

## Occupational Medicine in the time of COVID-19

*Longe prestantius est praeservare quam curare, sicut satius est  
procellam praevidere ac illam effugere quam ab ipsa evadere.*

Bernardino Ramazzini

Coronaviruses are found in mammals, birds and humans. They belong to RNA viruses, a class including viruses causing recurrent infections (common cold) and inflammation confined within the upper respiratory tract. Over the last 20 years, two coronaviruses – zoonotic in origin – emerged because of their ability to target the lower airways, and to cause severe and often fatal respiratory distress syndromes, occurring in about 10% and 34% of cases, respectively (6, 11). Although widespread, such epidemics — SARS-CoV (Severe acute respiratory syndrome coronavirus) and MERS-CoV (Middle East respiratory syndrome coronavirus) — remained confined mainly in hospitals of some countries (outbreaks occurred in 37 and 27 countries, respectively), including South Korea (11). Whereas MERS-CoV uses dipeptidyl peptidase 4 (DPP4) as a receptor for infecting human cells (20), SARS-CoV uses ACE2 as a cellular entry receptor (5, 19), thereby accounting for the clinical picture.

On 31<sup>st</sup> December 2019, the World Health Organization (WHO) China office was informed of cases of pneumonia of unknown origin detected in Wuhan city in Hubei Province, central China (15). By 9<sup>th</sup> January 2020, WHO stated that “Chinese authorities have made a preliminary determination of a novel (or new) coronavirus, identified in a hospitalized person with pneumonia in Wuhan” (16). The virus was initially referred to as 2019-nCoV, but has since been re-named as SARS-CoV-2, and finally the subsequent disease as Coronavirus Disease 2019 (COVID-19). On 30<sup>th</sup> January 2020, the WHO declared this disease as a Public Health Emergency of International Concern (PHEIC), and by 11<sup>th</sup> March 2020 COVID-19 has been declared a pandemic by the WHO, as cases approached 200,000 patients, with more than 8,000 deaths in over 160 countries (14). As of April 22<sup>nd</sup>, 2020 the number of cases and deaths are 2,585,468 and 178,845, respectively.

Among the first 425 patients with confirmed COVID-19 infection, the median age was 59 years and 56% of them were male (11). The majority of cases (55%) with onset before January 1<sup>st</sup>, 2020, were linked to the Huanan Seafood Wholesale Market, as compared with 8.6% of the subsequent cases. The mean incubation period was 5.2 days (95% CI 4.1 to 7.0), the 95<sup>th</sup> percentile was 12.5 days, and the basic reproductive number ( $R_0$ ) was estimated to be 2.2 (95% CI, 1.4 to 3.9). People bearing COVID-19 may be infectious even if asymptomatic (10). Public health measures, such as detection, quarantine and isolation of cases can be effective in containing the outbreak, but they should be implemented early and effectively. Evidence suggests that the public health efforts of the Chinese Government saved thousands of lives, whereas subsequent reaction in Italy and in other Western countries has been slow and confused, and the explosive increase in cases has sometimes overwhelmed the health care system. We can now delete the question mark put by the Lancet in the title of the recent Editorial “COVID-19: too little, too late?” (12) and we can claim its extension from countries to working settings, particularly to hospitals of high-income countries, facing their own outbreaks after years of cuts of beds and personnel in their health services.

Although democracies need to balance public health protections and civil liberties during crises, fears of the negative public and economic consequences that may follow from restricting freedoms should be put on one side, to promote more assertive infection control measures, which should anticipate, rather than follow the outbreaks.

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Although it has been classified as either accident or casualty, COVID-19 is also a new occupational disease, the deadliest one of recent times. Indeed, the majority of cases of the first outbreak and at least 20% of subsequent cases may be due to occupational exposure. The first documented occupational groups at risk were people working in seafood and wet animal wholesale markets in Wuhan, who accounted for 55% of the 47 cases with onset before 1<sup>st</sup> January 2020, when the market was closed. In comparison, only 8.5% of the 378 cases with onset of symptoms after 1<sup>st</sup> January 2020 had a link with exposure at the market (6). This also suggested that the virus had originated from wildlife and then crossed the species barrier to infect humans. As cases increased and required health care, health care workers (HCW) were a second high-risk group. In a case series of 138 patients treated in a Wuhan hospital, 40 patients (29% of cases) were HCW. Among them, 31 (77.5%) worked on general wards, 7 (17.5%) in the emergency department, and 2 (5%) in the intensive care unit (ICU). There was apparently a super-spreader patient encountered in the hospital, who presented with abdominal symptoms and was admitted to the surgical department. This patient infected >10 HCWs in the department (12). China's Vice-Minister at the National Health Commission said that 1716 health workers had been infected as of Tuesday 11<sup>th</sup> Feb 2020, among whom 6 died (6). On February 20<sup>th</sup>, 2020, a young man in the Lombardy region of Italy was admitted with an atypical pneumonia that later proved to be COVID-19. In the next 24 hours there were 36 more cases, none of whom had contact with the first patient or with anyone known to have COVID-19 (4). Despite stringent and timely lockdown measures, social events in the area had already contributed the spread of the virus in other regions of Italy.

