh.

Resilience preparedness will assure that once the actual crisis or catastrophe occurs, locally adapted action plans should be immediately implemented to maintain team moral, provide them with support and prevent attrition.

It is of note that despite repeated local and Global crises, data-based lessons from the past are slow to being accepted. Preventative pre-crisis guidelines and procedures for well-being of Healthcare teams have not been sufficiently implemented yet. Indeed, they should.

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