COVID Mitigation for Schools & Businesses:

What should we do if we need to continue operations that increase the risk of viral transmission?

HAC HEALTHCARE ADVISORY COLLABORATIVE

Douglas Monroe MD MBA
Virginia Kennedy RN MS CIC FAPIC
Linda Speer RN MSN MBA CPHQ

How clinical experts evaluate risky operational scenarios and help reduce the chance of viral spread

Introduction

When you are stuck with some risk factors, it's critical to mitigate as many others as you can. Here we offer two scenarios to highlight how we approach making risky but necessary operations much safer.

Although our advice is always to stick to the federal, state and local science-based guidelines, those measures are often inconsistent with one another. Additionally, many guidelines are open to interpretation in operational settings. As a result, schools and other organizations often seek outside assistance from experts such as consultants, board members, and other members of the healthcare community.

DID YOU KNOW?

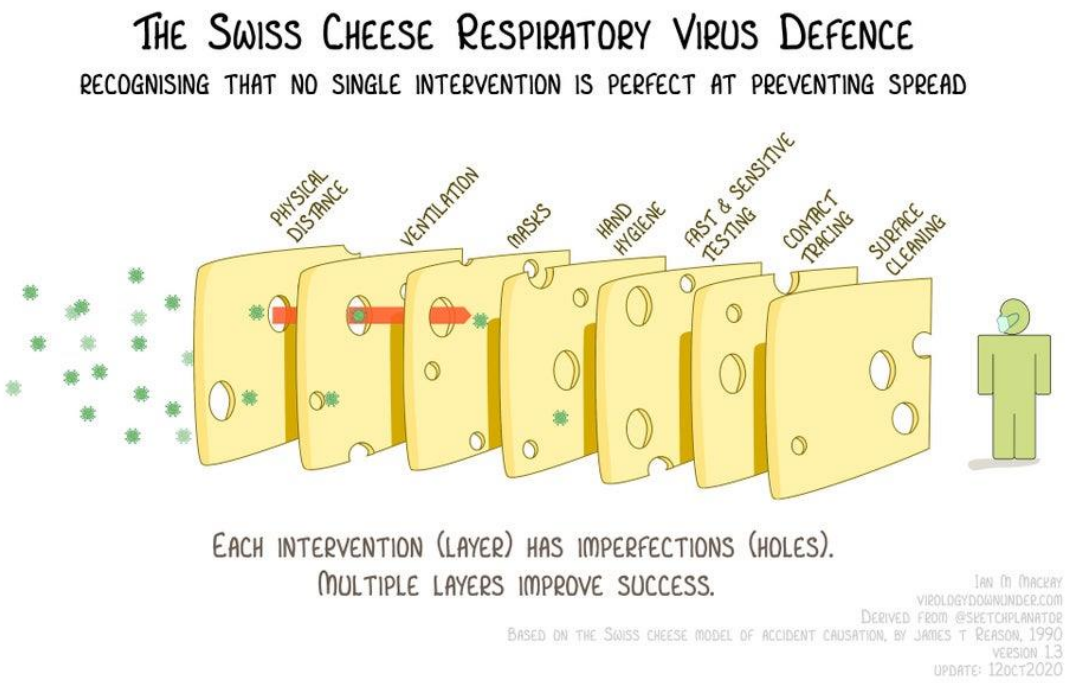
HAC is a collaborative of senior healthcare executives and clinicians who help hospitals and healthcare systems improve clinical performance.

In April 2020, we responded to the pandemic by offering our infection control and safety expertise to schools and other businesses.

Our services include comprehensive education, assessment, and implementation for operational pandemic risk mitigation.

High Risk Operations

Schools and businesses want to operate safely but know that opening doors increases the risk of viral transmission. They also understand that helping employees, customers and families to not only *be* safe but also to *feel* safe increases the chance they will return. After we've conducted a full risk assessment, our clients often ask us about specific operational situations that are important to continue, but that they know will increase risk.



James Reason's Swiss Cheese Model, adapted here by Ian Mackay, illustrates how we think about mitigating viral transmission during risky operations. In short, if you increase the size of a hole in one slice of cheese, you should try to decrease the size of the holes in the other slices.

Categorizing Risk Mitigation Efforts

We take a systematic approach to evaluating risk, whether we are reviewing an entire organization or focusing on a single operational scenario.

