

# Occupational health surveillance of healthcare workers during COVID 19 pandemic: a narrative review

Gabriele d'Ettorre<sup>1</sup>, Vincenza Pellicani<sup>2</sup>, Massimo Muratore<sup>1</sup>, Giancarlo Ceccarelli<sup>3</sup>

<sup>1</sup> Department of Occupational Medicine, Local Health Authority, Lecce, Italy; <sup>2</sup> Department of Mental Health, Local Health Authority, Lecce, Italy; <sup>3</sup> Department of Public Health and Infectious Diseases, Azienda Policlinico Umberto I, Sapienza University, Rome, Italy.

**Abstract.** *Background and aims:* Current literature has increasingly highlighted the risk of spreading the SARS-COV-2 infection in healthcare settings and showed the need for occupational health surveillance of HCWs during the current epidemiological emergency from COVID-19, as a preventive measure to minimize the spread of the infection. The purpose of this narrative review was to evaluate the literature and discover what the latest developments are about the management of the occupational health surveillance of healthcare workers (HCWs) during COVID-19 pandemic. *Methods:* We searched for publications in MEDLINE, Pubmed and Google Scholar using selected keywords. Each article was reviewed and categorized into one or more of the following three categories based on its subject matter: early diagnosis of COVID-19 in HCWs, detection of worker susceptibility to severe COVID-19, medical examination of HCWs returning to work after COVID-19. *Results:* Selected articles showed the RT-PCR test for Sars-CoV-2 as the gold standard to enable rapid identification of infected HCWs; an effective schedule of occupational health surveillance allows the identification of the susceptibility of the workers to severe Covid-19 and protect HCWs returning to work from the disease. *Conclusions:* The findings of the present narrative review show the need to strengthen the occupational health surveillance of HCWs during the current COVID-19 pandemic, with the aim not only to contain the spread of the infection in healthcare settings, but also to protect HCWs coming back to work after the disease. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** Covid-19, Sars-CoV-2, occupational health surveillance, healthcare worker risk management

## Introduction

Protecting healthcare workers (HCWs) exposed to occupational risk of acquiring the coronavirus disease 2019 (COVID-19) is a special challenge for both health organizations and HCWs. To date, COVID-19 represents a huge issue for healthcare systems due to the high transmission rates and the high prevalence of severe disease and mortality (1,2). The risk of viral transmission to HCWs has been discussed since the start of the outbreak, when the evidence for human to human transmission of SARS-CoV-2 emerged and the concern regarding transmission from infected individuals

to HCWs increased. Early reports showed that HCWs were not only at high risk of infection but also frequently incurred a severe disease. The first HCW who warned the international community about the infection was the doctor Li Wen-Liang, an ophthalmologist in Wuhan who died of the disease that he contracted while was at work (3, 4). Evidence immediately emerged about the high risk of spreading the infection in healthcare settings; in fact, a retrospective analysis from a single centre Zhongnan Hospital, Wuhan, of 138 patients with COVID-19 pneumonia showed that 41% of infections were hospital-acquired (5). Approximately 70% of these patients were HCWs, with one individual

requiring intensive care, but there were no deaths. The study showed that infected HCWs worked mostly on general wards (77.5%) followed by the emergency department (17.5%) and critical care (5%) (6).

In Italy, as of June 30, 2020, 240,455 people have been confirmed with the disease with more than 33,736 deaths (7); mean age of patients dying for SARS-CoV-2 infection was 80 years (median 82, range 0-100), women were 14,069 (42.0%). Median age of patients dying for SARS-CoV-2 infection was 20 years higher as compared with the national sample diagnosed with SARS-CoV-2 infection (median age 62 years). Women dying for SARS-CoV-2 infection had an older age than men (median age women 85 - median age men 79).

To date there is no aggregated database at a global level accurately tracking deaths among HCWs; governmental websites are inconsistent in the data that they have been able to collect. The validity and reliability of these informations are unknown, and reports suggest that around the world there has been an under-reporting of all cases of COVID-19 (8).

The data from Italian National Institute of Health (ISS) showed that, as of June 30, 2020, 29,397 cases were diagnosed among HCWs (12.2% of the total reported cases), median age 48 years, 29.8% male. The data indicate that lethality among HCWs is lower, even for the same age group, compared to total lethality in general population, probably because asymptomatic and pauci-symptomatic HCWs were more tested than the general population (7).

Nevertheless, data from United Kingdom showed the overall mortality rate amongst health and social care workers was similar to the general population (8). However, the majority of COVID-associated mortality is in patients older than working-age (> 70% of deaths are in those aged > 75 years) and amongst men (57% men), whereas National Healthy System employees are younger and 77% are women (9,10).

