

## Transcript: Webinar - COVID-19 challenges and solutions

12 months of COVID – what have we learned? Part 1 | 24 March 2021

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During this webinar our audience submitted their COVID-19 IPC questions to our expert panel.

### Panel members:

- **Dr Lena Ciric** - Associate Professor in Environmental Engineering, University College London
- **Dr James Dodd** - Consultant senior lecturer in respiratory medicine, University of Bristol
- **Professor Catherine Noakes** - Professor of Environmental Engineering for Buildings, University of Leeds
- **Dr Jon Otter** - Infection prevention and control Epidemiologist, Imperial College London

**Chair: Dr Chris Lynch** - Microbiology SpR, Sheffield Teaching Hospitals

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**Chris Lynch 0:08**

Okay, hello everyone, we'll just wait another minute to allow everyone to join.

Right, we'll make a start so thank you everyone for joining our COVID-19 challenges and solutions audience led webinar series. Today's webinar will focus on 12 months of COVID, what have we learned, and this is part one of two parts, and this one's themed around ventilation and the environment. So I'd like to introduce our panel. Well, I'll ask them to introduce themselves. To start off, Cath Noakes.

**Cath Noakes 1:00**

Hi everybody. So thank you for inviting me along Chris. I'm Professor Cath Noakes I'm at the University of Leeds. Background, I'm an engineer and my background is in ventilation and airborne infection, and I suspect most of you already know that I've been involved with SAGE for nearly a year now so I chair the environment and modelling group, although everything here is in a personal capacity.

**Chris Lynch 1:24**

Great. Thank you. Lena Ciric

**Lena Ciric 1:30**

Everyone, thank you for inviting me. My name is Lena, I am the. What am I, the what. I am an environmental microbiologist and an Associate Professor in Environmental Engineering at University College London.

**Chris Lynch 1:43**

Thank you very much, Jon Otter.

**Jon Otter 1:50**

Hi, everybody. Good afternoon. I'm so pleased to be here today. My name is Jon Otter. I manage the infection control team at Imperial College hospitals in London. So we've been through first and second waves with you. And I also do a bit of research at the College.

**Chris Lynch 2:08**

Thanks so much, James Dodd.

**James Dodd 2:12**

Hello Good afternoon. My name is James Dodd. I'm a consultant, respiratory physician in Bristol and I also have an academic remit, and have been working with Jonathan Reed and the aerosol Bristol aerosol research team on the AERATOR study, which has been looking at risk of aerosols generated from procedures, that we undertake every day in the healthcare service.

**Chris Lynch 2:37**

Brilliant, thank you very much. So, before this webinar, we asked the audience to submit some questions to you as a panel, and we selected the eight most popular questions, and we'll discuss those for about the next 40 minutes. During the last 15 or so minutes, we'll use that time to answer the live questions which the audience can submit via Slido. Throughout the event you can use Slido to express opinions and a couple of polls that we'll have. And so to do that, if you open up the Slido app or go to the slider website which is sli.do, and then the code is hashtag HIS. So we can start with the questions.

So question one. What is the role of carbon dioxide monitoring in assessing ventilation in healthcare settings. Cath do you want to take this one?

## Question 1:

What is the role of CO<sub>2</sub> monitoring in assessing ventilation in healthcare settings?

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**Cath Noakes 3:36**

okay yeah so I think we, first of all think we need to think what carbon dioxide does. So carbon dioxide monitoring is, it does not represent virus in any way carbon dioxide is a proxy for ventilation so when we exhale, we've got carbon dioxide in our exhaled breath, and the amount of carbon dioxide that is present in an indoor environment, assuming you have no other sources carbon dioxide, which sometimes you do. then, it is relative to the rate at which that is removed by ventilation so a high carbon dioxide concentration is relates to or is an indicator of poor ventilation. So I think the important thing with carbon dioxide monitoring is to always remember it's a proxy its never an accurate measure, and certainly not if you're using it in an ad hoc way. And it's something that will give you an indicator of the likely quality of ventilation in a space so for most buildings we

would say, you know, a carbon dioxide concentration below about 800 parts per million is indicative of quite good ventilation. If you've got carbon dioxide concentrations that are sitting routinely above about 1200, parts per million, you should be really saying this ventilation isn't good enough. It's a bit hard to give some exact numbers on this because the amount of carbon dioxide that you measure will fluctuate quite a lot - it will depend on how many people are in a space, it will depend on metabolic rate of those people of the activity that they're doing, and it will depend on the air mixing within that space, it will depend on the quality and type of carbon dioxide metre that you've got, and whether it's been calibrated or not, you know, if you go very close to breathe it'll go shooting up. So, I think, you know, it does have a place, I think if you're measuring in, you know a single patient room, you should be, or a single office occupancy office you should be treating that with a lot more caution, than if you're measuring in a space where there are multiple people, because the more people you've got in there, the more some of these fluctuations get evened out, by the way you're measuring. So, you know, I think it's a, it's a quick and dirty indicator it is a useful indicator, it can give you some ideas of which space you should be worrying about and which spaces, you probably don't need to worry about so much, but it is not a magic bullet number it is not you know, it doesn't it's not a standard. I think also that it is quite hard to relate it to air changes per hour, and in hospital settings, we tend to work on air changes per hour because quite often we are worried about the time takes for something to clear in a room, rather than the baseline, but even so, this can be quite useful.

**Chris Lynch 6:46**

Great, thanks so much. Anyone else want to come in on that at all?

**Lena Ciric 6:53**

I just wanted to mention some results that we've had from some field studies we've done looking at carbon dioxide versus microbes in the air, and we found that they don't necessarily correlate, probably mostly because people are wearing masks so the CO<sub>2</sub> still goes through those but the microbes may well be caught, depending on the size of the droplets and stuff like that so yeah as Cath said, it's absolutely a good measure of ventilation efficiency. But ventilation efficiency is just one aspect of all of the different things we have to worry about when we think about transmission and the part that the environment plays within it.

