

QUESTIONS & ANSWERS

COVID WEBINAR – APRIL 22, 2020

The following are questions from webinar attendees and responses provided by the four speakers:



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Access the webinar [recording here](#) and [slide deck here](#).

Q1. Was UV treatment post HEPA filtration considered?

A1. We did not consider UV post-HEPA because there is no need for UV. HEPA is sufficient for virus removal. We have had discussions with some FMs about using UV on the upstream side of HEPA where bag-in/bag-out housings are not in use. However, that wouldn't apply to a portable HEPA scrubber, and could delay the project anyway. There are other ways to mitigate the risk of filter changes, including waiting long enough after infectious patients and/or using PPE during change-out.

Q2. The number of COVID-19 patients who need surgery would seem to be fairly small. What percentage of ORs would need to be converted to handle these cases? Just looking for round numbers here.

A2. Agree that numbers are quite small. In the case of the hospitals that Medxcel and Mazzetti worked on together, we converted two ORs at each campus, regardless of the number of ORs present.

Q3. Off topic, but what are you seeing with regard to oxygen and medical air supply and distribution as more ventilators are used in more non-ICU locations?

A3. This is a question that come up many times. There are a number of factors to consider, mostly having to do with the number of ventilators, high-flow nasal cannulas, and the like in use. BeaconMedaes put out a good analysis, but one of the conclusions is "it depends." A pretty common answer regarding COVID, right? Our analysis of piping in a few hospital wings is that generally ICUs seem to be pretty well piped to handle the flow rates. Patient room wings and PACU will generally count on more diversity so should be checked closely. There have been

some reports of bulk tank vaporizers having trouble keeping up, with a recommendation to setup some large fans to increase airflow across vaporizers.

Q4. Were there access/ADA or egress issues with the temp walls in the corridor?

A4. Mazzetti worked closely with a team at Medxcel, including facility directors, architects, and engineers. They reviewed primarily for Life Safety issues. In every case where we blocked a corridor, we ensured that there were doors on both sides, and there was an alternate route for egress that did not require passing through the vestibule.

Q5. Do you see potential in using UV light for disinfection?

A5. Absolutely. UVGI is known to be effective against viruses, though I am not aware of any testing (yet) on SARS-Cov-2. Upper room UVGI is a proven technique, though not very common today. Use of UVGI in ductwork or AHU requires very high intensity due to the short exposure time. Most of us are not comfortable using UVGI in lieu of filters, but it can be a supplement to, say, MERV 14 filters. I understand some of these systems were in short supply as surge prep started to happen - as were HEPA filters. See also, the newly released ASHRAE Position Document on Infectious Aerosols.

Q6. What is the strategy when transporting a patient from the elevators to the infectious disease unit?

A6. Transport of the patient was prescribed in the infection control plan, which involved proper use of PPE.

Q7. Please share your thoughts on the use of UV-C to deactivate the virus that is airborne.

A7. UVGI is known to be effective against viruses, though I am not aware of any testing (yet) on SARS-Cov-2. Upper room UVGI is a proven technique, though not very common today. Use of UVGI in ductwork or AHU requires very high intensity due to the short exposure time. Most of us are not comfortable using UVGI in lieu of filters, but it can be a supplement to, say, MERV 14 filters. I understand some of these systems were in short supply as surge prep started to happen - as were HEPA filters.

Q8. If the exhaust is more than 20' above grade is there a need for a HEPA filter when creating a negative unit?

A8. I think it depends. Potentially infectious exhaust should be discharged vertically, at a high velocity to improve dispersion. It must be kept away from intakes, of course. Horizontal discharge of unfiltered air 20 feet above a place where people are likely to be seems risky to me.

Q9. What methods can be used to control virus spread on ACT (acoustical ceiling tile)? A lot of patient rooms I've seen have ACT that is not smooth. Are there any instances of virus transmission that way?

A9. I am not aware of any studies that address virus deposition on ceilings of any type.

Q10. Did you develop any ad-hoc tools to communicate pressure gradients to clinical staff?

A10. Pressure checklists were provided for staff to record pressures and report any readings that were out of range.

Q11. What if your entire OR is served by one primary common air handler? Wouldn't mechanical adjustments create challenges with ASHRAE guidelines as well as Regulatory requirements?

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A11. One key to the approach we took with these ORs is that we did not significantly affect the overall air balance. We did increase the amount of air moving from the room to the corridor, but it was not enough to affect the pressure differential of the other non-COVID ORs. If it was, then we would probably have to add a second HEPA scrubber in the COVID ORs so that we did not change the overall air balance at all.

Q12. Based on your experience, is any hospital using PM2.5 and PM10 measurement? Do you think is a good practice? Will be a nice-to-have or must-have?

