

Written evidence submitted by Observations of Engineers Covid Task Force

Introduction and Summary

Covid 19 has spread across the globe but Far Eastern countries have controlled it far more effectively than in the Western World. Their death rates over 2020 were 4000 times lower than the UK [Johns Hopkins CRC 24 Jan 2021].

The Engineers' Covid Task Force (ECTF) was formed in April 2020 to provide Infection Control and Risk Management expertise to complement that of SAGE Scientists and solutions to help control infection transmission and manage this pandemic

The ECTF has members on both sides of the globe, all Fellows and Members of the Institution of Mechanical Engineers. As Chartered Professional Engineers, many are directly engaged in the management of this pandemic for their own organisations or governments. They have all held senior positions in major organisations and together they have lifetimes of practical experience in Infection Control, Crisis and Risk Management and a broader perspective on the management of this and future pandemics.

Since the outset of this pandemic, its members have been working 24/7 to help save lives and livelihoods. Throughout, the ECTF has conducted an in-depth investigation to compare best practice, East and West, to identify lessons that can be implemented in the West, not just by the UK and COBR but by the WHO and Western Governments.

Whereas Scientists and Academics are the experts on the nature of SARS-CoV-2 and the mechanisms of infection, it is not widely recognised that it is professional Engineers who have the in-depth understanding of infection transmission and provide the systems and guidance to control it, not just for hospitals & laboratories but for supermarkets & schools, restaurants & bars, workplaces & public spaces, all forms of transport, trains, planes, buses & their terminals.

The aim of this response is to suggest how the expertise of Engineers and Scientists, Academics and Practitioners can be brought together, to ensure the UK is far better prepared, not only for future pandemics but to manage other major crises without similar loss of life and economic cost.

Primary Observations and Comparisons between East and West

While Scientists have an in-depth understanding of the mechanisms of Infection, Engineering understanding of the mechanisms by which a virus is transmitted from one person to another, together with evidence from Far East countries where there has been far closer collaboration, has provided insight into how best to control Covid-19 and future pandemics.

In the light of that, what has emerged is a remarkable divergence in approaches between East and West, with serious consequences in terms of both loss of life and economic damage. In some Far East countries it was possible to suppress Covid-19 well in advance of vaccine development, as had also proved possible with SARS.

Comparison of approaches has confirmed the importance of deploying every measure and all resources available to control infection as early as possible. Many Engineering-based measures to control infection transmission are already proven, not only in previous epidemics but to control many other forms of pollution and contamination. They did not need epidemiological “evidence” to confirm their effectiveness and early evidence quoted in the West proved misleading, as has recent evidence from deployment of home made face coverings, as to the efficacy of far better masks available.

Far East practice was to implement all actions, however minor, that might possibly assist in reducing infection transmission at the earliest opportunity, based on best understanding as to the mechanisms of Infection at the time. Each could contribute progressively to reducing the dosage transmitted to below the threshold for infection in a wider range of circumstances, thereby reducing the probability and rate of infection spread. As it happens, that appears close to the approach advocated by UK and Western Engineers of the Covid Task Force in early 2020.

In contrast, the Western world and the UK, in particular, focused on a succession of far more draconian and economically damaging “Top Down” measures and “Silver Bullet” solutions, none of which was sufficient on their own. In the Far East they made best use of existing resources, local knowledge and expertise, delegating responsibility for Infection Control action to local authorities and providing them with best information and support.

Whereas ambitions of Western Scientists to apply an “evidence-based approach”, to be “guided by the science”, to apply the “precautionary principle” and to wait for “peer-reviewed papers” are laudable, Government advisors failed to evaluate and recognise the associated balance of risk. That balance is very different in infection control to that of vaccine and drug development, where the consequence of premature deployment could be far worse than the diseases they are trying to prevent. The adverse effects of wearing the best mask possible or applying better ventilation are miniscule in comparison to their potential prevention of Covid.

Epidemiological models are useful but they do not model the first stages of transmission, many of the more effective basic measures or the changes in human behaviour sufficiently to provide the prime means of pandemic management. Many factors are outside their scope.

Waiting for data to run them caused serious delays, allowing Covid 19 to spread widely. Since the input data to run them - hospitalisation and deaths - were the same factors as they were seeking to control, any predictions were inevitably too late to be useful. Engineers prefer to use models to evaluate and optimise measures individually but to maintain a far wider perspective and sources of insight to decide next actions.

Engineers on both sides of the globe were able to predict the impact of changes in Government guidance or other developments one to two months ahead, by observation of a far wider range of factors, using skills acquired during the risk management of major projects, crises and companies, allowing them to identify opportunities to control infection and take action to suppress outbreaks far earlier.