**Cath Noakes 7:39**

Could I just add on that as well. Again I agree about measuring microbes because I think it depends on which microbes you measure, but if you go and measure bacteria in a hospital in the hospital ward, that bacteria comes from multiple different sources. So, it's, it will not necessarily be reflected in the CO<sub>2</sub>, which is the CO<sub>2</sub> is only the exhaled breath source and even then you can't necessarily correlate them.

**Chris Lynch 8:09**

Great. Oh Jon.

**Jon Otter 8:12**

Question, of Cath really do you envisage a future where we have standards of CO2 levels in our hospital wards.

**Cath Noakes 8:22**

I wouldn't ever say standard, because I think if you put a standard on, let's say you have a standard of 800. So is that 800 above background or is it 800 net, and as the outdoor background creeps up every year do you have to keep changing your standard. And then of course, if you measure 800 and somebody else measures 820 is that now over the standard, or is it, is that just within the, I would argue that's within the inaccuracy of the metre but 900 is within the inaccuracy of the metre so I think it's an interesting discussion that we're going to have. I do wonder when what we might end up doing is, is using CO2 more and more frequently in buildings as a sort of best practice guide. And over time, it might become used as a means of demonstrating whether you're likely to meet a ventilation standard or not, but I don't think it would ever be held up in law as you have met a ventilation standard I think its too variable.

**Chris Lynch 9:35**

Brilliant, thank you very much so let's move on to our next question. So we had a number of questions regarding recirculating HEPA filters. So, put them all together and asking a multi part question. Is there any evidence to support their use in a ward environment, how do you demonstrate their effectiveness, and is there a standardised method to assess them? Cath would you be able to start us off on this again?

## Question 2:

Recirculating HEPA filters:

- a) Is there any evidence to support their use in a ward environment?
- b) How do you demonstrate their effectiveness?
- c) Is there a standardised method to assess them?



**Cath Noakes 10:02**

Okay yeah so yeah there's a lot of discussions about HEPA filters at the moment. Evidence for a ward environment. I have to admit I haven't gone and looked at the detail of what's published recently but there's a little bit out there but it's patchy. I mean obviously they're well used in HEPA filters are well used in various bits of hospital ventilation but that's not quite the same as used in circulating ward environment. I know there are places who have used them. I think there's very little published evidence of their effectiveness, and their benefits. But I think they do have a potential application, I mean I would never ever advocate reducing ventilation anywhere. I think if you've got an environment where the ventilation is poor, and it's very challenging to do something about it, then they might have a potential use, where you have to be careful is of course a manufacturer will tell you, it has a particular effectiveness, usually I will tell you they remove 99.99% of everything, which is true, if it goes through it, but the question is can you persuade the air and the things in the air to go through your HEPA filter device. So it's all about how effectively it can mix the air in the room, whether it can do that sufficiently well, to make a difference in a real-world setting is a challenge, and whether it can, whether it can do it without also not being too noisy and too obtrusive. There are some standards to assess and there's something called the clean air delivery rate, which is a measure of how much clean air, they put out again that doesn't tell you about how they perform in a room that just tells you about how much something removes. But compared to all the other technologies out there, I mean, they are probably one of the better ones - don't touch ionisers with a bargepole. I know I'm going to get hounded over that, sorry.

**Chris Lynch 12:12**

James

**James Dodd 12:13**

Yeah, just, just to feedback on a bit of experience from the studies we've been undertaking. We were trying to measure aerosols from inpatients with COVID. And the way that we go in AERATOR is we use an ultra-clean laminar flow environment to really get the background down to zero for all the procedures but we weren't able to do that for patients with COVID-19 we had to do it in their room. So we put two or three HEPA filters in their side room to get the background rates as low as possible, so it was effective in getting the background rates down but it wasn't kind of ultra clean, to the point where we actually couldn't differentiate the difference in background at baseline speaking and breathing. But when they coughed we could see the cough signal of aerosols come up above that reduced background so by proxy, it certainly does appear to clean the air and reduce the air background particle count but from a scientific point of view it wasn't ultra clean.

**Jon Otter 13:10**

Yeah. I've looked at some of the evidence around these units and I think it's helpful to broaden the discussion beyond just HEPA filters because I think there's a couple of different technological ways to take organisms out of the air. I agree with Catherine I'm quite dubious about the chemical or other emitting devices that put something out into the air. I think that's going to be challenging, but there's ways of pulling air into a box and disinfecting it and putting it through. I think the challenge

as Cath alluded to is you end up with a very small pocket of very clean air in a rather large area that has limited impact. So I think we need those, those studies in the clinical environment to show that yes, they do reduce the microbial burden in the air and that that translates to reduced transmission.

**Cath Noakes 13:55**

Something else that might be worth mentioning with them is that there might be other benefits to these in certain environments so a HEPA device will also remove some other air pollutants particularly particulates. So if you are in a city hospital with poor urban air quality, and you've got some natural ventilation, actually you might provide additional benefits there to some of your patients through additional air cleaning. I agree, I think, one, it is a real challenges as to how do you and I think you can demonstrate that these will reduce the bioburden in the air and a particulate burden in the air. Demonstrating they have a measurable impact on infection transmission is incredibly hard. And I think we actually do need some studies to do that. And probably now is the only time we're going to manage to that sort of study, but it is very hard, you need a lot of devices and a lot of places to power a study sufficiently to be able to demonstrate that they've made a difference.

**Chris Lynch 15:00**

Right. Thank you very much, so I think we'll move on to our next question. So, what is the utility of screens or barriers to create patient segregation where two metre physical distancing isn't possible. And are there any drawbacks. Lena do you want to start this question.

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### Question 3:

What is the utility of screens/barriers to create patient segregation where 2m physical distancing isn't possible? Any drawbacks?



**Lena Ciric 15:21**

Yeah, I'll get us going. So I think I'll, maybe talk about the theory of these and the practice and some of the considerations we have to take into account. So the theory is that these screens will catch the

respiratory droplets carrying virus particles between one patient, and another one. Now, I think I think that is that is generally true it will catch the larger droplets that those will land on the screen rather than going beyond to the other patients or staff. I guess in practice, however, what the screen is like and how, you know how tall it is, where exactly it's placed, how wide it is, what the ventilation is like in the space will also have an impact on how well it works so it could be that the air flows might blow some of the larger droplets across the smaller droplets of the aerosols, we're going to talk about this a bit later anyway, they may not be caught by the screen so then it means that you have a screen that's helping to some extent but not totally. And I guess, maybe we are more concerned with the larger droplets because in theory, they're going to be carrying more virus particles just by the sheer volume of them.