A logistic regression performed by Jackson et al. (7) aimed to determine whether some professions were safer off than others, stratified by seven countries (United States of America, Italy, Spain, France, Brazil, United Kingdom and Australia), showed that the percentage of deaths from HCWs compared to the general population was lower given that they used

personal protective equipments to decrease the risk of exposure and had the skills to protect themselves. Physicians and nurses working closely with patients resulted particularly vulnerable to COVID-19 mortality given the number of contact hours that they have with infected patients (i.e. anaesthetists, are at a higher risk in activities such as intubation).

Given this context, the occupational health surveillance of HCWs, performed by the occupational health physicians, represents a strategic way for protecting HCWs from COVID-19 through the early diagnosis of the infection, the detection of worker susceptibility to severe COVID-19, the medical examination of HCWs returning to work after suffering from COVID-19.

The purpose of this narrative review was to evaluate the literature and discover what are the latest developments about the management of the occupational health surveillance of HCWs during COVID-19 pandemic.

## Materials and methods

### *Search strategy*

A narrative review of literature from February to July 30, 2020 regarding the occupational health surveillance in HCWs was conducted. The general methods and selection criteria were based on different sources. First, three major electronic databases (MEDLINE, Pubmed, Google Scholar); second, the reference sections of the identified studies were scanned for additional relevant studies satisfying the criteria. We aimed to identify original research articles (i.e. non-reviews) with the following exclusion criteria: (1) not written in English; (2) non-human studies; and (3) not full reports.

### *Data extraction*

The screening of articles was carried out in two phases. In the first phase, articles were screened on the basis of title and abstract. The abstracts of all the selected titles were sorted for more detailed information. Two independent reviewers (G.D. and V.P.) read

the abstracts and categorized them as relevant, not relevant, or possibly relevant. In the second phase, the full-text articles were assessed for eligibility. Two reviewers (G.D. and V.P.) independently applied inclusion and exclusion criteria to potentially eligible papers and both reviewers then independently extracted data from the original articles. Any disagreements were independently checked by the second reviewer (G.C.) and a consensus was reached.

#### *Categorization of selected articles*

Every full-text article that met the inclusion criteria was reviewed and categorized into one or more of the following three categories based on its subject matter: early diagnosis of COVID-19 in HCWs, detection of worker susceptibility to severe COVID-19, medical examination of HCWs returning to work after COVID-19.

#### *Early diagnosis of the infection in HCWs*

Occupational health surveillance of HCWs during the epidemiological emergency from COVID-19 represents a general preventive measure in healthcare settings, as it can intercept possible suspected cases and symptoms of infection and, therefore, could minimize the spread of the infection (11). In accordance with Hunter et al. (12), combined nose and throat swabs, taken for SARS-CoV-2 real-time reverse transcription-polymerase chain reaction (RT-PCR) test, represent the effective testing protocol to enable rapid identification and isolation of infected HCWs so as to protect patients and the wider community, given that nosocomial transmission has been already recognised as an important amplifier in epidemics of both SARS and Middle East Respiratory Syndrome. With regard to the serological diagnosis of COVID-19 in healthcare settings, Wang To et al. (13) revealed that it is important for patients who present late with a very low viral load, below the detection limit of RT-PCR assays, and not for early diagnosis of the infection. Moreover, the Italian Society of Occupational Medicine stated that to date, given the insufficient scientific evidence available, the use of serological tests for COVID-19 should be limited to epidemiological investigations aimed at knowing the

spread of the infection and the degree of immunization of the population, and not for the employees readmission to work (14). As regards to rapid serological tests for SARS-CoV-2 antibodies, in accordance with the review conducted by Riccò et al. (15), to date they cannot substitute other more reliable molecular tests, such as assays based on RT-PCR, due to their low sensitivity (64.8%) and, consequently, the resulting rate of false negative cases may be substantial. Given this limitation, the rapid serological tests, may lead to misdiagnosing true positive but asymptomatic workers, potentially eliciting new outbreaks in the same settings that such tests should contribute to protect (16).

