Transcript: Webinar - COVID-19 challenges and solutions 3. Managing ventilation in the context of COVID-19 | 10 June 2020

Watch the webinar

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

Panel members:

- Peter Hoffman - Consultant Clinical Scientist, London
- Dr Chris Lynch - Graham Ayliffe Training Fellow, Sheffield Teaching Hospitals
- Professor Catherine Noakes - Professor of Environmental Engineering for Buildings, University of Leeds
- Karren Staniforth - Clinical Scientist, Nottingham University Hospitals NHS Trust

Chair: Dr James Price, Consultant in Infection Prevention and Control and Antimicrobial Stewardship, Imperial College Healthcare NHS Trust

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James Price 0:41

Let's make a start. Good evening, everyone. Thank you for joining us for the third in the series of webinars hosted by the Healthcare Infection Society on COVID challenges and solutions. Today's webinar is focused on the management of ventilation in the context of COVID. My name is James Price and as well as being an infection control doctor at Imperial, I sit on HIS Council and chair the HIS Professional Development Committee. We have a fantastic panel today to provide their personal thoughts on a broad range of topics around ventilation and COVID. And so I'm going to ask them to introduce themselves, starting with Peter Hoffman

Peter Hoffman

I'm Peter Hoffman, I'm a consultant clinical scientist with Public Health England with interests in decontamination and ventilation. For this webinar, I'm going to be giving it as a member of HIS, and my opinions are purely personal, not organizational.

Cath Noakes

Hi, I'm Cath Noakes I'm a Professor of Environmental Engineering for Buildings at the University of Leeds. So my research is around ventilation and infection control in buildings, and I've had a long standing interest in healthcare ventilation.

James Price

Thanks. Next we have Karren Staniforth.

Karren Staniforth

Hello, thanks James. I'm a clinical scientist and I work in the infection prevention and control department at Nottingham University Hospitals and like Peter have an interest in decontamination and ventilation systems.

James Price

Thanks, Karren. And finally, we have Chris Lynch.

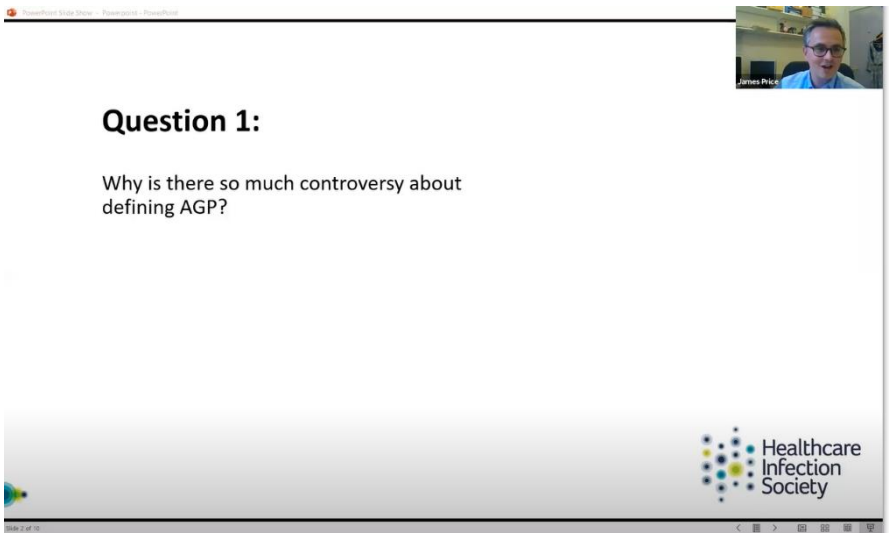
Chris Lynch

Hi, I'm Chris Lynch, a microbiology registrar in Sheffield, and a Graham Ayliffe training fellow with HIS my year has been focused on surgical site infection and ventilation. And it's certainly been an interesting year to be an infection control fellow.

James Price 3:19

Right. Thanks to all of you for volunteering your time to give your views. So, we're all in a brand new era of video conferencing, and we know that technical issues can arise. I just want to let everyone know that if we do get some connectivity issues with our panellists, we may need to turn off the video so please don't be offended. So before this webinar we asked our audience to submit questions to put the panel, and we've selected the eight most popular.

And we're going to discuss those for the first 40-45 minutes. And for the last 15 minutes we're then going to move on to live questions which our audience can submit via Slido. Throughout the event you'll be able to use the Slido app to up vote for a couple of live polls. So, if everyone could open their Slido app you can either enter the code #HIS or use scan the QR code that should be on your screen at the moment. And if we don't get time to answer all of the questions we're going to aim to post them on Twitter over the next couple of days so keep an eye out for them.



So without further ado let's move on to our first question, which we can get up on the screen.

I think this is going to be a bit of a big question so we're going to aim to give that about 10 minutes. I'd like to start by asking Cath to take this on, but I think this is going to be a probably an all panel, tag team.

Cath Noakes 4:51

Okay so yes this is a bigger difficult question. And I think the reason it's a big and difficult question is, it's very hard to identify what, when an aerosol is generated from something, and when it isn't. So there are a huge raft of different procedures, which all can cause aerosols in the healthcare setting. And I'm no clinician, I don't know the details of all these procedures, but I do know that they range from those which focus on respiratory, all the way through to orthopaedic surgery and aerosolization from drilling and so on.

And many of these procedures are carried out over quite short periods of time, that quite transient procedures so it's actually very hard to identify that an aerosol has been generated and if it is to say,

How much was generated? How long was it generated? What kinds of particles were generated? And does it even carry the virus?

So not every single aerosol generating procedure would, carry a virus or plenty of aerosols. There are plenty of aerosols that are not going to come from part of the body where there is any virus. The problems is we don't always know that, and it's very hard to get that evidence, and I think it's worth saying why it's hard to get that evidence.

So you can get the evidence in two ways you can look at how people have been affected, and you can go through epistemological evidence. The challenge with that in many many cases is that you can't actually really determine exactly where somebody was infected and how they were infected. All you can do is look through your set of data and say, actually there's a higher a higher probability of people being infected who are doing these procedures compared to those people who weren't. But it doesn't really tell you exactly what happened. So then the other way you can do it is you can go in and do some form of measurement. And that could be doing a biological aerosol sample, or it could be using a particle count of some description. Again, these are really tricky things to measure because a lot of the time they you know they say they have over, maybe a period of a minute or two. So it's a short duration event. It's very hard to actually capture a good biological aerosol on a very short duration event. And it's actually very hard even to capture a particle aerosol over that short duration. Also when you're trying to measure them, it's very hard to actually get close enough to measure accurately without interfering in the clinical procedures that's going on.

So you've got this whole set of real big challenges with getting some data on them, and interesting I think where there is more data are the sorts of procedures where people are on positive pressure ventilation things aren't this work, people are on things for much longer periods of time. That would be actually becomes much easier to measure the aerosol concentrations associated with them.

But of course that doesn't mean that it's, the most risky procedure necessarily. So unfortunately, I haven't gotten answers to which is an aerosol generating procedure which is not. I think is really difficult to say. Some things that could be aerosol generating and a risk for one disease and not necessarily the same as other diseases as well, so I'll stop there and I'll hand over to my fellow panellists.

