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Short Communication

COVID -19: Protection of Workers at the Workplace in Singapore

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ABSTRACT

The COVID-19 pandemic has resulted in movement restrictions being instituted globally and the cessation of work at many workplaces. However, during this period, essential services such as healthcare, law enforcement, and critical production and supply chain operations have been required to continue to function. In Singapore, measures were put in place to protect the workers from infection at the workplace, as well as to preserve the operational capability of the essential service in a COVID-19 pandemic environment. This paper critically analyses the measures that were implemented and discusses the extension to broader general industry.

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The COVID-19 pandemic has resulted in significant changes to the social and economic behavior of communities. In some countries, this has resulted in movement restrictions and temporary cessation of economic activity. Although the severity of the imposed restrictions has differed by country, the common result has been the temporary closure of workplaces to contain the spread of the virus. However, there has been a distinction between essential and nonessential services, where essential services such as healthcare, law enforcement, defense, power generation, food supply, medical device production, and critical logistics, to name a few, have been required to continue to operate.

These essential services have had to establish processes and procedures to both protect the worker from infection, as well as limit the operational impact, should a COVID-19 case develop within the workforce. As the pandemic continues to evolve and countries begin to ease their movement restrictions, it has become apparent that the measures that have been instituted at essential workplaces may have to be extended to the wider workforce.

Singapore's pandemic alert system has four levels, coded as Green (lowest), through Yellow and Orange, to Red (highest). The Yellow and Orange levels reflect increased risks of community transmission but controlled through contact tracing and quarantine whereas Red implies uncontrolled community spread. When Singapore increased its pandemic alert level to Yellow on 21 January 2020 [1], temperature monitoring of staff in essential services was implemented. Employees were required to take and report their own temperature twice a day, before travel to the workplace and upon arrival at home after their shift. Workers

were briefed to not come to work and to seek immediate medical attention if they detected a fever, defined as above 37.5 degrees Celsius, or if they felt unwell with any respiratory symptoms. Temperatures were tracked for compliance, largely through mobile applications and other electronic reporting tools. Oral digital thermometers were offered to employees that required one.

Nonemergency access to workplaces was reduced to minimal designated one-way entrance and exit points. All employees as well as visitors and contractors had their temperature taken on ingress and egress from the workplace. Access temperature taking was commonly performed via noncontact infra-red temporal artery thermometers. If the threshold value (37.5 degrees Celsius) was exceeded, the person was denied entry, given a surgical mask (if they were not wearing one), and advised to seek immediate medical attention. If a fever was detected at the exit, the procedure for management of a suspect case at the workplace was initiated. For larger workplaces, the use of infra-red thermographic camera systems replaced manual temperature taking at both the entrance and exit.

Use of mass temperature screening, in this context, was utilized during the SARS (Severe Acute Respiratory Syndrome) (2003) and H1N1 (2009) outbreaks by various Asian countries. While the screening characteristics of such an approach is not optimal, with one report stating sensitivity 70%, specificity 92%, positive predictive value 42%, and negative predictive value 97% [2], active surveillance has been suggested to have possible benefits in slowing the spread of disease in a pandemic setting [3]. Thus, while mass

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temperature screening has a role in infection control in the workplace, it must be coupled with other complementary measures.

Workers are also mandated to wear a surgical or cotton mask while at the workplace, including all workers in production areas and open plan offices. Workers were instructed that they could remove their masks only in the toilets and during their meals. The evidence that surgical and cotton masks do not protect the wearer against aerosol inhalation of viral pathogens is strong and predates the COVID-19 pandemic [4]. However, the current premise for the use of cotton masks is not to protect the wearer against aerosol inhalation. It is postulated that cotton masks can reduce fomite contamination of the environment by the wearer as well as reduce fomite transfer from the environment to the nasal area of the wearer, by the wearer's hands. Thus, while surgical and cotton masks cannot be recommended for high-risk exposure such as front-line healthcare workers (where N95 masks are compulsory), the premise of community mitigation described earlier requires further study. A recent meta-analysis of observational studies suggested some benefit in community use of surgical and cotton masks [5]. Apart from this study, there is insufficient evidence to fully recommend or reject the use of surgical and cotton masks for community mitigation. Its current use is predicated on the theoretical benefits outweighing the theoretical harm. Use of these masks in this manner also requires the workers to be educated in maintaining the cleanliness of the mask as well as performing disciplined hand disinfection (either through alcohol sanitizers or hand washing) upon mask removal.