In the light of that, it has been possible to suggest a range of more cost effective and less damaging measures, as well as offering more comprehensive guidance to enable businesses to restore their viability and the Economy to recover.

Specific Measures

The rapid and widespread deployment of high performance masks to control Covid at source in the Far East had a similar effect to vaccination, improving “immunity”, reducing “infectiousness” and reducing the viral load released by infected persons into the atmosphere. As a result, the dosage received by wearers was reduced to well below the threshold for infection, causing many outbreaks to die out. In Hong Kong they referred to them as “the Lockdown on your Nose”

However, such were the political and cultural objections that few in the Western World recognised that mask-wearing imposes little or no practical restraint on economic activity or daily life, in comparison to Lockdowns and more draconian measures. However, that will be far easier to explain for a future pandemic.

The Far East made far greater use of animations and online advice, to provide increasingly more understandable and comprehensive guidance. In contrast, the Western World asked YouTube to restrict its coverage of Personal Infection Control guidance and they used Twitter to draw attention to their limited and simplistic guidance.

The decision to allow members of SAGE and CDC to speak on their own account, whilst acknowledging their membership of the Institutions, has undermined confidence and led to considerable confusion, particularly when each was asked questions outside their sphere of competence, irrespective of whether they felt obliged to answer or declined to do so.

The WHO has been far more disciplined in that respect but has limited its spokesman to maintain the same simplistic advice based on peer-reviewed papers and scientific evidence. Western Behavioural Scientists also placed emphasis on maintaining the same simplistic messages.

In Taiwan, which had only 10 Covid deaths in 2020, they made early efforts to give clear comprehensive guidance to ensure all families knew precisely what to do, where, when and why to keep themselves and others safe and how to self-isolate or quarantine in the home without risk of transmission. Rather than make exceptions, they applied the same advice for all ages, even children over two, “for the avoidance of doubt”. They provided all with the best means to do so, maximising supplies of surgical masks which proved to be 98% effective, above specification when later tested, and Hong Kong free-issued even better washable masks that were 99.4% efficient.

In contrast, the WHO and Western Governments took months to recommend homemade face coverings and later issued new standard for commercially produced face coverings rather than best masks, specifying that they only had to be 70% effective i.e. they could let up to 30% of virus escape or penetrate their filter media. Either is likely to inspire dangerous overconfidence, such that wearers get too close.

Before publication of the new standard, in early 2021 the Institution of Mechanical Engineers highlighted to BSI that all reputable western mask manufacturers should be able to meet 99% i.e. their face coverings should be able to reduce the amount of virus escaping or penetrating by a factor of 30 times more than the new standard.

If such better masks are worn by both parties, then the dosage received is likely to be reduced by at least two orders of magnitude over those wearing face coverings. Since Omicron is more infectious, the threshold for infection must be much lower and such improved performance could have proved critical in controlling infection this week. Despite reintroducing mandated wearing of masks, 18 months on from their first imposition, homemade face coverings to no particular standard are still permitted in such critical areas as vaccination stations and could well be accelerating infection, rather than preventing it.

Concluding Observations

It is clear that previous national exercises to test the preparedness and resilience of NHS and Public Health Infrastructure had focused on assessing and managing the consequences of infection. Less attention had been paid to the protocols & resources needed to prevent initial spread, perhaps as that responsibility had earlier been devolved to Local Resilience Forums and Directors of Public Health and national resources disbanded.

In hindsight the decision to be “guided by the Science” and ignore the normal COBR procedures to identify wider sources of expertise and advice and implement solutions was misguided. Huge resources were focused on investigating the problem but, in contrast to the Far East, very little on the urgent identification, development, optimisation and deployment of practical Infection Control measures that could have helped.

Neither Academics, nor Politicians are trained in or have experience of major Risk and Crisis management. Moreover, the over-application of the Precautionary Principle and demand for epidemiological evidence delayed progress in decision-making and perpetuated “Groupthink”.

Two years on, it is clear that, whilst the Far East deployed all possible measures that might work within days “for the avoidance of doubt” and sustained an intensive search for supplementary solutions, the West has still not fully deployed all that were known to work at the outset and have now proven to be effective in the Far East.

The lack of input oversight by staff experienced in Risk Management was misguided and lost the connection and coordination between national and local infection control resources. Since central knowledge of local capabilities appears to have been lost, many functions were bought in from general contractors with no specialist experience.

Importantly, comparison of latest action to suppress Omicron, East and West, shows that the UK in particular has still not learnt the basics of Infection Control. It is as ill-prepared for the next pandemic as it was for the last.