The table below shows how we categorize mitigation techniques into four broad areas. Using our example above, think of each category as a slice of cheese. There is a lot of detail that isn't shown here, but at a high level it's important to understand that a hole in one area means focusing on closing other holes. The most important rule is ***wearing a mask,*** but as we'll discuss in the second scenario, dining facilities pose a significant mask problem.

Educational Mitigation	Behavioral Mitigation	Structural Mitigation	Environmental Mitigation
Understand viral behavior & corresponding mitigation techniques	Improve personal and local hygiene	Reduce static and dynamic human density	Improve air ventilation, filtration, and flow*
Practice and re-educate regularly; continuously update knowledge	Wear masks	Limit contact pool	Improve environmental (surface)cleaning

*Handling of indoor air deserves its own article, but in short a balance needs to be achieved between ventilation, or the amount of air moving through the system, and filtration, which can remove particles like COVID from the air. For a variety of reasons we will discuss elsewhere, we tend to emphasize ventilation over filtration, although both have important roles to play.

Two Scenarios

Group Singing: Some school and church communities want to return to group singing. However, they know that singing can increase the risk of viral transmission through forceful expiration in close quarters for long periods of time.

In Person Dining: Many restaurants want some form of in-person dining but also wants to protect staff and customers from what we know will be an increased risk of exposure due to unmasked diners.

Scenario 1: Group Singing

Increased Risk Factors

Forceful expiration in close proximity over a long period of time, usually in an indoor setting

Potential Mitigation Techniques

1. Wear masks
2. Conduct practice outside
3. Increase physical distance by a multiple of 2 or 3
4. Move air downward and away from group
5. If indoors consider ventilation, filtration, and air turnover

How We Evaluate the Scenario and Develop a Solution

We know that the virus can be transmitted through droplets or aerosolized particles, and that aerosolized particles can hang in the air for more than 10 minutes and travel more than 14 feet.

Behavioral Mitigation

Masks are the first and most effective way to prevent viral transmission by reducing the amount of droplets and aerosolized particles for others to inhale.

Structural Mitigation

Holding practice indoors will increase the amount of virus in the local air despite masks, although the masks will decrease the overall amount of aerosolized virus present. Moving outside means that air turnover is unlimited, although on a windless day the air may hang around for longer. It is also easier to increase physical distancing (and therefore decrease human density) outside.

Environmental Mitigation
Whether you are indoors or outdoors (and clearly outdoors is preferable) moving potentially infected air away from people should reduce the chance of transmission. In general, we consider airflow that is downward and away from a group as optimal. Placing a fan above the group that directs air downward should decrease the risk that aerosolized particles will remain up high, say near people's mouths and noses. Additionally, moving air away from the group should also reduce the same risk. Fans exhausting air away from the group (for instance out a window, or toward an unoccupied outside space) may similarly mitigate infectious transmission.

Scenario 2: Group Dining

Increased Risk Factors
Not wearing masks, prolonged sharing of space, eating and drinking, using shared utensils

Potential Mitigation Techniques
1. All others wear masks
2. Improve personal and local hygiene
3. Eat outside when possible
4. Increase physical distance by a multiple of 2 or 3
5. Move air downward and away from diners

How We Evaluate the Scenario and Develop a Solution
As stated above, we know that the virus can be transmitted through droplets or aerosolized particles, and that aerosolized particles can hang in the air for more than 10 minutes. The concentration of viral particles in the air will increase when people aren't wearing masks, as when eating and drinking

Behavioral Mitigation
Masks are the first and most effective way to prevent viral transmission. Masks work by reducing the amount of droplets and aerosolized particles which can transmit the virus. Although diners may be unable to wear masks while eating and drinking, everyone else should wear a mask at all times, including those in the kitchen. Additionally, high quality masks are recommended due to the increased risk posed by unmasked diners.

Structural Mitigation
Not all restaurants have an outdoor dining area, but those that do can reduce risk by utilizing the outdoors to reduce human density and increase ventilation. Dining indoors will increase the amount of virus in the local air. Moving outside

means that air turnover is unlimited, although on a windless day the air may hang around for longer.

Environmental Mitigation

Whether you are indoors or outdoors (and clearly outdoors is preferable) moving potentially infected air away from people should reduce the chance of transmission. In general, we consider airflow that is downward and away from a group as optimal. Placing a fan above the group that directs air downward should decrease the risk that aerosolized particles will linger up high, say near people's mouths and noses. Additionally, moving air away from the group should also reduce the same risk. Fans exhausting air away from the group (for instance out a window, or toward an unoccupied outside space) may similarly mitigate infectious transmission.