COVID-19: a further step forward in the long journey of Occupational Medicine

It is generally agreed that Occupational Medicine (OM) was born with the publication of De Morbis Artificum Diatriba (1), Bernardino Ramazzini's masterpiece. Less well known are Ramazzini's contributions to Public Health (PH) in another book to which our journal has dedicated a supplement (2), his insights into the need for multidisciplinary work to fight epidemics (3), as well as the complex interplay between health and the economy, the Scylla and Charybdis through which we must navigate during the COVID-19 pandemic (4).

Since his time, industrial revolutions have influenced the development of OM, a branch of Internal Medicine concerned both with the amount of ill health and injury among workers associated with the drive for economic progress and with advocacy for healthier conditions at work and better nutrition and housing. Primary prevention has been effective in many countries in overcoming major issues at work (e.g., occupational poisons and dusts) and at home (e.g., tuberculosis, poliomyelitis), but as societies we still face the same problems from viral epidemics and use the same measures used against the influenza pandemic (the so-called Spanish flu) of 1918-19 to combat COVID-19 (5). Curiously, the Spanish influenza was not mentioned in our journal, save only for a summary of a report written by M Vevriès, rather too little, too late, and too inaccurate to show that OM was concerned with the pandemic: "*We can glimpse a prophylactic action in iodine vapours diffused in the environment because none of the workers in the workshop was affected by the Spanish influenza during the epidemic of 1917-1918*." (6)

In contrast, today, COVID-19 is seen as a major occupational health problem, especially for health care workers (HCW). We receive many papers dealing with what seems to have become the main challenge of contemporary OM. The COVID-19 pandemic is highlighting the dual role of OM both as a clinical discipline aiming at individual workers' care and as a branch of PH using population-based approaches and methods, such as health promotion and mass vaccination programs. Today, OM deals with all aspects of health management in the workplace, offering occupational health professionals a central role. Their ethical mandate to ensure workers' safety and health calls for commitment to all aspects of epidemic management, from advice to management on prevention and control of infection including vaccination to rehabilitation and counselling for workers suffering from COVID-19's consequences (4).

"*Something is known concerning the nature of influenza. Much remains to be determined*" (7). This start to an article written a century ago, after the first year of the Spanish flu pandemic, by the Editorial Committee of the American Public Health Association to present "*A working program against influenza*" could well be written today after one year of the COVID-19 pandemic. Despite tremendous progress in science, a century later we are still struggling to find an answer to questions not covered by available evidence on the severe and often deadly disease caused by the SARS-CoV-2 virus. We have already published original work and reviews on the best methods to protect HCW from the risk of infection (8, 9). In this issue, we publish original work showing the effect of vaccination and other aspects of health surveillance of HCW (10, 11) moving forward from the only laconic conclusion possible one century ago: "*There is no known laboratory method by which it can be determined when a person who has suffered from influenza ceases to be capable of transmitting the disease to others*" (7).

In the first half of the 20th century, Industrial Toxicology provided the scientific underpinning of the discipline, dealing with the toll of developing chemical technology, and mainly based on clinical discoveries of new work-related hazards and diseases, including cancers. Experimental work on animals was used to provide evidence of the causal role of chemical and physical agents and has been instrumental in

improving our understanding of both occupational and non-occupational diseases. In the second half of the 20th century epidemiology, used initially for studies of infectious diseases and then for investigations of the pneumoconioses, has been employed increasingly to recognise and quantify occupational risks and diseases. From the late 20th century there has been a shift towards more common disabling work-related musculoskeletal and psychological disorders, and applied ergonomics has become an important OM subspecialty.

OM's duality as both a clinical specialisation for injured workers and a population-oriented specialisation aimed at health promotion and risk management at the workplace has the background necessary to appreciate the principles of clinical epidemiology to laboratory tests now available to detect and monitor SARS-CoV-2 infection. After one year of the pandemic, an impressive array of tests is available. Choice and interpretation of molecular and antigenic diagnostic tests for SARS-CoV-2 must be guided by the aim and context of their application (10). Likewise, aim and safety of procedures should inspire clinical tests and manoeuvres for health surveillance, e.g., spirometry (12), according to guidelines issued to give due consideration to the risk of infection in a pandemic context. The Italian Society of Occupational Medicine (SIML) has expressed concern and provided clear recommendations about the use of serological tests for SARS-CoV-2 (8). Occupational health physicians should apply diagnostic tests complying with clinical epidemiology principles, thus ensuring their either positive or negative diagnostic validity depending on the clinical or epidemiological objective. They should resist managers' and politicians' pressure to do anything without considering the deleterious consequences of inappropriate testing.