James Price 8:20

Thanks Cath. Anyone else want to come in and comment, Peter.

Peter Hoffman 8:25

One of the problems here is language. So, things like rainfall. We've got about 30 different words to describe it, which take into account differences and subtleties. We've only have one word to describe an aerosol, which is a one size fits all.

If you look at tuberculosis, which is a truly aerosol transmitted infection. There, people have been able to demonstrate transmission over considerable distances. Guinea pigs put into individual cages in the extract system of a respiratory ward acquired TB. Another example was an American warship where ventilation is supplied to cabin A - flows to cabin B etc there TB could be transmitted through, and you could see the infectivity drop off, as it went cabin to cabin. That's true aerosol transmission.

With respiratory viruses, it's far more indirect.

People noticed during 2003 SARS that healthcare workers who are carrying out certain procedures were at greater risk of infection. And these were then then termed aerosol generating procedures with minimal evidence of the existence of aerosols. These were only to people who were close.

There's a good review of the evidence of AGPs (aerosol generating procedures) on Health Protection Scotland. They acknowledge that the evidence is at best week for aerosol transmission. But if you look at the references where a AGPs are implicated all of the people who seem to be at risk were either performing aerosol generating procedures, assisting in or very close by. So this appears to be almost another category of aerosols distinct from TB where proximity is important. Proximity is important because aerosol generating procedures also generate splashed and droplets which won't travel far, but are fairly powerful vectors of infection, or because the aerosol needs to be sufficiently concentrated for the viral numbers to be there to infect.

So that's why there's controversy, on what an AGP is because the evidence is inherently poor.

James Price 11:26

Anyone else like to comment? Karren.

Karren Staniforth 11:40

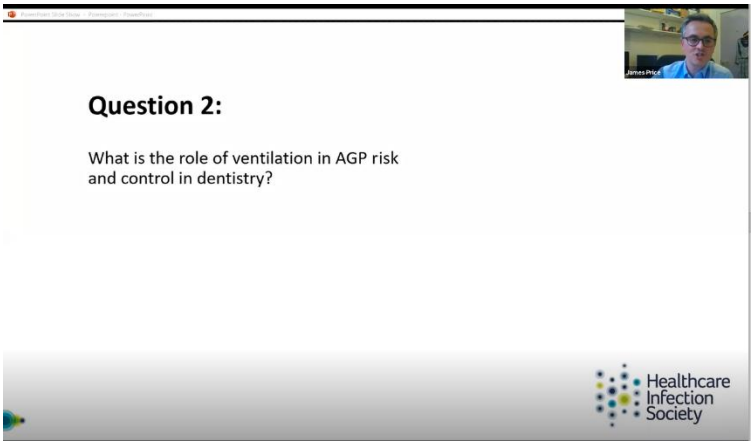
Thank you. So I think because the science has all these gaps, and there was a huge amount of anxiety, and that was the cut-off. If you were performing an aerosol generating procedure you were given an FFP3 facemask. And if it wasn't you didn't. And I feel that was a huge distrust at the beginning that a surgical face mask was going to be enough. This was from what from what I saw, driven completely by fear, in many cases, so people needed to wear the FFP3 to try and deal with there fear, rather than the actual risk itself, but I think that has subsided and it has settled.

But because we don't have all the answers it hasn't gone completely. And we are still managing that anxiety and I think it's actually a huge part of what infection control is about. It is not just the science. It's very easy when we have the science and we have all the answers and people trust us and believe us and they're not scared, but that hasn't been where we have been in the last few weeks.

And I think that's is largely what's driven some of the anxiety and the misunderstandings about what an aerosol generating procedure is, what the risk actually is, regardless of what terminology you use, and what precautions are actually needed. And, and hopefully we are getting past that now but I think we will never set up an absolute definition of aerosol generating procedure.

James Price 13:10

Well thank you all for that, I think, in the interest of time, let's move on to the next question.



So it would be great if Peter - if you're happy to take on this question.

Peter Hoffman 13:40

Body fluids tend to be self cohesive to get an aerosol, you need to put a lot of energy into a system in order to break it up into particles that are so small that they behave much like the gas they're suspended in. Aerosols are solutions in air. Body fluids are fairly self adhesive, you need to put a lot of energy in to break them up. If there's one activity that is good at putting energy into breaking up body fluids. It's the use of power tools. So things like dental drills, scalers and so on. So, dentistry, probably generates very heavy aerosols. This has been seen in studies of bacteria dispersion of oral bacteria during dental procedures. It hasn't been seen in viruses during dental procedures, but you can assume that they would be dispersed fairly widely. Infection prevention in dentistry is still primarily a matter of contact - direct and indirect - and splashes and droplets. AGPs, and the significance of AGPs in the spread of respiratory viruses in dentistry is unexplored. So at the moment, the standard approach of (if you know the ventilation rate, within dental practice area) five air changes will reduce that contamination. Each air change reduces by about 63%, so five air changes will reduce 5 x 63% sequentially. So that becomes less than 1%. If there's no if there's poor ventilation, or no deliberate ventilation in a dental area, the accepted time is one hour for the aerosols to settle out or disperse. I would like to think that this will in time, be critically examined, and the actual evidence for aerosol generating procedures of vectors of respiratory viruses can be reinterpreted but at the moment, that's the situation we have.

James Price 16:30

Chris?

Chris Lynch 16:33

I see what Peter says. I've seen the papers saying that, that is 1.5 meter is the droplet splatter zone. Like I said with bacteria on settled plates and I've seen some with UV fluorescence. But the problem when it comes to AGPS in dentistry is a lot of these areas are either very poorly ventilated or unventilated. Normally density has got very high throughput. They'll see people for 5-10 minutes so

to try to introduce a one hour follow period - they're not going to be able to do dentistry as a practiced before. Unless we have some way of saying that the patient themselves doesn't have the disease, because then obviously it's not an infectious AGP so can we have shielded patients, screening. Well antibody testing come into that. I don't know . But as things stand it's incredibly challenging. I know in the local dental hospital, looking at things like installing extract-only ventilation, is that feasible? A lot of these rooms that they're not they're not all single side rooms. Some of them have got 30 dentist chairs and typically for undergraduate teaching. Spaced 1.5 to two meters apart. And clearly, as things stand you can't do anything aerosol generating in those. And some of these rooms are aren't mechanically ventilated at all. Yeah it's very difficult.

James Price 18:15

Thanks, Chris. Should we start with Karren?

Karren Staniforth 18:21

It's quite quick. I was just going to say that this is probably the next challenge we're going to face is the restoration of routine services. And a lot of these very high throughput outpatient services that have not been considered for any ventilation the past. Suddenly that now is raising the question of, is that okay? Has it ever been Okay? And what do we do about it to get these services back on.