A12. I am not aware of anyone using PM2.5 or PM10 measurement as a proxy for SARS-Cov-2. I would, in fact, advise against, because virus particles are at least, in order of magnitude, smaller than PM2.5 and because we don't have data to tell us what to do with the information.

Q13. Was local Health department and AHJ have any involvement in these temporary solutions

A13. Local AHJs were involved when required by code for temporary solutions.

Q14. I've read conflicting information on the ability of HEPA filters to filter out the virus? HEPA is 0.3 Microns effective and the virus is 0.1 Microns. Is there a white paper available that confirms this as an effective mitigation solution?

A14. This is a case of a myth that is based on a fact. Yes, most viruses are closer to 0.1 micron than 0.3. It is also true that HEPA filters are rated on the basis of 0.3 micron particles. But, HEPA filters are generally MORE effective with smaller particles than with 0.3 micron particles. There is a very good paper by NIOSH on the subject of filtration of bioaerosols:
<https://www.cdc.gov/niosh/docs/2003-136/default.html>

Q15. Any standard procedure regarding decontamination of medical gas containers circulating within healthcare facility and avoid cross-contamination?

A15. There was no specific policy around medical gas containers, they were included in the overall infection prevention plan.

Q16. Based on the electrical data coming in, do you think diversity factors will be changed moving forward because of the surge demand or how do you see this impacting electrical design?

A16. We know that current electrical demand factors result in systems that are vastly oversized. The NEC has resisted changing them because of fears of the impacts of surges. Mazzetti has recently deployed meters into seven hospitals across the country, and we are working with several others. With this never before available data, we hope to persuade the NEC committee this cycle to see reason.

Q17. FGI doesn't require anterooms any longer, but all your solutions utilize them. Can you highlight all the reasons anterooms are so important in these scenarios?

A17. In general, an anteroom is intended to serve as a kind of air lock, to ensure that air pressure relationships are maintained. That's essentially what we did in the PACU example. In the case of the ORs, the anteroom serves a different purpose. Because we want the OR to be positive to the corridor, to keep external contaminants out of the room, that means air flow out of the OR. The anteroom is intended to capture that air, potentially carrying infectious particles, from being dispersed into the corridor. Positive in the OR protects the OR from the world, and the negative anteroom protects the world from the OR. See also ASHRAE's unequivocal position on this in their new Position Document on Infectious aerosols.

Q18. Could you share the name of the MN document about 'infectious disease zones'?

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A18. The document was put together by the Minnesota Department of Public Health for response to airborne infectious diseases and has lots of diagrams and illustrations.
<https://www.health.state.mn.us/communities/ep/surge/infectious/airbornenegative.pdf>

Q19. Are you concerned about exposing the patients to other airborne contaminants by placing the entire space in negative pressure?

A19. The usual principal when dealing with an infectious disease is to protect others from the infectious patient. Placing an ICU, PCU, or patient wing into negative pressure presupposes that all patients in the space are infected with the same agent. They may be susceptible to other agents as well, but that is always true in an Airborne Infectious Isolation room.

Q20. How do you heat or cool the increased exhaust air?

A20. The whole point of using HEPA scrubbers is to clean the air so that it doesn't have to be exhausted. The only one of the three examples where we actually increased exhaust is the patient wing, where we dumped air through the window to create a negative unit. We could have dumped that air back to a return air duct, but there was no return duct available in this wing, and the amount of air exhausted was deemed insignificant to the overall AHU. Strategies that turn whole AHUs to 100% OA are likely to have problems in most climates during some parts of the year. For those fortunate enough to live in benign climates, that may be a viable strategy.

Q21. What would be challenges to convert a hotel floor for COVID patients? Also, a shopping mall environment?

A21. That is well beyond the scope of this webinar, but it is certainly an interesting topic. Mazzetti worked with HKS architects on a concept for a hotel conversion, which is posted on the ASHE website and [available here](#). Shopping malls may be more difficult due to less-robust power, plumbing, and HVAC available.

Q22. If you don't leave them in place, what about 2nd wave anticipation?

A22. Well, that's an excellent question. How large is the second wave going to be? Larger than the first, or smaller? The point of our electrical metering is to inform design and code going forward. Unless patient rooms or ICU see a problem with electrical load in the first wave, there won't be a need to make modifications for the second wave, as each patient room should already have seen its maximum load.

Q23. Are the modified operating rooms with a negative anteroom safe to use for non-COVID patients once electives start back up?

A23. The modifications don't change the safety of the OR for a patient. Use of the rooms for non-COVID patients is a matter of cleaning.

Q24. If two operating rooms have the same anteroom, is one OR safe to use for non-COVID and the other COVID?