Among the first 25 locally transmitted cases in Singapore, 17 cases (68%) were probably related to occupational exposure (3). They included staff in the tourism, retail and hospitality industry, transport and security workers, and construction workers. An international business meeting for 109 staff was organized by a multinational company in Singapore. At this event, healthy company workers interacted with other infected participants, which resulted in the transmission of the virus to three employees based in Singapore. Besides those infected from Singapore, one employee from Malaysia, two participants from South Korea and one staff member from the UK were also infected and were identified as cases after leaving Singapore (3).

Crew on board cruise ships with infected passengers are also at risk. At least 10 cases have been reported among the 1035 crew on the liner Diamond Princess, which docked in Yokohama with around 3600 people quarantined from 3<sup>rd</sup> February 2020 (18). A Hong Kong man boarded the ship on 20<sup>th</sup> January in Yokohama at the beginning of a 14-day round trip cruise, before news was received that he tested positive for COVID-19. The Diamond Princess returned to Yokohama, and was quarantined until 19<sup>th</sup> February 2020, with guests isolated in their cabins and screened (10).

Taxi drivers are also exposed to occupational risk of being infected by COVID-19 positive passengers (8), but health care workers (HCW) are the occupational group shown to be the most frequently infected since the early phases of COVID-19 outbreak (7). The Italian College of Physicians – FNOMCEO – dedicate a page of their website to honour colleagues who died for COVID-19: they were as many as 145 by 22<sup>nd</sup> April 2020 (1). According to the Italian Institute of Health (2), as many as 14,066 out of 136,110 cases recorded as of 10<sup>th</sup> April 2020 (i.e., about 10% of total verified cases) occurred among HCW: their median age was much lower (49 y) and the gender rate was reversed (35.8% males) as compared to other affected people. Health workers are at the front line of any outbreak response – sometimes without adequate personal protection equipment (PPE) – and as such are exposed to hazards that put them at risk of infection with an outbreak pathogen (in this case COVID-19). Whereas HCW are celebrated as heroes, they are victims of occupational casualties, a possible infection by a deadly virus being highly predictable for doctors left alone to face the epidemics without proper personal protection. A document highlighting the rights and responsibilities of health workers, including specific measures needed to protect occupational safety and health, has been issued by the WHO (13).

Hazards include pathogen exposure, long working hours, psychological distress, fatigue, burnout, stigma, and physical and psychological violence. All health personnel should be alert to the risk of COVID-19 in a wide variety of occupations, and not only HCWs. These occupational groups can be protected by good

infection control practices. These at-risk groups should also be given adequate social and mental health support (17), which are needed but which are sometimes overlooked.

At the time of COVID 19 pandemics, occupational health services achieved a recognition in terms of role and responsibility from health authorities, agencies, and corporate managements, and even from colleagues used to consider prevention as a luxury item, instead of the pre-requisite for health preservation. For example, all pregnant healthcare professionals, especially those in high risk areas [intensive care and high dependency units], have been advised to discuss their individual circumstances with their local Occupational Health department” (9). Occupational health professionals seem to have gained a key role, owing to their ethically binding mandate – i.e., the workers’ health protection – and that of company’s advisers in a multidisciplinary effort to re-organize industrial activities ensuring that the job be fitted for the workers’ safety and health, and not only the workers’ fitness for the job.

Over the last few decades, hospitals have evolved towards a model of patient- and profit-centred care, whereas any epidemic requires a change of perspective toward a concept of community- and service-centred care. There are tight borders between rationalization and rationality which cannot be crossed. This is particularly important for our national health system (SSN), which has been fragmented into regional health systems (SSR), each one run with decisional autonomy depending on the local political administration. The only common decision of SSRs has been the dismissal of dozens of peripheral hospitals and the revision of established networks of health practitioners, which have been dismantled to centralize peripheral services. Another common trait has been the progressive reduction of hospital beds, to achieve a supposedly optimal capacity of 3 – 4 beds every 1000 inhabitants; this is clearly overwhelmed in times of epidemic.

Finally, we have learned the importance of being interconnected with other disciplines – which may also have been neglected because poor rewards in a system allocating resources according to the DRG (diagnosis-related groups) – particularly those belonging to Public Health and sharing a concern with prevention. In addition to community-oriented measures, there is a need to provide a worker-oriented approach, for which occupational health physicians are called to assume full responsibility. This is particularly true in view of re-opening industrial activities: we need a strategy, in which occupational health physician must play a key role, to identify those workers who are thought less susceptible to SARS-CoV-2 on the basis of appropriate tests (e.g. specific IgG) in addition to relevant clinical information and other rational criteria, which however should be based on the actual predictive value of available tests and not simply on speculation or, worse, on commercial pressure that takes advantage of expectations, to sell poorly performing kits. Also, occupational health physicians will have additional responsibilities, e.g., to collect and manage personal information in relation to COVID-19, which is necessary to ensure that precautions are taken to lessen or prevent a serious threat to the life of either staff members or visitors. It is also necessary to ensure the distribution of WHO-approved PPE, whenever necessary, and establish training programmes and guidelines to protect staff members. I leave the conclusion to José Saramago, “We are the memory we have and the responsibility we take on. Without memory we do not exist, and without responsibility perhaps we do not deserve to exist”.