James Price 18:46

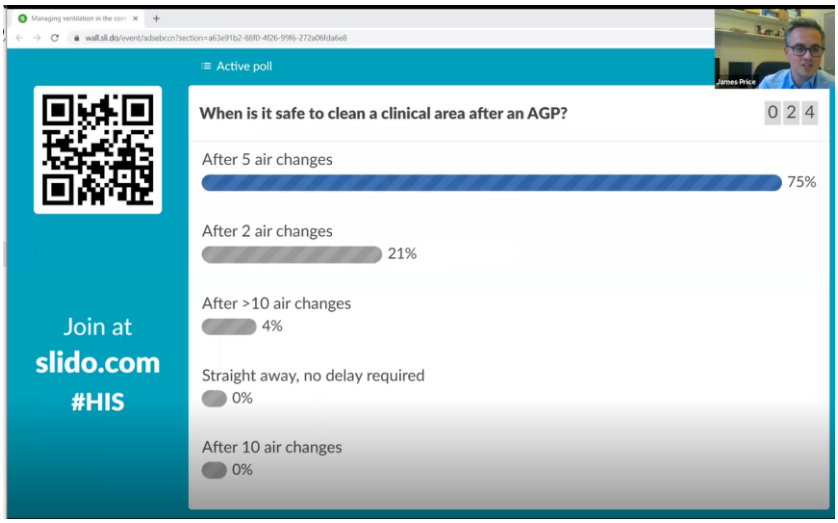
We've got time for a brief comment.

Cath Noakes 18:50

Just say I think there's two major challenges with this one. What happens during an event. So who's at risk? And what's the exposure to the Dentist, Dental nurse working in that space? Then there's what happens after the event. Peter has already mentioned about the ventilation rate to clear the air. I think what's really important here is also to think about what lands on surfaces and what poses a risk in terms of surface contamination. And to be honest, I think this is a really challenging environment, how do you deal with this one? And I think this is an area where there is real potential to think about new technology innovations, new ways of rapidly cleaning environments, potential to locally control aerosols. There are all sorts of devices already on the market, even weird things you put around lips and things like that, and possibly there is some real need to do some clinical evaluation of these types of devices to see actually do any of the work for manufacturers say, and how effective are they in different settings. So maybe there's a bit of a research challenge out there for people.

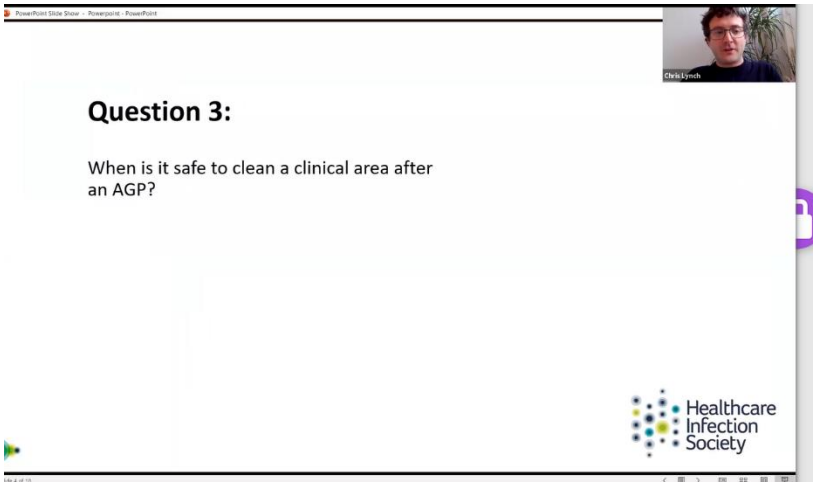
James Price 19:53

Thanks everybody. Let's move on. I think the next one we have a bit of audience participation, we have a poll coming up now. So if everyone can get by Slido apps open. What we want to do is to answer the question.



Answers are we can see them coming in, gradually, and we're starting to see the vast majority of people that after five air changes.

If we move on to our next question.



Chris over to you.

Chris Lynch 20:43

Thanks, James. I'll consider this question in two parts.

The first part is, when's it safe to turn to return to that room without respect to protective equipment like FFP3 respirator? And then, at what point can you say, or hopefully say, that you can define an end to ongoing environmental contamination from the air (as Cath alluded to the last question).

So, in the initial Public Health guidance that came out there was a sentence referring to two air changes. That would be pragmatic, to wait two changes for entering an area without a respirator and

cleaning, which seems odd to some bits later on in the guidance, which would prefer five or 10 air changes like Peter said, leading to the removal of 98.7% or whatever.

So pragmatic didn't necessarily go down that well, and for consistency, we stuck with five air changes as to when it was safe to enter that area.

And then taking a second point, of what point can you define an end to environmental contamination.

And I think that's really difficult. I don't think that, as far as I know there's not an answer to that yet. Like I said, we know that the larger droplets are going to settle out sooner. Smaller particles in the air, begin to dry out, become droplet nuclei, tend to remain airborne for a more prolonged period.

But, logically, I think, presumably they have less virus in them. That then it's not purely about removal of airborne contamination with dilution. There's also air flows. Will that virus in those droplet nuclei still going to be viable infectious virus? Presumably it's going to be much lower amounts. I've read something suggesting that they think possibly after half an hour, that you're going to find infectious virus in the air and therefore there is not going to be ongoing environment emanation. Well, I don't know but dramatically was a moment we're sticking to five air changes so an hour in a normal Ward, 20 minutes in critical care, and recess and 10 minutes and operating fitness, but I'll be very pleased to hear what other people got to say.

James Price 23:19

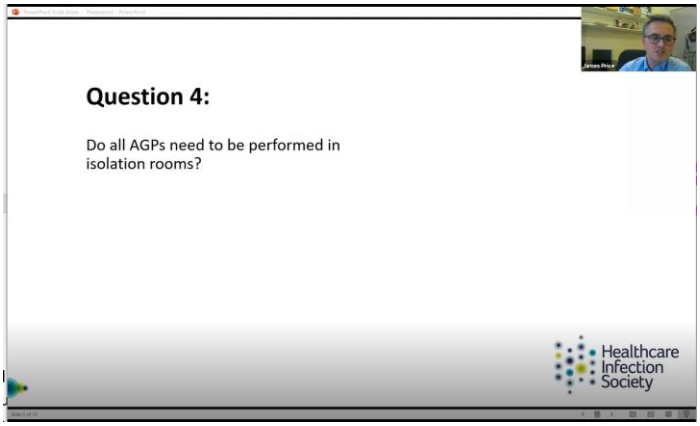
Thanks Chris. Shall we open it up. Peter.

Peter Hoffman 23:22

This business of five air changes, reducing things to 1% is purely arbitrary. 1% sounds like a good number, but I don't know how it relates to infectivity of any microbial aerosols, or COVID, in particular. Now, when should cleaning a room occur after an AGP? There are two elements the first element is, when is the most when is maximum deposition of airborne particles likely to occur? Now there as you said you're looking at the big particles, we're probably not looking at aerosols. If you are looking at aerosols - its aerosols towards the higher end towards the 10 micron, and so they will probably settle out under gravity, far more rapidly than by the air changes. The other components to when does when, when should cleaning take place is, is when is that environment safe to enter without a respirator? So, there are two elements here, and you probably get maximum deposition, way before five air changes. So, it's largely governed by when is it safe to enter.

James Price 24:51

Thanks, Peter, unless we have any other pressing comments I'm keen to move on to get to all the questions if that's okay. So should we move on to the next question.



Karren Staniforth 25:12

I'm going to say yes and no.