At a national level, social distancing was introduced as a measure to reduce the risks of aerosol spread and direct fomite contamination of a person's body and clothes. At the workplace, this was implemented as separation of workstations and workers by at least one meter, reduction of worker density by encouraging work from home and transiting face-to-face meetings to teleconferencing platforms [6]. The practice of hot desking was suspended, and common areas such as canteens and worker rest areas were reorganized to facilitate worker separation. Where possible, workplaces were encouraged to install screens between workers. Social gatherings and cohesion events were canceled or postponed. As a stand-alone measure, the impact of social distancing on infection control has not been quantitatively reported. However, working in concert with other measures, the impact has been modeled to significantly reduce the basic reproduction number of COVID-19 [7]. Social distancing should also be implemented in a culturally and ethically sensitive manner [8]. For example, in Singapore, this has included considerations such as temporary allocation of larger rooms at workplaces to facilitate social distancing for Muslims during daily prayers.

In common areas with unavoidable large footfall, such as toilets, canteens, and lifts, cleaning and disinfection frequency was increased, especially after high-usage periods. Unnecessary common contact points such as fingerprint recognition attendance or access systems were converted back to their nontouch card-based modes where available or otherwise suspended. Transportation times were staggered, and waiting areas for transport were increased where possible to reduce worker density at these areas. To prevent congestion at public bus and subway stops, workers were released from the workplace at staggered intervals, based on their cohort segregation, as described in the following passages.

Workplaces need to monitor the constantly evolving risk to their workforce. Monitoring includes tracking of workers that have been, or living with someone that is, identified as a contact and issued with lawful stay-at-home or quarantine orders. Exposure to local hotspots and clusters should also be reported, as they occur. Depending on circumstances, the worker, if not already issued with

legal public health orders, may be asked to work from home, or give paid leave of absence for fourteen days, and asked to stay at home.

A suspect case can arise at the workplace when a worker feels acutely unwell, or when a fever is detected at temperature screening. After transfer of the worker to a medical facility, the company will proceed to disinfect the designated work area of the suspect case and commence contact tracing to identify workers that have been in close contact with the suspect case. The definition of a close contact was defined by the Singapore Ministry of Health as within two meters of the case and for greater than thirty minutes of exposure time [9].

Active management of suspect cases identified at the workplace acts in concert with the wider national effort (Singapore) to contain the spread of COVID-19 through aggressive contact tracing and quarantine of contacts. There is modeling evidence that such a strategy can be effective in containing the spread of a pandemic [10], and this strategy was used effectively during the SARS outbreak in 2003 [11]. Differences between the infectivity profile of COVID-19 and SARS, notably the increased likelihood of transmission before symptom development, may reduce the effectiveness of this measure in containing the spread of COVID-19 [11]. This measure is also unlikely to be effective in countries that are not performing or only performing limited contact tracing.

Workers can be segregated into cohorts to prevent widespread manpower degradation and total loss of the essential service if a case occurs in the workplace. There have been reported instances of hospitals closing, during the pandemic, after large numbers of cases and quarantined contacts among their staff [12,13]. Thus, a principal consideration in cohort segregation strategies is to prevent a case from generating multiple contacts within the essential service. This is achieved through multiple levels of cohort segregation. For example, for a hospital, doctors should not socialize with other doctors from other hospitals (one level), and care teams should not mix with other care teams without PPE protection (another level) [14]. Other modalities of segregation, across industries, include segregation by shift, production rooms, and operational areas. Care must be taken to prevent mixing of cohorts, especially in common areas such as toilets, canteens, rest areas and locker facilities as well as during shift changes, when shift cohorts are all on-site at the same time. Measures that can be taken include designated toilets for different cohorts, separation of locker facilities based on the cohort and rostered use of canteen and rest areas. Where possible, quick wipe-down disinfection of contact surfaces such as tables and chairs can be conducted between cohort usages of common areas. Meeting rooms, training rooms, and spare offices can all be converted to designated eating and rest areas for critical individual teams to further reduce the risk of infection at common areas.

An issue that Singapore has faced has been the spread of COVID-19 in foreign worker dormitories. As at 11 August 2020, the total number of cases detected has been 52,395 of 323,000 at-risk (prevalence of 16.22% contrasted against a community prevalence of 0.04%, representing 2195 cases of 5,381,000 at risk) [15]. All foreign workers in dormitories have been confined to their dormitories or quarantine facilities since 21 April 2020 and have not yet returned to work. A key aspect to the control of spread in this population is the need to conduct proactive testing rather than testing only symptomatic cases that see a doctor. As the health seeking behavior of this population is different, large numbers of mild cases did not seek medical attention and contributed significantly to the scale of the outbreak in this population. In preparation for the return of these workers to the workplace, apart from the workplace measures discussed earlier, the government has since created capacity to proactively test the entire foreign worker population every two weeks, to support proactive detection.

On 01 June 2020, Singapore came out of a two-month long partial lockdown. To mitigate spread via the workplace, the measures discussed before were extended from essential services to all workplaces. As of 11 August 2020, the measures appear to have contributed to the national effort to contain community spread of the epidemic. In the period 01 June 2020 to 11 August 2020 (71 days), there were 510 community cases, compared with 1540 community cases in the period 21 March 2020 to 31 May 2020 (also 71 days). The death rate has remained low in Singapore, with 27 total deaths across both the dormitory and community populations (as of 11 August 2020). As workplaces re-opened on 01 June 2020, there has been active policing of workplace measures, with the deployment of enforcement officers and advisory personnel to inspect and guide the workplaces, respectively. Although we are unable to accurately attribute the extent that workplace measures have contributed to the suppression of cases, they represent an important component of the overall effort.