So I guess the drawbacks are just that, it's really, it's unpredictable knowing how well these are going to work because it depends so much on a number of different factors like the screen itself and the patients and the viral load that they might have and the circulation of the air around the particular space where you place them as well. And then the other thing to think about is that, potentially, these, this is another piece of equipment that needs to be cleaned on a regular basis so you know if they're if they're doing what they shouldn't be doing, which is catching the larger droplets, coming from the infected patients then there are also going to be contaminated areas which need to be cleaned on a regular basis, which is both more work but also a transmission risk.

**Chris Lynch 17:45**

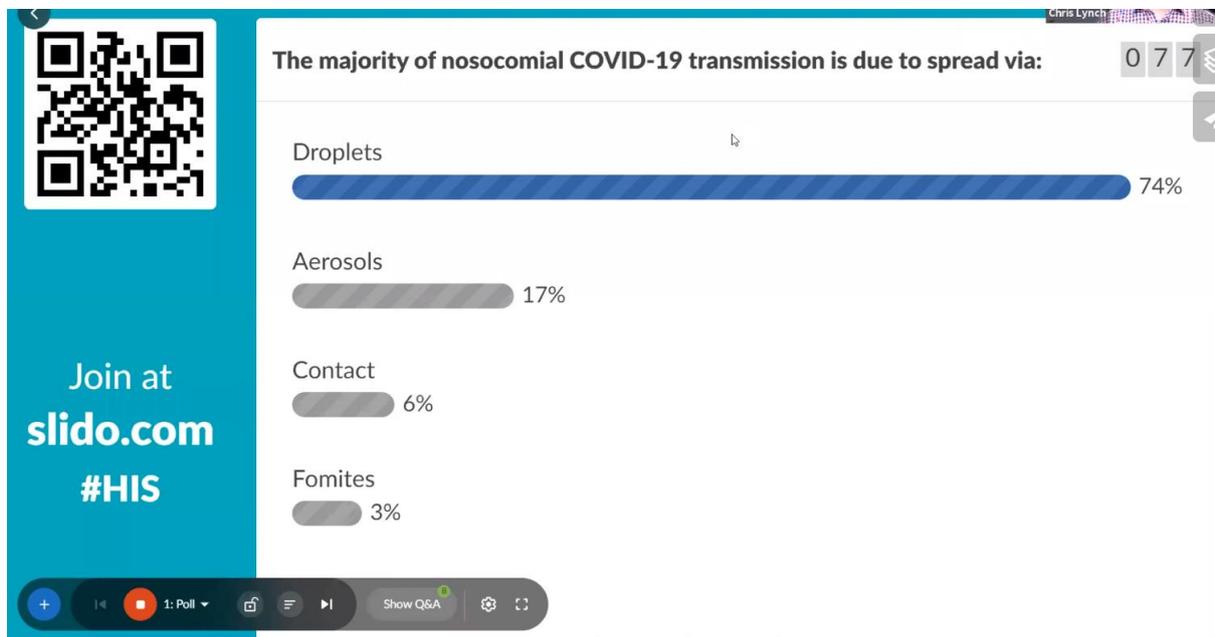
Cath did you have something to add?

**Cath Noakes 17:48**

So I think you have to be quite careful with the screen as to whether it's going to impact on ventilation, particularly if you've got full height partitions or screens. We did a study a few years ago in a large naturally ventilated, also a Nightingale ward, where we looked at using CO<sub>2</sub> as a tracer, so looking at potentially as a marker for airborne for very small aerosols, with, with or without partitions between beds and you could see that without the partitions, it was pretty uniform flow across the whole space up, you know, the risk would be the same for everybody. When you start putting partitions in, you got lower risks to the side but then you've got higher risks within the space where the, the, the healthcare worker might be attending that patient, and you've got higher risks to the person in the bed opposite because of the way it channelled the air flows, and that was obviously very specific to that particular ventilation system but I think that is something to be really aware of, and certain rooms if you put them up, you will block, and you create zones of which you could have sort of pockets of higher concentrations of stuff remaining in the air so I think it is quite difficult. There is, it's a strange one screens and barriers because there is almost no data published on them. They are the most widespread measure for public health throughout this pandemic and yet there's almost nothing published on the effectiveness as a screen in any way. The other one I just comment on here is curtains. I think as Lena mentioned if things get contaminated, there is a risk with curtains that you can resuspend, because if you shake a curtain you can resuspend it. Now whether this will happen with SARS-Cov-2 virus, I wouldn't like to say but certainly that's been demonstrated with other microorganisms.

Chris Lynch 19:53

Brilliant, well I think we're running a bit short on time so we'll move on to the next question, well I think we've got a poll before the next question. So again, if you go to Slido, you can contribute to this, so the majority of nosocomial COVID-19 transmission is due to spread via droplets, aerosols, contact or fomites.



People have a few seconds to cast their vote. Droplets winning at the moment. Okay great, so that's about 75% think that droplets responsible for the majority of nosocomial COVID So that leads us into our next question. How do we get the balance of precautions right as the COVID prevalence falls, what will be relatively more important spacing masks ventilation or environment? James do you want to answer this one?

## Question 4:

How do we get the balance of precautions right as the COVID prevalence falls? Which will be relatively more important – spacing, masks, ventilation, environment?



**James Dodd 21:19**

Yeah, so I'll split it in two. The first part about the balance of precautions, I think that's incredibly important for the NHS as we try and deal with the backlog of diagnostics and get things going again. And, and, you know, the opportunity to do that should be greater as prevalence falls, and if we look at my own respiratory so spirometry for example, our capacity to do that over 50% down with the air change requirements and the PPE requirements, and then you look to the community, essentially it's halted. So, understanding more the opportunity to understand more about the risk, particularly from the aerosol generating procedures like spirometry and trying to get the evidence to refine that and then downgrade it if possible. So you know that what we found from our work was that actually lung function with if you use the filters that are standard, they don't generate aerosols and that should help kind of change your operation as the prevalence falls to doing things in a more risk appropriate way.