So, I'm going to try and give some examples to try and qualify that. So, if you think about a large Intensive Care Unit, and perhaps during the peak of the outbreak, we'd have had all the COVID positive patients in one area, all being intubated, and all having bronchoscopies and microbiology taken to laboratories. But all of the staff were in correct PPE for dealing with aerosol generating procedures and they kept those on the whole time that were in that environment. So that risk has been managed.

If you think of a patient who has tested positive for COVID. They have CPAP at home. But then we bring them in, they don't need to go to intensive care and they're put on a routine ward. But with other patients that are testing positive for COVID. Again, if all the staff were the correct PPE, then the risk has been managed.

But that's not ideal. So if you have a side room, and you can protect those rooms and use them for the patients that need them for aerosol generating procedures, it means you contain the problem. So there are less people that need to wear FFP3 masks which were in short supply. And there's less surface areas to clean, even in the immediate vicinity. So it's not essential, but it does make things a lot easier to manage.

I think if you then go to a ward where you're not expecting patients to have COVID and you have a patient come in with vague symptoms that possibly aren't COVID and certainly at the beginning we had a lot of patients with COVID was not suspected, but actually it became clear after, after a few days that's actually that's what was going on. If those patients are having aerosol generation procedures on board with non COVID patients, then you have a serious risk that isn't being managed.

The staff will be protected because they should be wearing the correct PPE even if that patient's testing, negative. But what about the other patients? So, we would expect those patients to be in a side room. And as we move away from the peak, we're having less patients. So really there should be no shortage of side rooms. So, why wouldn't you put them in a side room? Because it makes everybody's life easier and it's a lot easier to contain and manage the risks, unless they're in a big Intensive Care Unit. Does somebody else wants to comment on?

Cath Noakes 27:49

I would just comment. I know the question is, in isolation rooms and I guess if you've got a side room you go for a side room. But if you've got an isolation room that's under negative, or neutral pressure. It's a better bet, because then you've got them in a place where you know that their change rate is much higher. The ventilation is controlled. And even if the risk of an aerosol going into a corridor is quite small. You've managed it even more. So it just takes an extra level of protection into that space.

And of course they shouldn't be in a positive pressure isolation room.

James Price 28:26

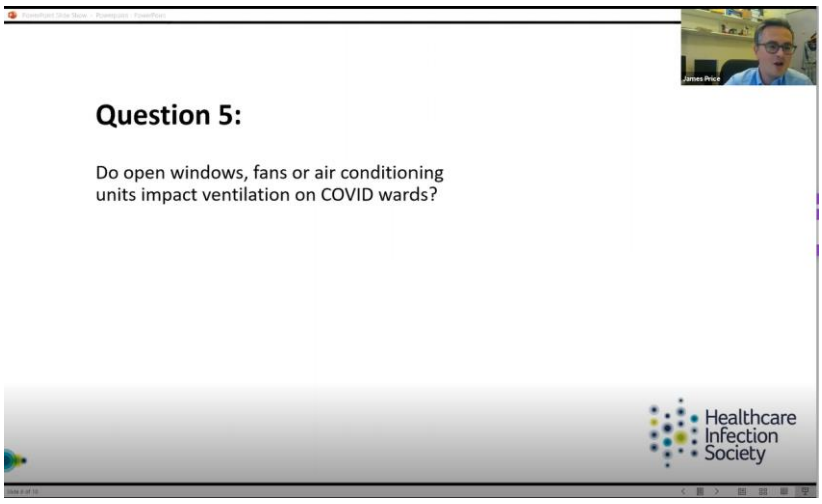
Thanks Cath. Any other comments at all?

Peter Hoffman 28:30

The other advantage of an isolation room, is it's built for infection prevention, so it will have a lobby, which is suitable for the donning and doffing of PPE and hand washing. So whatever the ventilation considerations, an isolation room, provides better quality assurance isolation.

James Price 29:05

Thank you. So let's move on to the next question.



Peter?

Peter Hoffman 29:25

This goes back to a AGPs only being observed risks, fairly close to the source of aerosol generation. So open windows - any ventilation is a good way of diluting the concentrated aerosols that are viewed as being most risky.

I think this this thing goes into another question. Natural ventilation is accepted as being a way of ventilating to big risk areas. Then fans. There is substantial infection prevention feeling that fans are a problem. You look at the average fan in healthcare, and they are frankly fairly dirty, but they're not going to be a source of contamination because the dust that you see on the fan blades is very firmly meshed together. If it wasn't, it wouldn't be in place. So what fans do, is to move the existing air around, they know that has microbial contamination, or remove microbial contamination. So, from the point of view of COVID fans are substantially safe. They should be positioned such that they don't actively move out of one area (say out of a COVID bay into a non-COVID bay). If they if their positioned sensibly, they're fine.

Portable air conditioning. Fans just move air around, they're not going to cool people particularly wearing PPE, they're not going to reduce the temperature, portable air conditioning might, it varies in quality from dismal, to just about acceptable. It can on a good day, reduce temperature. Again, these devices, take air in pass it over cooling coils and back out the same area they took it in from. They neither add microbes, nor remove microbes, they give you exactly the same microbes, just cooler microbes. So, the same caveats apply. Use them sensibly, use them so they don't move air too much from one area to another.

In many hospital environments, there is no alternative environments to using portable air coolers. We're expecting staff to wear long, arduous shifts in occlusive PPE. If they are overheated, overheating is going to affect their clinical performance significantly. So on balance, there's no problem with fans.

James Price 32:31

Thank you, Peter. Can I ask a question myself? Do you think you've having fans near a patient - we talked about having a certain distance to one and a half meter two meters - do you think that impacts on that and how we might use PPE?

Peter Hoffman 32:50

It would impact it both ways. It will move the air, but in moving the air it will dilute infectious aerosols making the less infectious. I don't think there is an answer to this and, in practice, I don't think it's going to be possible to factor in all the considerations. I don't think they are going to increase the hazard significantly.

Cath Noakes 33:20

So, just to comment on that. I think it is possible, a higher velocity air can keep a 20 micron droplet suspended for a little bit longer - and that maybe it means it travels, you know, two and a half meters rather than two meters, it's not going to take you 26 meters down the corridor, but it might move it a little bit further. I think that's where it's probably worth thinking about being pragmatic about this so if you have a COVID patient, and they've got a fan next to them to keep them cool, perhaps don't stand downstream of the fan, as best you can. If you're in there with them stand downstream of the fan. But if you're that close to them you really should have PPE anyway, but try and avoid that, as well.