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## References

1. FNOMCEO. Elenco dei Medici caduti nel corso dell’epidemia di Covid-19 (Updated on 22<sup>nd</sup> April 2020) <https://portale.fnomceo.it/elenco-dei-medici-caduti-nel-corso-dellepidemia-di-covid-19/>
2. Istituto Superiore di Sanità (Report updated on 19 March, 2020), available online at the site: [https://www.iss.it/documents/20126/0/Bollettino+sorveglianza+integrata+COVID-19\\_19+marzo+2020.pdf/e56791f7-820c-555e-8b0c-750c9db2883d?t=1584728196303](https://www.iss.it/documents/20126/0/Bollettino+sorveglianza+integrata+COVID-19_19+marzo+2020.pdf/e56791f7-820c-555e-8b0c-750c9db2883d?t=1584728196303)

3. Koh D, Lim MK, Chia SE, et al. Risk perception and impact of severe acute respiratory syndrome (SARS) on work and personal lives of healthcare workers in Singapore: what can we learn? *Med Care* 2005; 43: 676–682
3. Livingston E, Bucher K: Coronavirus Disease 2019 (COVID-19) in Italy. *JAMA*. Published online March 17, 2020. doi:10.1001/jama.2020.4344
4. Li, WH, Moore, MJ, Vasilieva N, et al: Angiotensin-converting enzyme 2 is a functional receptor for the SARS coronavirus. *Nature* 2003, 426, 450–454
5. Li Q, Guan X, Wu P, et al: Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *N Engl J Med*, doi:10.1056/NEJMoa2001316
6. Nature. China Says 6 Health Workers Died from Coronavirus, 1,716 infected. (<https://www.nature.com/articles/d41586-020-00154-w>) (accessed on 24<sup>th</sup> March 2020)
7. Pongpirul WA, Pongpirul K, Ratnarathon AC, Prasithsirikul W: Journey of a Thai Taxi Driver and Novel Coronavirus. *N Engl J Med*. 2020;382:1067–1068
8. Rimmer A: Covid-19: pregnant doctors should speak to occupational health, say experts. *BMJ*. 2020;368:m1104. Published 2020 Mar 18
9. Rothe C, Schunk M, Sothmann P, et al: Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany. *N Engl J Med*. 2020;382:970–971
10. Swerdlow DL, Finelli L: Preparation for Possible Sustained Transmission of 2019 Novel Coronavirus: Lessons From Previous Epidemics [published online ahead of print, 2020 Feb 11]. *JAMA*. 2020;10.1001/jama.2020.1960
11. The Lancet. COVID-19: too little, too late?. *Lancet*. 2020;395(10226):755
12. WHO. Coronavirus disease (covid-19) outbreak: rights, roles and responsibilities of health workers, including key considerations for occupational safety and health [https://www.who.int/docs/default-source/coronaviruse/who-rights-roles-respon-hw-covid-19.pdf?sfvrsn=bcabd401\\_0](https://www.who.int/docs/default-source/coronaviruse/who-rights-roles-respon-hw-covid-19.pdf?sfvrsn=bcabd401_0)
13. WHO. Coronavirus disease (COVID-19) outbreak webpage (accessed 15 March 2020) <https://experience.arcgis.com/experience/685d0ace521648f8a5beeee1b9125cd>
14. WHO. Pneumonia of Unknown Cause – China. <https://www.who.int/csr/don/05-january-2020-pneumonia-of-unknown-cause-china/en/> (accessed on 24<sup>th</sup> March 2020)
15. WHO Statement Regarding Cluster of Pneumonia Cases in Wuhan, China. (accessed on 25<sup>th</sup> March, 2020). <https://www.who.int/china/news/detail/09-01-2020-who-statement-regarding-cluster-of-pneumonia-cases-in-wuhan-china>
16. Xiang YT, Yang Y, Li W, et al: Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *Lancet Psychiatry*, doi:10.1016/S2215-0366(20)30046-8
17. Zhang S, Diao M, Yu W, et al: Estimation of the reproductive number of novel coronavirus (COVID-19) and the probable outbreak size on the Diamond Princess cruise ship: A data-driven analysis [published online ahead of print, 2020 Feb 22]. *Int J Infect Dis*. 2020;93:201–204
18. Zhou P, Yang XL, Wang XG, et al: A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature*. 2020;579(7798):270–273
19. Widagdo W, Sooksawadi Na Ayudhya S, Hundie GB, Haagmans BL: Host Determinants of MERS-CoV Transmission and Pathogenesis. *Viruses*. 2019;11:280