The second thing in terms of the relative importance of spaces, masks and ventilation, I think that I would say it doesn't need to be a versus one or the other often. You know, mitigations against the same route of transmission. so masks and ventilation both help against airborne transmission, masks and distancing mitigate droplets spread. So I think it's going to be a combination of all of them. Going back to the, the prevalence dropping. I wonder whether that might be an opportunity for policymakers to consider how to be less pressured in their decision making when it comes to resources, and I'm thinking more about PPE decisions here, and that might be an opportunity to change, perhaps that fed into some of the decision making earlier on.

**Chris Lynch 23:18**

Thanks very much - has anyone got anything else to add? Cath

**Cath Noakes 23:25**

One of the things in terms of thinking about balance, is to look at hierarchy of risk controls when thinking through how to how to balance things. So it's very tempting to get straight stuck into PPE, but actually we should be thinking about, you know, the controls that come before that which are much more around the engineering controls, the environment controls and how effectively you manage that environment, and I think we, we, we often forget more about those, perhaps it's because they're harder to influence as an individual, that really, you know, we shouldn't just be saying what do we do now for COVID, we should be thinking what do we do for future resilience against, you know the next pandemic and actually putting time, putting resource into improving environments and not just patient care environments but across the whole of the hospital estate. There are a lot of very poorly ventilated staff social spaces and staff offices and things which, you know, we, we ought to be now thinking actually, we've got to reprioritize and think about, it's not just all about energy efficiency anymore, it's actually about making sure we've got healthy spaces for everybody. And if you manage that, then, hopefully, you have to rely less on the control measures that require individual behaviours, to make sure they work.

**Jon Otter 25:10**

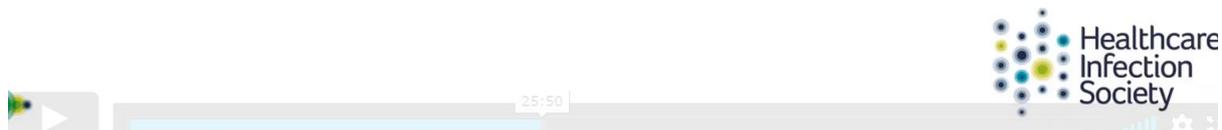
Jump. Just a very quick follow on from that, if I may. I think the most important thing is none of those things because the best way not to spread infectious disease is not to interact with other humans. So I think enhancing the kind of digital transformation there started. But having the right blend, of face to face and virtual consultation is definitely the way forward, and being outside more, we can find a way.

**Chris Lynch 25:39**

Right, thank you very much. So, move on to our next question. So, why do you think the droplet versus aerosol debate was so polarised? Lots of you said on this I think it's still ongoing. Lena do you want to start off.

## Question 5:

Why do you think the droplet vs. aerosol debate was so polarised?



**Lena Ciric 26:00**

Yeah I'm happy to get started, but I think it's definitely one for all of us to discuss. For me, I think it's a difficult one. I think the reason to the debate, and this sort of dichotomy between droplets and aerosols, is mostly because of the clinical implications of a truly airborne infectious disease. And I think initially at the beginning of the pandemic, we almost, you know, didn't want to, we didn't want to believe that there was an airborne component. So, so for me it's that and I mean I can't really comment on the clinical side of things, because I'm not a clinician, but from the point of view of science and engineering, ultimately there is there is aerosols and droplets, we call them that because they behave in different ways but it's not like one ends at exactly one point and the other one starts at another so it's really a continuum. And I think the good thing about having this debate is that we need to maybe define these in a better way, and also then have our clinical procedures mirror that too – or processes.

**Chris Lynch 27:34**

Anyone else want to comment on the reasons for polarisation – Jon.

**Jon Otter 27:40**

Just pick up on something Lena said. I've been reflecting on on how I can contribute to this - I think the one thing I'd add is just to pick up on that terminology I think that's been one of the most unhelpful aspects. If you look at that poll we just answered droplet, aerosol, contact, fomite - in the past before this debate, I would have been very happy to say droplets but actually I think something like short range respiratory droplets would be a much better answer. And that would move us away from the droplet aerosol particle size which I don't think is the key issue. And just to say this is not a new issue it came up in the 1995 outbreak movie featuring Dustin Hoffman, etc.

**Chris Lynch 28:26**

Cath

**Cath Noakes 28:27**

I think there's two things to comment. One is I think we, as well as thinking about how do particles move, as in, are they staying in the air, or are they dropping out on the surface, there's also the how do they cause infection - so do they have to reach the alveolae of the lungs to cause infection, in which case it's only the smallest ones that matter, or do they, can they cause infection by impacting in the upper respiratory tract, in which case larger ones matter too. And I think that's where, you know, conventionally we've segregated into airborne is only those smallest ones and droplet is the rest. And, therefore, to me, a droplet drops but of course a droplet doesn't have to drop it can stay in the air too. And I think that's where we've got stuck a bit with this and I think because we've genuinely got a disease here, which quite probably can infect right across all the particle size ranges, and therefore all particle sizes matter. And I think the other thing is about public perception because there's one thing is saying in a clinical space that the word airborne is reserved for a particular thing, and the word droplet is reserved for a particular thing, but from a public perspective that doesn't work because from the public's perspective, the public think a droplet is like a raindrop. They are great big things and they go splat, and things that are in the air that you breathe, are airborne. And actually if we tell them that things are breathing are airborne or droplets, they get really confused. And so I think then when we're saying to people, actually its in your breath, ventilate your room, stay a distance apart, but it's not airborne, that gets really confusing to people so I think we probably need to take a step back and say, how are the words we're using in a very specialist sense being translated by the public or not, in a different way. And I think that's probably caused a lot of challenges in this