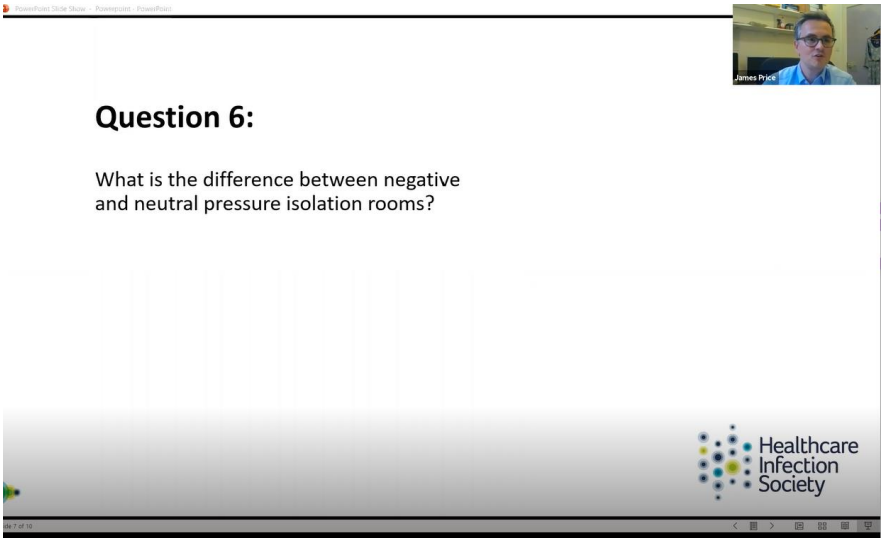
I also want to comment on Windows - I know that was in question. So, I would say, if, if your hospital ward has opening windows open them, because it was designed in that way. And if that's one of its

main ventilation routes, and there's no, you know, there's this nearly always a benefit from having better ventilation in the building, regardless of COVID, but this would be a good idea.

What I would say about changing ventilation patterns. Is it is something that you should do with care so perhaps don't. For example, some of these portable air conditioners, you can set up in such a way that you put the extract out of the window, and they do have the potential then if you set them up, wrong, that you could change pressurization in spaces, So it's just worth thinking about doing this with care to make sure you don't move inadvertently from one space to another space by doing it. But most of the time, good ventilation is always a good idea.

James Price 35:13

Thanks Cath. Lets move on to the next question.



Chris Lynch 35:27

I think we've already touched on this a bit. I think its seen as a hierarchy really but yeah, ideally, anyone with a potentially airborne transmitted disease you would want in a negative pressure isolation room with 10 air changes, and HEPA filtered extract. But we don't have that kind of a state in the NHS and we weren't going to be able to magic that out of nowhere. So, we saw things as a hierarchy, and as the pandemic surged up that we would use the rooms we had. So, negative pressure then neutral pressure then cohorting on wards. And now as we've seen the epidemic curve tail off, we're doing the same in reverse. Early on, we just look at adjusting ventilation on some of our side wards in particularly in critical care. So some of them we were able to convert from being positively pressured to either neutral or slightly negatively pressured by maximizing the extracts, and sometimes rebalancing things so the supply a bit lower. Obviously we were conscious that really wanted to maintain as much as many changes as possible for the dilution effect, protecting the people in there. So we only did only reduce the supply slightly. My feeling is that probably the benefit of negative pressure over neutral pressure is probably relatively marginal. But obviously if you have it then, then definitely use it and it's a hierarchy thing but, again, I'm very interested to hear what others think.

James Price 37:25

Thanks Chris you open this up. Anyone have any comments? Oh, start with Karren.

Karren Staniforth 37:35

just wanted to touch on maintenance and verification of ventilation systems. I don't know if this I suspect this is a common problem across the NHS is that often. You know, you might think you have an isolation room but when was the last time that the ventilation was checked? Now I suspect a lot of ventilation checks have happened since March, and we have a lot better idea now what's actually going on in our rooms, and certainly a lot more interest in what's going on in those rooms. But an isolation room should have been maintained and there should be checks in place to make sure that it's still functioning. It should have gauges so you can see the pressure differential and everyone knows it's working. Many neutral pressure rooms are actually just side rooms with, you know, in my experience, all manner of different attempts at ventilation which may or may not be working, and the direction of flow can very easily develop. So we've had rooms where extracts have failed, but supply of carry on working, and then you've got a positive pressure room where we're not really expected that. So unless there's maintenance and checks, we often don't know what we have, I think, is where I would urge caution.

Peter Hoffman 38:53

This is another problem with words. A positive pressure room is intentionally a positive pressure and negative pressure room is intentionally at negative pressure, a neutral pressure room is just anything that is neither of the format. So, a room is never going to be a neutral pressure it's not going to be at precisely zero pressure. A neutral pressure room is a room that's neither intentionally positive nor intentionally negative that is bound to be one or the other at random.

James Price 39:28

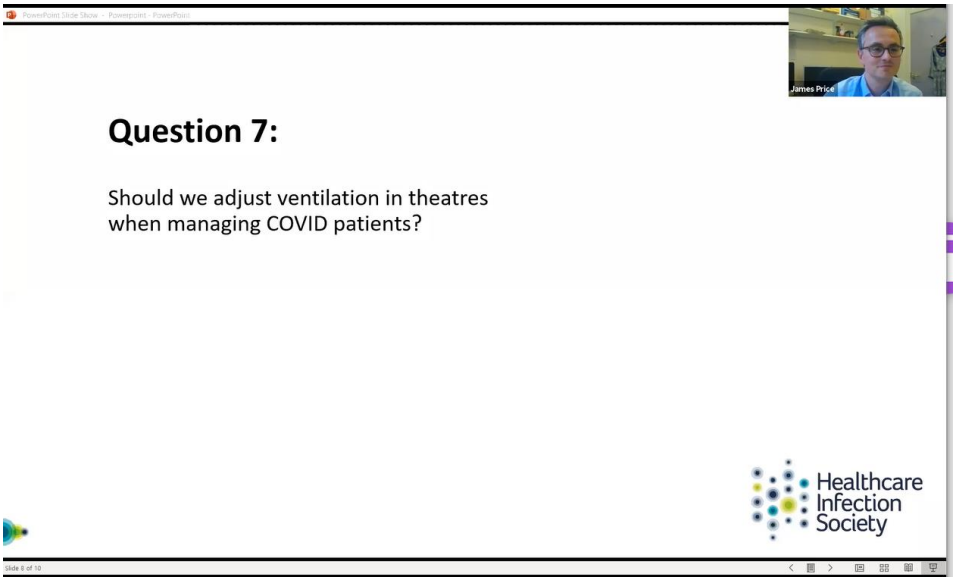
Cath a quick comment

Cath Noakes 39:30

Just to follow on from what Karren said about verification of ventilation. There are neutral pressure rooms that use a positive pressure ventilated lobby approach. There’s not many but there's some of those. Many of those use a pressure stabilizer, which also acts as the air distribution point into the room, and of course that's another easy check. So if that pressure stabilizer is not open when the rooms got the doors closed. It basically means it's operating correctly.

James Price 39:56

Next question.



Karren.

Karren Staniforth 40:19

A lot of the things are starting to come together now. We need to get that dilution, we need to move air away from the immediate vicinity where the virus could be at a very high concentration. Having the ventilation working is going to maximize that and minimize the risk to those people who are very close to the patient, and potentially performing these high risk aerosol generating procedures.

So the last thing we want to do is to turn that ventilation off. We need to keep it running or to get the air moving. And really, even if it's positively pressured by the time you've it's reached a few feet away from the patient its very much diluted it's going to be drying out, and you're not going to be pushing high concentrations of virus out into the corridors, in a large operating theatre.