Death rates could again be similar, while the country again awaits the development of a new vaccine, rather acting quick enough to obviate the need.

Key Lessons for Future Pandemics

For future pandemics and other crises requiring academic input, there is a need to establish a separate Rapid Reaction Force under COBR, staffed by those with specialist Risk and Crisis Management experience, whose sole focus is to find proven solutions and mobilise all available resource to implement them based on best information from SAGE and other sources but not directed by them.

The investigation illustrates the importance of having those experienced in Risk and Crisis management, not only in leadership positions but alongside those drawn from fundamental research - Practitioners alongside Academics, Engineers alongside Scientists and national coordinators embedded within Local Resilience Forums - as has previously been the practice on the UK Government’s Civil Contingencies Committee (otherwise known as COBR) until this pandemic.

The primary function of COBR should be to assemble the most relevant world class expertise and leadership, not just to understand the problem but to identify the short term solutions and get the most effective and least economically damaging emergency actions underway devolving responsibility to local practitioners and resilience forums for delivery at the earliest opportunity.

In addition to the Rapid Reaction Force above, COBR should also put in place a longer term Contingency Planning and Risk Management Group to anticipate future crisis developments. Whereas academic epidemiologists and modellers should be part of that Group, it should be led by those of far wider risk management experience.

Both groups should employ spokesmen and media relations to communicate best advice to the public but members should be discouraged from speaking independently to the media.

There is a need for an international collaborative effort, similar to that directed to vaccine development, to develop, optimise and adapt other Infection Control solutions and provide more comprehensive guidance to the public as to how to avoid transmission.

In particular there is an urgent need and opportunity to develop an upgraded standard of surgical mask, with lower leakage and 99+% efficiency, suitable for both clinical and community use and possibly as part of a two part solution that offers higher viral capacity, flexibility and greater effectiveness, not only to control Covid-19 but in readiness for future pandemics.

In the meantime Western Governments should consider promoting the far more widespread use of best possible masks (95-99.9+%) in the community, to replace face covering entirely in all high risk areas or wherever there may have been exposure to potential risk or infection has been detected.

Moreover, there is a need to engage with the research, development and evaluation of atmospheric sanitisation systems that has been active from the outset in the Far East and establish equivalent research, development and testing facilities and programmes.

The aim should be to certify and select the best existing equipment and evaluate emerging technologies, not just HEPA filtration but UVC and other sanitisation techniques. Rather than allow universities to develop their own test facilities, many of which are uncertified, a national facility should be established, possibly at Porton Down.

ECTF members have already set a new standard for UVC Filtration units in collaboration with the NHS and completed a demonstration project for dentists' surgeries, but there is now a need for similar projects for a school, a hospital, a care home and a high rise office block to show what can be done and identify best ways to minimise the cost.

Coincidentally many building operators are urgently needing to review their energy consumption in response to Climate Change considerations and now rapid rises in energy cost, as well as dealing with the cladding crisis. ECTF members have identified that it would be practical and cost-effective to incorporate infection control measures in conjunction with heat pump and zero carbon retrofit, rather than have to offset the energy loss of increased ventilation separately.

Furthermore, to restore economic viability as well as achieving full Covid security, many operations will need to review of their ventilation, sanitisation and operational procedures, with the assistance and oversight of an Infection Control Engineer or Specialist, as much of the initial modifications to comply with Social Distancing regulations has rendered buildings and businesses uneconomic.

UK products and manufacturing facilities should be approved and stocks put in place for both masks and sanitisation equipment, such that supply can be ramped up quickly and can be deployed to control specific outbreaks or in areas of higher infection.

The aim should be to deploy all effective measures as soon as possible, based on laboratory evaluation for workplaces and public spaces to enable an earlier safe return to relatively normal life and to improve their resilience for this and future pandemics.

There is a need for updated guidance specific to situations such as schools and hospitality to include supplementary measures, based on an in-depth understanding of the mechanisms of transmission and proven methods of Infection Control, similar to that provided in Hong Kong.

As Far Eastern countries have now shown, it is perfectly possible to maximise control of infection, whilst minimising the impact on the wider economy, particularly by deploying all available solutions fast, to control first infections at source before they have time to spread.

However, comparison of the recent responses to the threat of Omicron suggests that should we have another pandemic requiring development of a new vaccine, we would still not be able to react fast enough to avoid similar loss of life and avoid similar economic damage.

There is an urgent need to bring Scientists and Engineers, Academics and Practitioners, Local and National Public Health Leaders together with experts from East and West, to learn from this pandemic and put in place contingency plans for the next.

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