**Chris Lynch 30:39**

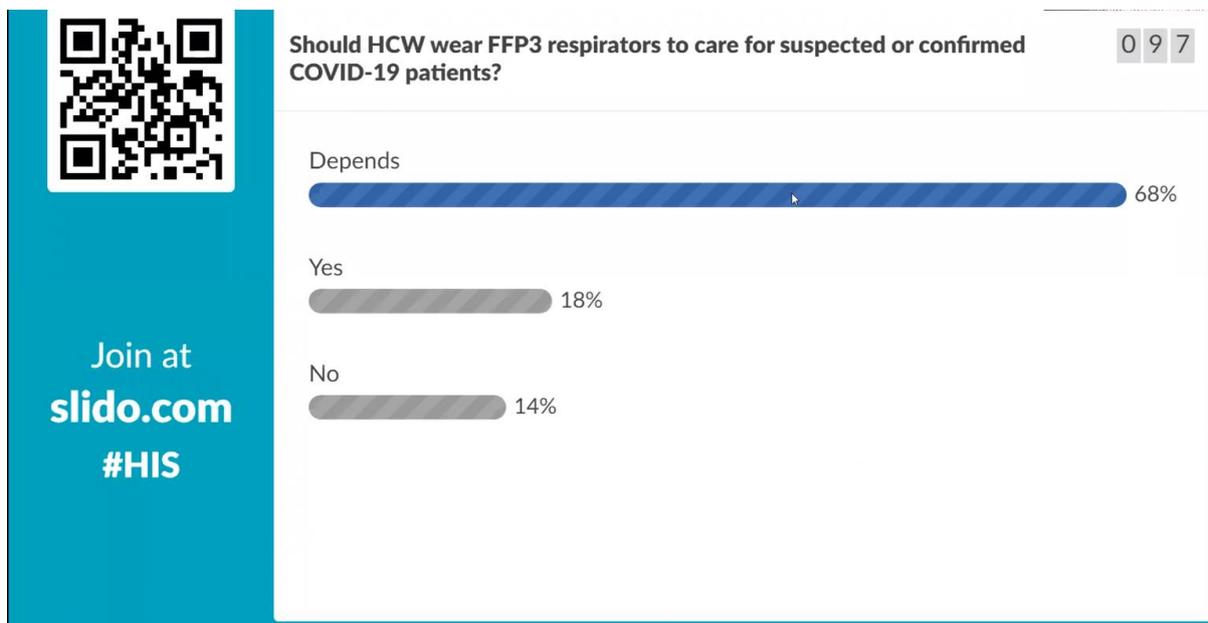
Thanks. James.

**James Dodd 30:41**

Yes a final point on this. I think talking to my colleagues in the aerosol world when they, I think there may be some kind of background cultural and training issues as well a lot of the kind of people from an IPC background maybe more familiar with the droplet and fomite theory - their textbooks are written in that way. And I think if hopefully again should be from this that the interdisciplinarity and perspectives need to be fundamental to decision makers at all levels, just so you're having these conversations, and getting rid of those semantics from the, from the discussion and talking about the implications.

**Chris Lynch 31:20**

Thanks very much, that was great. So I think we've got a poll now. So back on Slido please. So, the debate about this rages on, so be interesting to hear what you think. Should health care workers wear FFP 3 respirators to care for suspected or confirmed COVID-19 patients. Yes, no or depends. Shame we can't know what it depends on - what's in people's minds. A couple more seconds. So most people are sitting on the fence.



**Chris Lynch 32:22**

So we'll move on for our next question then. Why are FFP3 masks not recommended in the UK for healthcare workers when caring for a suspected or confirmed COVID-19 patient? James do you want to answer this one?

## Question 6:

Why are FFP3 masks not recommended in the UK for healthcare workers when caring for a suspected or confirmed COVID-19 patient?



### James Dodd 32:38

Okay, I think I've walked into this question as the new boy. Here, have this question! We can only speculate, I'm nowhere near the decision making. So I'm going to say, let's see what the evidence review that Public Health England are referring to, how they frame things and that gives us a bit of insight, and then I can perhaps, a little bit of insight from conversations with various groups, who, as part of when we are presenting our AERATOR data. So if we start with the rapid review of evidence which feeds into the decision making, that's the last was published on the 12th of March and just looking and reading at that, their essential position is consistent with our audience today, is that the position is that transmission is predominantly droplet, saliva and tears generated by coughing and sneezing and indirect contact with contaminated surfaces. They also kind of fall back to the position that it's aligned to WHO guidance. They also define, as we've noted, that there's a traditional definition of airborne transmission as airborne equals long distance, and they make that explicit in the guidance. I think this all feeds into FFP3. In conversations with them and also looking at the guidance they do not believe the outbreak evidence is definitive enough for the definition that it's airborne, that it's sufficient to warrant FFP3 in the situation we describe. They, we can certainly have an argument about that, and people are doing that, but they would look at the, they would expect the outbreaks to be larger if it is predominantly airborne. That is a consistent message that we get fed back. I would note though that, you know, the Public Health England's own data on the first wave looking at nosocomial infection, I wonder whether we're just losing a signal a bit because if you look at patients who are over 70 admitted to hospital in the first wave, 40% of them picked that up in hospital. So I think that there are counterpoints there that are missing a little bit. I would reflect, however, that their threshold of evidence that they require to make the move to airborne, and therefore FFP3 decisions, is quite high. So, I'm kind of quoting here, they want detailed outbreak work with whole genome sequencing, visualisation, particle seeded with viruses, air sampling and animal studies. And I wonder whether the same threshold of evidence is applied to other transmission routes, which feeds back into this kind of culture of not wanting necessarily for this to be the primary route, but that's again, this is speculation. My final point would really be around, and this feeds back to kind of perhaps the audience answer saying depends, well the guidance is it

depends, FFP3 depends if you're doing an AGP. Now the problem with AGPs, there's lots of problem with AGP, as we work through the list of AGPs a lot of them are not AGPs. And so, that definition is, I think, becoming less helpful, and I think that the true risk really coming out from epidemiology is for patients, for healthcare workers, in particular those who are not wearing FFP3 spending prolonged periods of time with COVID-positive coughing patients, particularly earlier in the illness. So seroprevalence rates in, you know, porters, healthcare assistants in ED, general medicine are high. If you look at patients, staff in ITU who are wearing FFP3 they are very low. So I think that that needs to be addressed. I think also in conversations that have come up there's concerns over control, and that if there is not access to the PPE in the guidance then they may be faced in a position of healthcare workers unwilling to care for patients without the right PPE and that the whole system collapses. And I think that we should look at the remit of the guidance makers; they, their remit is to maintain services and manage capacity while providing safe and equitable service. So they want everybody to use the same, and to be, you know, balance this with the needs of the service, so I think that's probably feeds into a lot of their decision making. The final point, again, I don't necessarily buy into, and I think that this was discussed when there was kind of general public use of face coverings, is that, it's been expressed to me, that there are concerns over unintended consequences, behavioural consequences of staff wearing FFP3, i.e. the false sense of security. And I'm afraid I don't feel that bears out. So, there you go, hopefully I've done my homework there and not necessarily give a polarised debate to what has become polarised, but I've tried to use what the PHE have kind of published, and a little bit of experience from interacting with trying share data on aerosols from our work.