So, the risks from leaving on or minimal, the risk of turning off, start to increase quite dramatically. We did have a lot of problems at the beginning because people were afraid of leaving the air the ventilation systems running in theatres. So that was a huge issue, and there was a lot of conflicting guidance that people were referring to, which made it equally difficult for people to make an informed judgment and to feel confident and safe. But we've gone through that and we've all agreed that there to ventilation needs to be on.

The other thing is, I think it's something that Cath said - we don't want to be modifying these systems that we don't want to be doing it just on the spur of the moment somebody making a decision to just take up a ventilation rail or, you know, transfer grill, because the implications of that can be significant. And if you are going to modify system it needs to be done properly, and there needs to be a proper plan a proper design and it needs to be all checked, so that there's no unintended consequences.

James Price 42:15

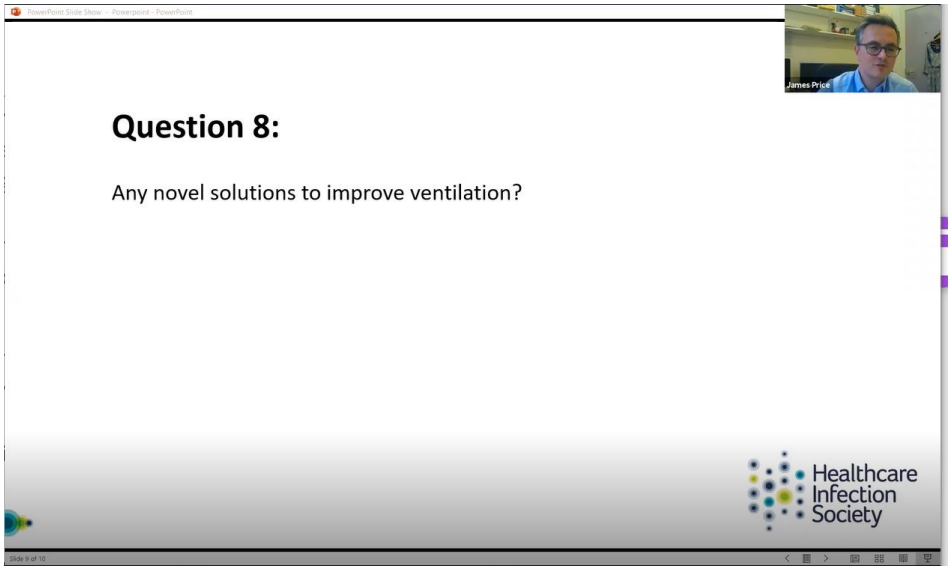
All right, thanks Karren we've got time for a brief comment. Cath.

Cath Noakes 42:20

I would just add to that I totally agree. I think the biggest, the biggest thing you need to do in here is dilution. The only thing I would add is that some hospitals do have theatres, which were designed to operate at neutral pressure under certain circumstances. If that is the case, then it's not a bad thing to set those up and use those for COVID patients, but only, where they've been designed and done properly and still have a high air change rate.

James Price 42:43

So let's move on to our last question. Question eight.



Cath?

Cath Noakes 43:10

The spoiler for this is nothing, nothing dramatic that's going to change your life next week unfortunately. Because one of the real problems with any changes is that any shifts are going to be longer term solutions. There's not a magic bullet that we can just suddenly install and we've got an answer for next week. But I think if we are looking at longer term, I think there are some things that I wouldn't necessarily call them all novel. I think there is a need to look at better understanding of air distribution, because we've talked a lot about air change rates, but actually most that basically assumes that the air in a room as well mixed and that's not always the case.

And there's some areas of hospitals where there are specialized ventilation systems where the ventilation is designed in a particular way, it's commissioned in a particular way. There are checks on how well that air is distributed. Most of the hospital environment is not done in that way, and we don't truly know how well our air is distributed, and I think there are spaces in hospitals that we are starting to become aware of. For example dental surgeries which, you know, which we've not really thought about before, and suddenly there is now a much higher risk appearing there.

And I think there are other spaces that we should be thinking about more carefully in hospitals. Even places like corridors, because a lot of corridors, you know, are converted into waiting rooms. People spend a lot of time and they were never designed for that. And I think it's perhaps a real time to think more holistically about how the ventilation is designed in a hospital. And I think going forward, there

is probably a need to look at how we think about infection control, more closely across a wider range of spaces, and that again doesn't suddenly mean we're going to be installing really detailed specialist ventilation. It's more thinking about air distribution and more careful positioning of vents and things like that, and better use of that ventilation. Many wards are naturally ventilated. Many of them are quite old we just assume we open the window and it's going to ventilate, but that's very weather dependent, and again, need to think more carefully about how that happens.

In terms of technology solutions, I think there are one or two out there. There is a lot of noise around air cleaning disinfection type systems. Some of them are not going to be viable. But there are some where there might be potential in certain spaces. For example ultraviolet disinfection that has been shown to be useful in certain circumstances. By no means a benefit everywhere, but there may be certain rooms where it could be applied. And there are new technologies coming in, I've seen something recently about use of 222 nanometer wavelength light, which doesn't have the human health risks of the standard UV disinfection, but of course it's still at a research stage. So it's quite a long way off. I do think we're at a time though where we should be thinking about those technologies and exploring what is out there. But with care. There are many promises that are made by technologies that actually when they're tested in reality don't always deliver. So I think we should be open minded but with a bit of care.

James Price 46:35

Do we have any, please comments from any of the other panellists?

Chris Lynch 46:40

I suppose, mine's more of a question I don't it might come up in some of the audience questions but I've been asked a lot about HEPA filtered air scrubbers, and also installing extract-only window mounted extract fans to increase changes. So there are two technologies that that I'm being asked about and I guess I have my own views but I'm interested in others thoughts.

Peter Hoffman 47:15

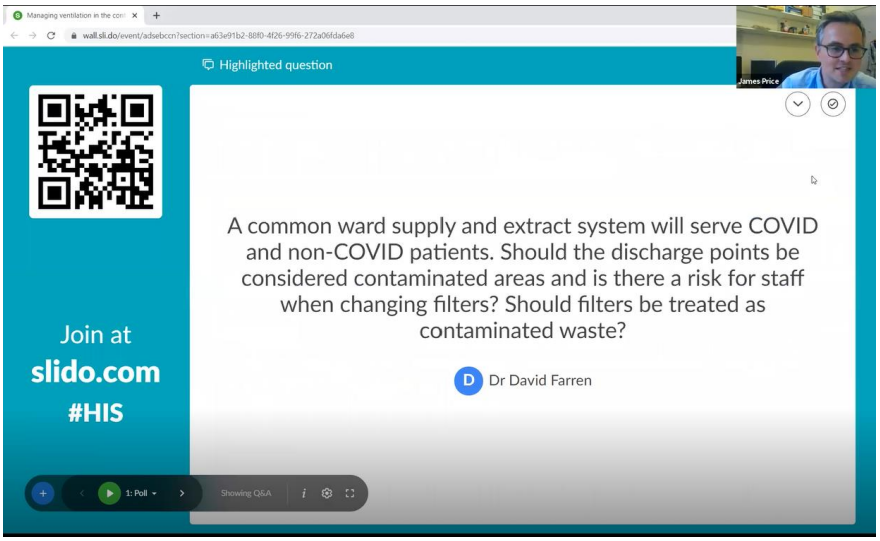
HEPA filters, recirculating HEPA filters. Look at the test data, most of them have been tested by a single introduction of aerosols into a test chamber, that's very small and in no way represents typical healthcare space. The other point is that the susceptible, the healthcare worker is going to be very close, probably about 30 or 40 centimeters away from the aerosol generating procedure. The HEPA filter is going to be stuck in a corner about two or three meters away. Is it really going to have any effect on that? The most critical elements of transmission?