In conclusion, as workplaces begin to re-open within a COVID-19 environment, protection of the worker should be a priority. The measures that were implemented by essential services to both protect the worker, and to ensure business continuity, have been extended to general industry in Singapore, with corresponding contribution to the suppression of community spread.

Contributor information

The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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Conflicts of interest

All authors have no conflicts of interest to declare.

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References

- [1] World Health Organisation. Novel coronavirus (2019-nCoV) situation Report 4 [Internet]; 2020 January 24. Available from, https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200124-sitrep-4-2019-ncov.pdf?sfvrsn=9272d086_8.
- [2] Hewlett AL, Kalil AC, Strum RA, Zeger WG, Smith PW. Evaluation of an infrared thermal detection system for fever recognition during the H1N1 influenza pandemic. *Infect Control Hosp Epidemiol* 2011 May;32(5):504–6.
- [3] Cowling BJ, Lau LL, Wu P, Wong HW, Fang VJ, Riley S, Nishiura H. Entry screening to delay local transmission of 2009 pandemic influenza A (H1N1). *BMC Infect Dis* 2010 Mar 30;10:82.
- [4] National Academies of Sciences, Engineering, and medicine. Rapid Expert Consultations on the COVID-19 Pandemic March 14, 2020. <https://doi.org/10.17226/25784>. April 8(Internet). 2020.
- [5] Chu DK, Akl EA, Duda S, Solo K, Yaacoub S, Schünemann HJ. COVID-19 systematic urgent review group effort (SURGE) study authors. *Phys Distancing, Face Masks, Eye Prot Prevent Person-To-Person Transm SARS-CoV-2 COVID-19: A Syst Rev Meta-Analysis*. *Lancet* 2020 Jun 1;20(S0140–S6736):31142–9.
- [6] Ministry of Health. Stricter safe distancing measures to prevent further spread of COVID-19 cases [Internet]. Available from: <https://www.moh.gov.sg/news-highlights/details/stricter-safe-distancing-measures-to-prevent-further-spread-of-covid-19-cases>.
- [7] Koo JR, Cook AR, Park M, Sun Y, Sun H, Lim JT, Tam C, Dickens BL. Interventions to mitigate early spread of SARS-CoV-2 in Singapore: a modelling study. *Lancet Infect Dis* 2020 Jun;20(6):678–88. Erratum in: *Lancet Infect Dis*. 2020 May;20(5):e79.
- [8] Lewnard JA, Lo NC. Scientific and ethical basis for social-distancing interventions against COVID-19. *Lancet Infect Dis* 2020 Jun;20(6):631–3.
- [9] Ng Y, Li Z, Chua YX, Chaw WL, Zhao Z, Er B, Pung R, Chiew CJ, Lye DC, Heng D, Lee VJ. Evaluation of the effectiveness of surveillance and containment measures for the first 100 patients with COVID-19 in Singapore; January 2–February 29, 2020. *MMWR Morb Mortal Wkly Rep*. 2020 Mar.
- [10] Hellewell J, Abbott S, Gimma A, Bosse NI, Jarvis CI, Russell TW, Munday JD, Kucharski AJ, Edmunds WJ. Centre for the mathematical modelling of infectious diseases COVID-19 working group, Funk S, Eggo RM. Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts. *Lancet Glob Health* 2020 Apr;8(4):e488–96. Erratum in: *Lancet Glob Health*. 2020 Mar 5 Version 2. .
- [11] Wilder-Smith A, Chiew CJ, Lee VJ. Can we contain the COVID-19 outbreak with the same measures as for SARS? *Lancet Infect Dis* 2020 May;20(5):e102–7.
- [12] Radio New Zealand. Tasmania to close two hospitals to 'stamp out' Covid-19 [Internet]; 2020 Apr 12. Available from, <https://www.rnz.co.nz/news/world/414099/tasmania-to-close-two-hospitals-to-stamp-out-covid-19>.
- [13] Channel News Asia. Mumbai hospital shut after surge in Covid-19 cases among staff [Internet]; 2020 April 06. Available from, <https://www.channelnewsasia.com/news/asia/mumbai-hospital-shut-after-covid-19-cases-staff-12614992>.
- [14] Hoe Gan W, Wah Lim J, Koh D. Preventing intra-hospital infection and transmission of COVID-19 in healthcare workers. *Saf Health Work* 2020 Mar 24.
- [15] Ministry of Health. Situation Rep Dated; 21 March 2020, 01 June 2020, and 11 August 2020 [Internet]. <https://www.moh.gov.sg/covid-19/situation-report>.