**Chris Lynch 37:43**

I'm sure we could talk about this topic all night, but I think we'll have to move on to our next question. So our next question is do you think we've put too much emphasis on transmission via surfaces? Jon, do you want to take this one?

## Question 7:

Do you think we have put too much emphasis on transmission via surfaces?



**Jon Otter 38:03**

Yes, please. So short answer, no, I absolutely don't think we have. I think if we talk about the kind of relative emphasis on transmission routes, the contaminated, inanimate environment is historically the Cinderella of all of those routes. It wasn't so long ago that people were saying very publicly and very noisily that contaminated services don't contribute to transmission of anything at all in our hospitals, and it's taken a couple of decades of research to go through a process saying actually, yeah, they are contaminated and actually if we do a better job of removing the contamination, in fact we see less patient acquisition and better patient outcomes. And that's been a journey. I think there was a risk that with a respiratory virus that doesn't survive as long in the environment as other viruses, there may have been a perception that the environment wasn't so important, so I'm personally delighted to think that we've got it absolutely right, in terms of our approach to environmental disinfection, that we need to have enhanced vigilance, more cleaning, more disinfection, to make sure that we're keeping ourselves and our patients as safe as possible. We did some environmental testing very early on in the outbreak and we were actually really surprised at the extent to which we did find SARS-CoV-2 RNA on environmental surfaces. We didn't identify any culturable virus, and that was difficult to interpret, but equally we did air sampling and we didn't find any culturable virus in the air either at that time. We've done some follow-up sampling and found slightly less in the environment this time around. And I'd like to think that's a reflection of better control measures, but I do think we've got it about right, with the focus and the emphasis on surfaces and their role in transmission.

**Chris Lynch 39:48**

Cath?

**Cath Noakes 39:50**

So, I was going to say, I would largely agree with Jon on all of that, especially in a hospital setting. I think there's probably been an under-emphasis on ventilation, which is what makes it feel like there's too much emphasis on surfaces. And so actually we should not drop any of that surface, especially in a hospital, and put the, put that, put as much importance on the air as we do on the surfaces. I do think in some of the public spaces it's gone slightly the wrong way though because there's some quite mad cleaning going on where people are spraying, you know, benches outdoors and things like that, which I think is probably taking that to an extreme, and even in some senses that actually takes the emphasis away from what we should be doing in domestic and public spaces and workplaces, which is actually cleaning the high-touch surfaces well and not randomly spraying things that nobody ever touches. So I think we, I agree, totally agree with Jon, we need to be making sure our surfaces are clean for all sorts of infections, and it is a bit of a Cinderella one.

**Chris Lynch 41:03**

Lena?

**Lena Ciric 41:04**

I just wanted to add briefly about a study of surface contamination spread that we did just as everything was kicking off last year at Great Ormond Street. We clearly didn't use a pathogen of any sort; we just used a piece of DNA and inoculated it onto the bedrail in an isolation room on a Monday morning and then tracked onto how many out of something like 50 surfaces within that ward it had got to each day subsequently. And we found that by the end of that day, so something like 10 hours later, it was on about 40% of surfaces; by Wednesday it was on 50% of surfaces, but it was also disappearing from places and then reappearing as well. Clearly we can't swab an entire ward so we were just swabbing specific areas that we thought would be interesting to swab. So that's not saying that this has definitely happened with SARS-CoV-2, but, you know, it shows that even from within an isolation room where you know you have specific cleaning protocols, you have specific hand hygiene strategies, it got out very quickly and spread around without much trouble. So it's just something to bear in mind. And I think, you know, I think absolutely we mustn't forget surfaces, and we mustn't forget ventilation, and it's not more of this and less of that, it's, we need to be careful of everything.

**Chris Lynch 42:36**

Brilliant, well, I think we'll move on to our final preselected question, and then we've got questions from the audience. So, I suppose this is in keeping with the title of this, summing up, looking back on the last year. Knowing what you know now, what would you have done (or advised) differently a year ago? Jon, do you want to take this one again?

## Question 8:

Knowing what you know now, what would you have done (or advised) differently a year ago?



**Jon Otter 43:00**

Not really, but I have agreed to because it's a really brilliant question, whoever has asked it. I think it's really, really exactly what we should be doing, reflecting on what's gone well, what's not gone well. I've thought about a million different answers and I've got it down to three things that I'd like

to share, two related to PPE, one not. So in terms of PPE, I think this time last year, maybe just before actually, there were quite a lot of interactions between healthcare workers and patients that were not protected by any PPE, other than the usual risk assessment. In hindsight, community prevalence was very high at that time, there should have been more PPE for that general interaction. And I think that would have prevented cross-transmission in our hospitals and also protected healthcare workers. I suppose in the defence of the country and the guideline writers we didn't even have routine testing available to the patients at that time, so there were so many unknowns. The second one is about what PPE we would be using. I think there would be more eye protection, a little bit earlier on, and I wish we'd taken a different line with gloves in particular. We've seen a massive overuse of gloves over last year and that's going to be difficult to move back away from towards a dynamic risk assessment of when to use gloves, when there's blood and body fluid exposure. And I think we are beginning to see some unintended consequences of overuse of gloves, in terms of the transmission of other organisms, non-viral pathogens. And then the third thing is ventilation, I don't think there was enough discussion, I don't think there was enough in the guidelines about the importance of ventilation in the prevention of COVID early on.