James Price 48:05

I think that's a good point just to finish this section. I think it would be a good time now to move on to the live questions and thank you to the panel for answering the pre prepared questions.

So, the audience have been very kindly submitting questions throughout the webinar. And just to remind everybody that we're going to choose them based on those that have been voted for and get

the most answers, so continue to vote. But let's have a look at I think Richard has been working on collating them.



Who'd like to take that on?

Peter Hoffman 49:10

Healthcare tends to have separate supply and extract systems. There tends not to be filters in the extract system, the filters that are there, tend to be in supply system. The supply system will only have outside air passing through it. So, the filters on the supply air handling unit presents no risk of concentrating infectious aerosols. Discharge points. This is this is a bit like the operating theatre where air is passing out from the operating theatre into the corridor, but is highly diluted and doesn't present a risk. Similarly, extract systems from hospital ventilation, unless they're high consequence infectious disease isolation, don't present a risk. Everything will be very much diluted by the time it emerges from them.

James Price 50:50

Does anyone else have any, any comments, toughy to start with

Cath Noakes 50:54

I agree - I think most of them won't have a filter and there are a few cases which might I guess there are certain systems which could. There's also, if you've got local air conditioning systems which would have some filter in them. I think maybe it's a case of just being careful there. It's about having a good standard operating procedure for that. The risk is predominantly that it could be a surface contamination. So, having a good hygiene procedure, and it would be prudent to wear a medical mask and change them as a safety precaution. And I don't think it should be seen as a really big substantial

risk. But as with all these things I think it's about doing a proper risk assessment and walking through those procedures.

James Price 51:44

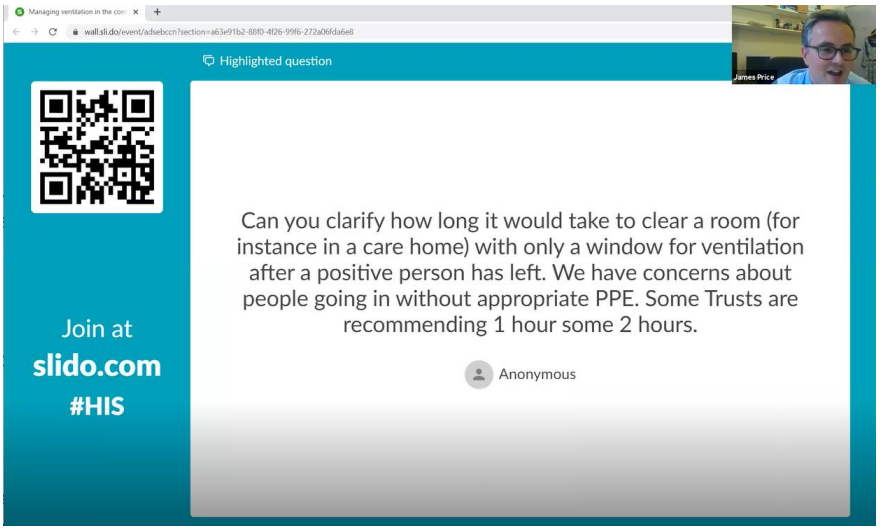
Chris did you want to come in.

Chris Lynch 51:50

I'm not sure that that anything's really changed from a COVID perspective because there were other infectious diseases. The thought is that COVID is going to survive in the environment for three to five days. There's going to be other things like tuberculosis, for example so I think this probably should have always been a consideration rather than purely a COVID thing.

James Price 52:21

And why don't we move on to the next question.



Chris, I can see your hand up.

Chris Lynch 52:56

Yeah, unless there's been an AGP then droplet PPE would be fine. If there had been an AGP then, assuming it's not got any mechanical ventilation and I'll say one hour.

James Price 53:14

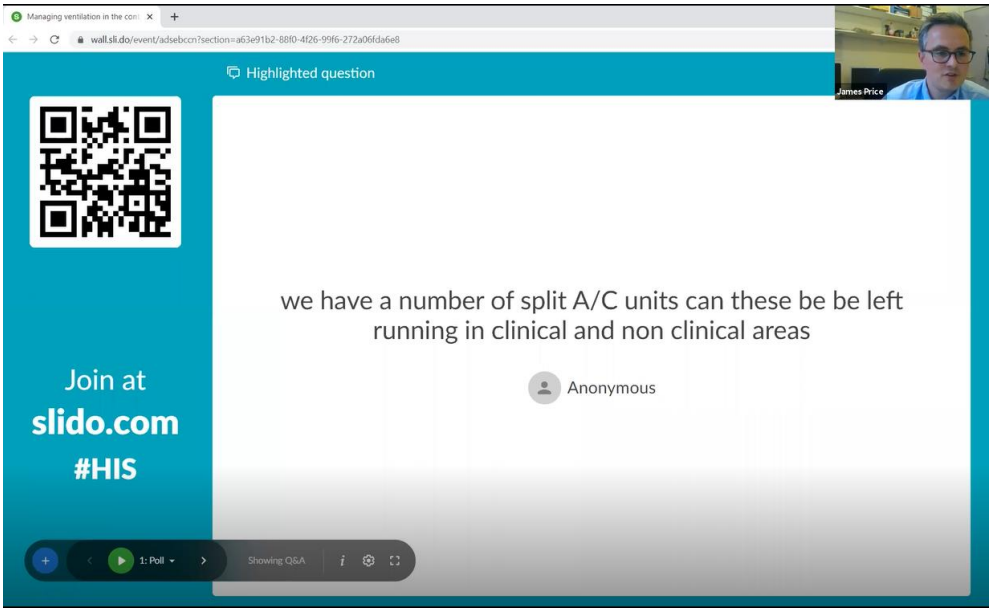
I can see nodding heads anyone else wants to comment on this.

Cath Noakes 53:23

I just comment that so for example in care homes ventilation is often not very well designed. So just because a window opens doesn't necessarily mean it would flush at five air changes an hour, or whatever. So, again, an hour is probably safe and having appropriate PPE on to go and clean that room is probably a good idea.

James Price 53:55

Fantastic. Thank you. Let's move on to the next question.