The first aim of the vaccination programmes should be to protect the elderly and vulnerable, thus reducing the immediate burden on health services. Thereafter there is a strong case for younger and productive people to receive the vaccine, as they are the ones in whom most spread occurs through mixing at work and leisure. While most medical attention during the pandemic has been on the heroic efforts of HCW at the front line in treating severely ill patients, there has also been recognition of a role for OM in the management of the COVID-19 pandemic at the workplace, both in clinical activities to manage individual workers' rehabilitation after illness and population-oriented programmes, such as mass vaccination and advising on preparedness for further outbreaks.

Critical changes are currently being debated in Western countries struggling to recover economies severely affected by prolonged lockdowns. In this context, we can try to summarise the lessons learned after one year of the COVID-19 pandemic and to indicate a way forward for OM, reconsidering its dual clinical population-oriented roles:

- Despite the need for a PH plan to confront future pandemics, following the Ebola and SARS epidemics, the first wave of the COVID-19 pandemic demonstrated the lack of preparedness of Western countries and the shortage of personal protective equipment (PPE), the production and supplies of which had been delocalised to minimise costs. The toll in terms of serious illness and lost lives has been particularly severe for health and social care workers in particular. Such workers were considered at a greater risk of COVID-19 because of their job when they needed PPE. A serious consequence of this has been that hospitals and care homes became centres of spread of infection among directly exposed staff, their colleagues, patients and families.
- The most notable successes have been the use of pragmatic trials of treatment, mainly in the British National Health Service, resulting in rapid discovery of several partially effective treatments for the acute disease, and the very rapid production of vaccines. This latter achievement has been a demonstration of the value of international scientific collaboration and of the power of molecular medicine and nanotechnology. Control of the pandemic depends critically on the ability to modify these vaccines to take account of dangerous variants.
- Alongside this, there has been widespread political failure of equitable distribution of vaccines, each country being driven by understandable self-interest. The result of this failure is apparent in India, the

world's greatest producer of vaccines, which has signally failed to provide for its own people. The consequences include development and spread of new variants.

- In Italy, and perhaps in other countries, occupational physicians have played a crucial role, thus compensating to some extent PH failures. By this involvement, they have helped to keep alive essential productive activities by identifying and tracing affected workers and their contacts and assuming a pivotal role in health management at the workplace.
- In many countries, notably in the Far East, Africa and Nordic countries, traditional PH measures of detecting and isolating cases and their contacts worked well and limited the mortality rates. In others, most notably Western Europe, USA, South America and now India, delays or failure to implement lock-down and failure of testing and contact tracing led to uncontrolled spread and recurrent waves of infection.
- As expected, because of coronaviruses' biology, many new variants have appeared and some in the UK, South Africa and Brazil, have contributed to worsening and recurrence. Fortunately, these variants are still susceptible to the antibodies produced in response to the current infections and vaccines. However, this may not be true of other variants, such as the emerging (and worrying) Indian ones. Testing and tracing activities and the production of new vaccines will be necessary to end the pandemic eventually.
- Owing to the tendency of SARS-CoV-2 to mutate and spread new variants, natural herd immunity could probably never be achieved, but it is likely that vaccination provides good immunity to vaccinated people and slows down the contagion also among non-vaccinated co-workers (12).
- For workers' protection, the same cautious hygiene measures already put in place one century ago for Spanish influenza should be maintained for several months, if not years. Even for vaccinated workers, travel should be limited to and from areas where the epidemic continues until more knowledge is available on the strength and duration of immunity.
- Social partners have recognised a widened role of OM to incorporate PH functions. OM academics and physicians should not regard these additional tasks as cumbersome duties. Instead, they present opportunities for revision of courses and training curricula because training new generations of professionals is critical to developing skills to ensure workers' safety and health.

The main lesson of pandemics for OM is the need for healthy, positive work environments for workers, particularly in health and social care, who are often struggling to survive in situations implying a severe risk of both illness and burnout. OM could implement models for managing the workplace going forward, and occupational physicians should lead the way based on their training, experience, and expertise.

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Acknowledgement

The contribution of Professor Anthony Seaton, CBE, professor emeritus of the University of Aberdeen, who revised the editorial and provided insights from a UK perspective, is gratefully acknowledged.

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