**Chris Lynch 44:45**

Thanks very much. Anyone got anything else to add on that? Cath?

**Cath Noakes 44:52**

I mean, going into this, I mean I've worked in, you know, from the engineering side of airborne infection and ventilation for a long time, and, and not just not just airborne actually thinking about buildings and infection for a long time. And as has Lena from an engineering point of view. And it's one of those things where you go into it and you think you know quite a lot about your subject area. And I've learned probably more this year about my subject area than in any year previously, and although I don't think an awful lot has changed in the sort of broad assumptions, all the nuances have really come home to me on this one. And I would just say a year ago, don't assume you know how something is transmitting, and don't let your biases and prejudices or whatever about how you think it is happening get in the way with what might actually be really happening, and keep a completely open mind to how transmission might be happening because I think it's far more complicated than any of us really even still know.

**Chris Lynch 46:08**

Brilliant, well thank you very much everyone. So hopefully we've had some questions submitted from the audience. So we'll see what we've got. So, David Farren, thank you very much. Are there any methods to effectively mitigate the risks posed by totally inadequate ventilation in old hospital estates? Cath, do you want to start on that one?

Are there any methods to effectively mitigate the risks posed by totally inadequate ventilation in old hospital estates?

 David Farren

**Cath Noakes 46:36**

Other than persuade the Prime Minister to give us lots of money to rebuild them and retrofit them properly. I mean, I think you can retrofit, and I'm aware of some hospitals where, you know, an old naturally ventilated ward has had a rapid retrofit with a mechanical ventilation system to upgrade the, you know, the respiratory wards, and it's amazing that that can be done very quickly, obviously you do need the money to do it. I do think it is a difficult challenge and it's something where we should be looking at, have we got the right specialisms in the right places possibly in some hospitals? You know, are we putting the highest risk things in the best ventilated spaces? And that's something could be looked at. I do think this is where we should be thinking as well about potential for use of air cleaning devices, and other strategies like that where we can't do anything else. Or certainly, and even if that is a short term measure, I think realistically, even if it's done as a short term measure, it'll be a 10 year short term measure before we can really properly, sort of go through the estate and deal with it effectively. But also I think just don't assume that an old hospital is poorly ventilated because I think you might find it's not always the case and it's often the newest ones which might be, have the lowest flow rates even if it's more consistent.

**Chris Lynch 48:13**

Jon?

**Jon Otter 48:15**

Lena and Cath will tell me if I'm wrong, but I think opening a window actually has quite a lot of impact.

**Cath Noakes 48:21**

Yes, yes. If you can open a window, open a window, definitely.

**Lena Ciric 48:26**

And also, just as Cath said, just because, you know, something looks old doesn't mean it's not well ventilated and just because something is, like, you know, you have a brand new, shiny hospital building doesn't mean that it's going to have very good ventilation systems, and it might have had well designed ventilation systems, but they might not be working as they should be. So it's not just about the right design, it's also about regularly checking whether the ventilation is working as it should be. And also that those spaces are being used as they were designed to be used. And if there have been changes then that, the ventilation strategy also needs to be addressed, readdressed, redressed. Whatever the word is!

**Chris Lynch 49:14**

Brilliant, thank you very much. So, we'll see if our next question, we've been managing COVID-19 based on 'droplet' close range transmission. There is emerging evidence on aerosol transmission and PHE state aerosol transmission in their latest ventilation of indoor space guidance. Why do we think there hasn't been any change to PPE guidance? What is the evidence? James, do you want to take this?

We've been managing CoVid-19 based on 'droplet' close range transmission. There is emerging evidence on aerosol transmission and PHE state aerosol transmission in their latest ventilation of indoor space guidance. Why do we think there hasn't been any change to PPE guidance? What is the evidence?

 Anonymous

**James Dodd 49:47**

I was hoping to share this one out. Feel free to step in, guys! I don't know why there hasn't been a change, I think that, yeah, other than going over the kind of, the balance that has to be taken, the general feeling, interpretation of the data is that it's predominantly not aerosol transmission. Hopefully, we can, I think we do need to reframe, particularly when we're, the current guide, there is this, we're using FFP3 in actually the lowest risk environment, in, where there's no AGP being generated. That has to be looked at. So, you know, I think there is engagement and willingness to discuss, but anybody want to help out then they can tell me a little bit more about why do we think it hasn't changed guidance.

**Chris Lynch 50:36**

Jon?

**Jon Otter 50:37**

Thanks, James, I enjoyed your answer earlier and I agree with you, and your synthesis of the guideline position. I mean, I think that if we look at types of viruses that we know from, you know, a wealth of epidemiological data are predominantly long range, aerosol-mediated transmission, which, many of which are viruses, SARS-CoV-2 clearly isn't the same as those. If we look at things like the household attack rate, it's surprisingly low; it's not filling the air and spreading everywhere in the same way those would. So I think that probably is part of the thinking and part, and should be part of the debate.

**Chris Lynch 51:19**

Cath?

**Cath Noakes 51:21**

Can I just comment on that? So I think one of the real challenges with this virus is it's very overdispersed, so some people seem to barely produce anything, and don't pass it on, and other people seem to be incredibly infectious. And the reason for that seems, it's very hard to be clear about, and you're right, Jon, about the household transmission rates, but they vary hugely, they vary from zero to 100 percent. And then you get occasional super-spreader outbreaks. Now there are some things where there's super-spreader outbreaks happen, probably are not going to happen in a hospital so the singing type ones, the high intensity exercise, I think. It came to me the other day, it's madness that we run indoors! If you think about it as a human species, it's just, you know, and when you think about how much we breathe, how much extra we breathe out and how much extra we breathe in. You know, cycling indoors in a group is just a really bad idea, full stop. So I think some of those really high risk activities are very unlikely in a hospital, but you do have the coughing, you do have symptomatic cases in hospital, which of course we probably don't have so much in the community, but I think this is what the evidence is showing us, is that sometimes we get hardly any transmission and then suddenly you get an explosive outbreak. And I do think the, there's some very recent evidence around hotel quarantine transmissions that are pointing to slightly further away airborne transmission than people were thinking about before. We're now starting to see there might be evidence of room to room transmission. And of course, it's one of those things if you don't look for it you don't find it. And when you've got a massive outbreak, and so many people infected, it's very hard to unpick that, but where, in these places like New Zealand and Australia, with small numbers of cases, they might just tell us some more about the evidence that we're missing. I don't think that answered the question though, sorry.