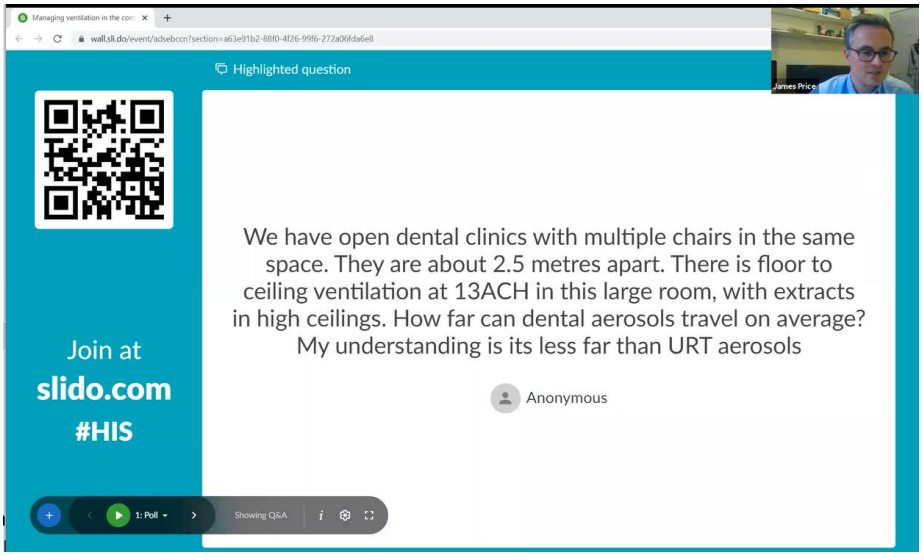


Peter Hoffman 54:05

This is the same as portable air conditioners, they just take air in cool it and give it back to the same space, different temperatures same microbiological quality. Yes, they can be left running.

James Price 54:27

Right, unless there's any major disagreement let's move on to the next question. Great. Okay, next question please.



Who'd like to take this on.

Cath Noakes 55:06

This sounds like an undergraduate exam question.

I hate to say it but the answer is, I don't think we know, at the moment, I think we've not got enough data to measure that. I mean the aerosols themselves - the travel distance will depend on the size of the aerosol. Those that are 20 microns and above will be settling out within one to meters. The 10, maybe 10 to five to 10 micron ones are going to be possibly going a bit further, and it will depend on concentration. And to some extent, the local airflow pattern in that room. It does sound like it's quite a high ventilated room with probably a mixing airflow. So, the time between them will be 13 air changes an hour. It's not quite operation theatre standard but it is much better you know it's double what you're getting in a side room. So it would reduce that time, but it is very hard to say specifically what the potential transmission is between those two spaces. At the very least, I would say only use every other one, I wouldn't put them in everyone.

James Price 56:40

Karren did you want to come in on this?

Karren Staniforth 56:45

I'd say that I was asked a similar question, and because it's there's so much uncertainty at the moment the decision was made, not to use multi chair rooms at this point until we have more information. I have to say that the room that I was looking at had did not have this amount of ventilation, and I do wonder if this is, this is one area where Perspex screens could be considered. But I don't know what what Cath thinks, but I think that could be something that someone could do but it would have to be designed correctly, and could have been validated to make sure they actually did what we expected it to do with all the air flows.

James Price 57:27

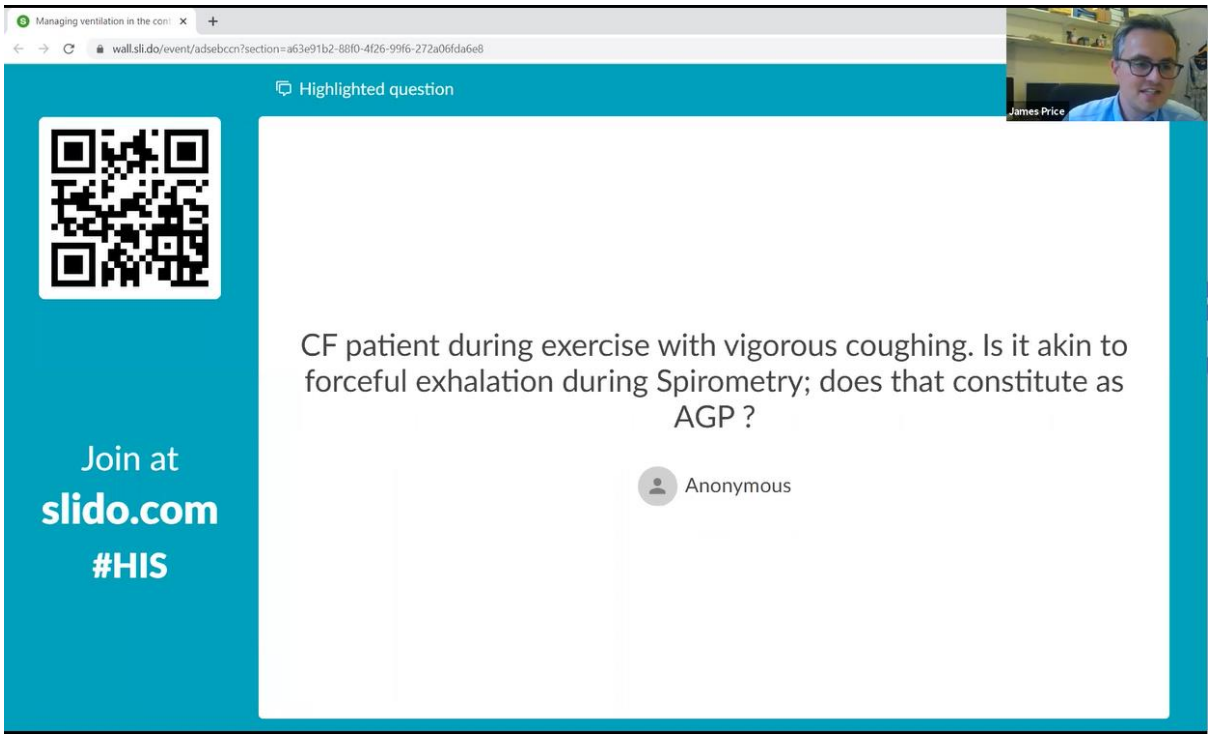
Thanks Karren, Peter?

Peter Hoffman 57:30

With chairs 2 and a half meters apart, I will be more worried about splashes and droplets than aerosols. That's pretty close and I think Karren's idea about Perspex screens is a good one.

James Price 57:40

All right, thank you all. I think it's time to sneak in one final question.



Who fancies taking that on? Karren.

Karren Staniforth 58:05

I'm probably not going to question but just to say that I think we've all felt that CF is one of these areas where again where people are nervous now, but perhaps they should have been a little bit more nervous before, and perhaps more research was required before, and more ventilation. And a lot of gyms have small pods with glass screens to keep them very separate even though they feel as if there is some kind of connectivity. So, I wouldn't say it is, but I think there are risks in CF that really do you need further investigation and it's not all about COVID.

James Price 58:59

Thank you.

All right, I think we're creeping towards the hour mark now. So I think we're going to call it on the questions, so thank you to the panellists.

So the audience we have a final poll, it'd be great for you to answer, particularly to what extent you agree with the following statement we are getting some mixed views. Generally we've seen that there's been some positive responses, please do feel free to fill out our post webinar survey we will be sending around because we're always really keen to improve how we how we run things.

Thank you. So finally I want to say a really big thank you to our panellists to Peter Hoffman, Cath Noakes, Karren Staniforth and Chris Lynch we really appreciate having you here. Thanks to the Healthcare Infection Society for hosting this, and the audience for interacting and posting all your questions.

And don't forget to tune into our next webinar, which is on COVID in the environment on the 24th of June. Have a good evening everyone.