#### *Detection of worker susceptibility to severe COVID-19*

Many diseases can make the worker susceptible both to a greater risk of infection and a more severe evolution of the SARS-COV 2 infection and, therefore, “fragile” as in a condition of vulnerability towards viral infection; therefore, the occupational health physician is required to carefully evaluate the worker fragility, given that numerous epidemiological data show significant health risk in the higher age groups of the population (> 55 years of age), as well as in the presence of comorbidity that can characterize a greater susceptibility to severe COVID-19 (17-19). In accordance with existing literature a series of diseases can determine an individual fragility towards the infection, as following:

- primary immunosuppression and /or immunodeficiency conditions or secondary to other diseases (malignant tumors, in particular leukemias and lymphomas, bone marrow aplasias, HIV infection) or to therapies (corticoids, chemotherapy, other immunosuppressants in autoimmune diseases);
- oncological diseases;
- heart diseases (ischemic heart attack, angina and other coronary artery diseases, severe arterial hypertension, heart failure, severe arrhythmias);
- chronic obstructive and restrictive pulmonary diseases;
- insulin dependent diabetes mellitus, especially if decompensated;

- chronic renal failure;
- diseases of the hematopoietic organs, hemoglobinopathies (e.g. bone marrow aplasias, severe anemias);
- chronic inflammatory diseases and intestinal malabsorption syndromes;
- rheumatic diseases (e.g. rheumatoid arthritis, systemic lupus erythematosus, collagenopathies and chronic systemic connectivities);
- severe chronic liver diseases (e.g. cirrhosis of the liver).

The occupational health physician is called to focus health surveillance on the search for the above diseases causing worker susceptibility to SARS-COV-2 infection, with the aim to protect HCWs who are at additional risk from Covid -19 and, therefore, susceptible to severe infection.

*Medical examination of HCWs returning to work after COVID-19.*

In accordance with the document edited by EU-OSHA and titled "COVID-19: Back to the workplace: Adapting workplaces and protecting workers" (20), HCWs who suffered from a critical or severe COVID-19 must be carefully examined by the occupational health physician during the evaluation of the fitness for work; in particular, a special attention is required in order to detect the unfavorable outcomes related to COVID-19 and impacting on workers' fitness. The available scientific evidences indicate, among the clinical outcomes of the infection, the following health conditions:

1. reduction of lung function consequent to the disease which, although temporary, must be carefully evaluated if incompatible with the work tasks in hospital settings; rehabilitation programs targeted to improve lung function should be prescribed in order to allow the worker to recover his fitness for work. The current scientific literature shows that people affected by COVID-19 and who have experienced pneumonia or severe acute respiratory infection, may have reduced lung capacity following the disease, even up to 20-30% of lung function, which can be significantly improved by respiratory physiotherapy cycles (21, 24);
2. sequelae of protracted hospital stay, such as the "Post Intensive Care Syndrome", which occurs with muscle weakness until compromised respiratory function and post-traumatic stress disorder (PTSD), which is estimated to have an incidence of 30-50 % in subjects who have been inpatients in intensive care, or even impairments of cognitive performances (attention, memory and concentration) who, although not present or not evaluable in the immediate term, can occur in the medium to long term in the form of reduced problem solving skills and social and work skills (23,25). Under these conditions, workers need the support of a re-education path to return to the performance levels prior to the infection.

As for the possible psychic sequelae of the disease, there is evidence that serious respiratory diseases with high contagiousness (such as SARS) have a psychological impact similar to that caused by major disasters (26,27). For example, Kwek et al. [28] found that, in a group of patients with previous SARS, 41% had symptoms of post-traumatic stress disorder (PTSD) 3 months after healing from the infection. Specifically, for SARS-CoV-2 infection, in a Chinese study (29) it was seen that 7% of the population in quarantine was affected by symptoms of PTSD and in this same study it was highlighted that women were more affected by the symptoms of PTSD than men and that having a better sleep quality is a protective factor against PTSD.

The evidence currently available highlights the complexity of the occupational health surveillance, which should involve a multidisciplinary medical team in the clinical examination of HCWs returning to work after disease from Sars-CoV-2 (30), so as to allow the occupational health physician to assess the workers' fitness for the job and to ensure that the job be fitted for the workers' safety and health.

## Conclusions

The findings of the present narrative review show the need to strengthen the occupational health surveillance of HCWs during the current COVID-19 pandemic, with the aim not only to contain the spread of the infection in healthcare settings, but also to protect HCWs coming back to work after the disease. The occupational health physician is called to ensure the updating of the occupational health surveillance schedules for HCWs, in line with the ongoing evidences regarding the early detection of the infection, the diagnosis of worker fragility for the disease and, finally, the return to work of HCWs recovered from COVID-19.

**Conflict of interest:** Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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**Correspondence:**

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Gabriele d'Ettore, Medical Doctor,

Health Unit of Occupational Medicine, via Miglietta, 73100,

Lecce, Italy.

E-mail: [gabriele.det@libero.it](mailto:gabriele.det@libero.it)