**Chris Lynch 53:27**

No, that's great, thank you very much. So we'll go on to our next question. As air conditioning units recirculate room air should wall mounted units be switched off if in clinical areas? Any volunteers for this? Cath?

As air conditioning units recirculate room air should wall mounted units be switched off if in clinical areas

 Anonymous

**Cath Noakes 53:47**

So, I'm going to say it depends. I think if you're simply recirculating the air within the same space, all you're doing then is mixing the air in that space, and because it could be slightly enhancing risks. It could also be reducing risk because they do have some filtration in, do air conditioning units so they will remove some virus. And, actually, you've got to balance comfort versus risk. So I think if you've got a well ventilated space already and you've got recirculating air conditioners that are within a single space, the additional risk is probably quite small. I think if those recirculating air conditioners are being used in places where it's moving air between spaces, and those spaces are poorly ventilated, then they might be adding quite a big risk. And the same is true of desk fan type things as well. Using it to provide comfort locally within a single patient room is probably not a big risk; using it to move air down the corridor, I think we'd be wanting to watch that a little bit more.

**Chris Lynch 54:58**

Great, so, we should have time hopefully for another few questions. What are the key things you would do to prevent nosocomial infection outbreaks as they're still happening with all the measures that hospitals are using in the UK. Jon, do you want to take that?

What are the keys things that you would do to prevent nosocomial infection and outbreaks as they are still happening with all the measures that hospitals are using in the Uk?

 Dr Gopal Rao

**Jon Otter 55:17**

Yeah, love to, really good question, and really important question. So I think the key elements to preventing transmission are first and foremost symptom management. If we can try and weed out at the earliest possible phase patients with, in fact, let me back up, let's go back to virtual consultations and let's make sure we are maximising digital consultations to keep patients who are potentially infectious out of the hospitals and cared for at home. Then, when we do see patients making sure we're having really strong symptom checks at the front door to make sure we don't have symptomatic patients. Testing, to look at asymptomatic carriage and identifying that as soon as possible. Contact isolation of patients who we know to be infected. So, ideally using rapid DNA tests, rapid testing at the front door. And throughout the stay of the patients continuous testing is important. One thing that has been contentious but I think is important is patients wearing masks and empowering our patients to look after themselves and reduce their own individual risk, And then managing our workforce appropriately to make sure that we are, we don't have staff with symptomatic or asymptomatic infection in our hospitals that could be contributing with careful management, especially of clinical rest areas and non-clinical areas as well. That was a bit of a splurge, but I hope I've covered most bases.

**Chris Lynch 56:52**

That was great, thank you very much. Oh, James, yes, please do.

**James Dodd 56:57**

I'm probably going to hop off the fence at this point, and I would say all of those things plus ventilation, and then I would say, if there is a high density of COVID-positive patients and a member of the healthcare profession is looking after them for extended periods, they should have the optimum PPE as well, and FFP3. That would be my take on it, on the basis of, particularly on the work we're looking at what is presumed to be high risk. I think we need to be looking at what

actually is high risk in terms of where our patient's cohort is. And you've got a, lots of coughing patients who are COVID-positive, that's high risk.

**Jon Otter 57:32**

Yeah, and sort of, one thing I forgot to mention actually, but it's really important, is there's such a huge debate about which PPE to wear, but actually I hear a lot less about the proper use of PPE to make sure that staff are putting it on properly, wearing it properly, and not letting their guard down when it comes to take it off, which we know is the highest risk point, disposing of it correctly. So I think a real focus on appropriate use of PPE, particularly in those clinical rest areas and non-clinical areas where there may be some guard let down.

**Chris Lynch 58:10**

Great, so I think we've probably got time for one more question. Okay, so do you think the lack of transmission to ITU staff is a function of the stage of disease rather than PPE? James, do you want to start this one?

Do you think the lack of transmission to ITU staff is a function of the stage of disease rather than PPE?

 Anonymous

**James Dodd 58:27**

Yeah, it's certainly possible, but there's the, and that, yeah, you know, potentially earlier in the disease, I understand that the virus shedding is higher. But equally, those who are critically unwell and go to intensive care often have prolonged viral shedding, so I don't think that you can say that it's definitely one or the other. But you know, you're in intensive care, they're often, you know, in enclosed circuits, we know that, we thought intubation was an aerosol generating procedure; it's not. And we know that the healthcare infection rates in that, those staff whose whole units wear high-grade PPE against airborne transmission their seroprevalence rates were low. But, yes, we don't know that for sure.

**Chris Lynch 59:11**

Cath?

**Cath Noakes 59:12**

I think it's also worth noting that, on the whole, ventilation rates in ITUs tend to be much higher than in general wards. It's not across the board, but I think, on the whole, that's the case. And far more consistently usually.

**Chris Lynch 59:27**

Lena?

**Lena Ciric 59:28**

Yeah, I was just going to add to that that I think ITUs are a much more controlled environment, so I think it, you know people are kept more separately, things are a bit more consistent, their cleaning protocols are slightly different as well, so I think just generally managing all of the different risks is slightly easier.

**Chris Lynch 59:52**

Right, brilliant, so I think we'll have to draw things to a close there. Thank you very much everyone that's submitted questions. And thanks for joining us. Thank you very much to all the panel, that was a really fantastic discussion, and certainly given plenty to think about. I would also like to thank GAMA Healthcare for supporting this event with an educational support grant. There'll be certificates of attendance sent out after the event. There'll also be a recording and transcript available on the HIS website, as are all the previous webinars and other COVID-19 resources. I said this was the first part of a two-part webinar, so on the 5th of May, we've got part two, which was going to focus on the IPC management of patients and staff, and registration for that will open tomorrow. So, thank you very much everyone and goodnight.