A24. Again, the rooms are unchanged, so that isn't a problem. However, the anteroom is considered a potentially infectious zone when a COVID-positive patient is in one of the rooms, so passing through the anteroom with a non-COVID patient is not advisable. Given the reduction in surgeries in preparation for the surge, loss of these two rooms was not considered a problem.

Q25. How quickly is it possible to get these physiological monitors to those that need it?

A25. These devices are readily available. The company [Mazzetti worked with is VivaLNK](#), but there are others.

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Q26. Can Chris expand on how technology is leveraged to manage the flow of people? How can I modify my BMS to support this function?

A26. There is technology available that will provide the location of people and asset, such as RTLS and blue tooth beacons. These technologies will provide data as to where people and assets have been. This will allow a health system to determine if there is a potential for a staff member for example to come into contact with an infected patient and then see their subsequent interactions. It is also used to understand the clinical workflows and determine where bottlenecks might exist and cause delays. You could tie this to your BAS for energy-savings, but it would mostly be about process improvement and also using it with security management systems for safety i.e. patient wandering, duress, and it is also used to monitor hand washing compliance.

Q27. For Patient Wing, please address concerns for the AHU serving other spaces.

A27. No air from the COVID ward is returned to the AHU, so there is no concern at all. That is true because the rooms are served by recirculating fan coil units. That would not always be the case, of course. There is another solution that we did not have time to show, which is an ICU that we converted for COVID patients. In that case, we intercepted the return air duct from the ICU and installed a HEPA filter rack and booster fan and dumped back into the return duct. we considered dumping outside, but that solution would not have worked in Alabama as summer weather comes into play. The filter added some extra work and cost but ensured that the ICU can continue to function regardless of weather conditions. The same approach could apply to a standard patient wing.

Q28. I have a Dental office trying to figure out how to set up Air flow and portable HEPAs. Any advice?

A28. We would happy to review with you, but we would need to know more about the systems and setup.

Q29. Do you recommend utilizing a portable HEPA scrubber in OR if existing system already contains MERV 18 HEPA filtration?

A29. It is probably not necessary. In that case, we would still recommend the anteroom to capture effluent from the OR, and you would need the portable HEPAs for that.

Q30. Was there a consideration for emergency egress and adjacent areas that impacted go/no go for areas selected for COVID patient use?

A30. Risk Assessments for both infection control and interim life safety measures were conducted for all locations.

Q31. CDC (Vol 26, Number 7) is now saying that aerosol transmission is a factor (in addition to droplet transmission). This is from a study of surfaces in COVID patient rooms in Wuhan, showing the presence of virus on return and exhaust air grilles more than 4m away from patients.

A31. The study was reported in Emerging Infectious Diseases Journal, Vol 26, Number 7. I believe you may be overstating the conclusions of that study. I think most of us have assumed that the risk of aerosol exposure is not zero. All guidance from CDC, though, that aerosol transmission is not primary. CDC continues to say "...airborne transmission from person-to-person over long distances is unlikely." In the examples given in this webinar, we proceeded as though airborne transmission is possible and took reasonable steps to manage that risk.

Q32. Do you anticipate UV and ionized technologies increasing in demand for hospitals and nursing homes? Do you have any concerns with the technologies?

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A32. I am aware of at least one engineering firm that is looking at how we can improve design of hospitals and other buildings. UV and BPI are strategies that are under consideration.

Q33. Will ASHRAE 170 modify air exchange requirements such as increasing them (or having the ability to increase them)? Do you think testing requirement for ACH will increase in frequency and areas required for nACH test and verification?

A33. My crystal ball regarding future standards revisions is cloudy. At this point, though, I do not think research points to increased ACH. There are numerous other changes that *should* be considered, and I think we will be engaging with clients, ASHRAE, and FGI on these issues.

Q34. Were you concerned at all with possibly pressurizing the ductwork where the HPS is connected?

A34. In the case of the ORs, we were not increasing airflow, so no concern. In the case of the PACU modification, we would increase return airflow, but only by 3-400 cfm. the air pushed into the return duct, though, is HEPA filtered, so we are not concerned about contaminating other areas.

Q35. Any concern for the need for make-up air when converting entire units into negative pressure? (especially when exhausting machines directly to the outside)

A35. Absolutely a concern, especially in the southeast US. The total exhaust volume, though, is small, especially relative to the AHU that is affected. If we wanted to setup direct exhaust from every patient room, the overall exhaust increase would have been much greater.

Q36. Did Medxcel do this to ORs in all hospitals servicing? If not, how did the system decide which hospitals to do this in?

A36. The hospital system we supported limited OR ante rooms to locations that had significant OR volume that warranted this added precaution.

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