IS ACE2 HARMFUL OR PROTECTIVE IN COVID-19 PATIENTS?

By Austin Krebs

Similar to SARS-CoV, it has been suggested that SARS-CoV-2 gains entry to human tissue through use of the ACE2 spike (S). The implications of this mode of viral entry have sparked debate about ACE2 and its role in COVID-19 severity. One line of thinking proposes that since the virus gains entry to cells via ACE2, increased ACE2 expression is harmful. Since ACE inhibitors (ACEi) and angiotensin receptor blockers (ARBs) increase the expression of ACE2 mRNA, some parties believe they should be avoided. Some believe that their effects on ACE 2 could facilitate greater risk of infection with COVID-19, and possibly cause more severe disease. Fang et al. have suggested switching to calcium channel blockers in COVID-19 patients currently on ACE inhibitors or ARBs, based solely on the ACE2 upregulation caused by these drugs.

The other side of the ACE2 argument hypothesizes a possible benefit in COVID-19 patients. It has been demonstrated that SARS-CoV downregulates ACE2 by binding its S protein, which contributes to severe lung injury through increased activity of angiotensin II. ACE2 catalyzes the conversion of angiotensin II, a potent vasoconstrictor, to angiotensin 1-7, which acts as a vasodilator. Meili et al. highlighted that ACE2 has been shown to be beneficial in animal models of lung and cardiac injury. ACEi and ARB treatment increase ACE2 expression, and they facilitated increased recovery in these animal models of injury. The current fear of ACE2 in the COVID-19 pandemic comes from a currently unconfirmed hypothesis that increased ACE2 expression will lead to worse infection. Kuster et al. suggests that underlying pathology such as hypertension, diabetes, and kidney disease - in the patients treated with ACEi and ARBs, rather than the drugs themselves, contribute to increased illness severity in this population. A pilot study investigating the possible benefit of recombinant ACE2 (rACE2) was proposed, however it was withdrawn prior to recruiting its first participant.

Using ACEi and ARBs, or rACE2 could be beneficial in COVID-19 patients, especially given the severe lung injury seen in critically ill patients. The current ideas regarding comorbidities and their effects on infection and disease risk must be explored in controlled trials to establish clear guidelines and confirm or disprove hypothetical mechanisms regarding ACE2.

Resources:
3. Fang, Lei, et al. “Are Patients with Hypertension and Diabetes Mellitus at Increased Risk for COVID-19? [www.nature.com](https://www.nature.com).
Effectiveness of Universal Masking to Prevent Transmission

By Katie Veltri

Theory:
Currently, the World Health Organization (WHO) does not recommend universal masking to prevent the transmission of COVID-19. These guidelines are limited by lack of evidence of protection, but this does not mean there is evidence of ineffectiveness [4]. The research presented in this paper reveals significant decrease in disease transmission, of COVID-19 and in epidemics/pandemics of the past, with the use of respiratory personal protective equipment (PPE). While we’re in a period of great uncertainty, we do know that masks and hand hygiene prevent infection in the hospital setting, thus we should be promoting the use of these methods in all settings.

Background:
WHO guidelines on wearing masks [2]:
Community setting:
- A medical mask is not required for people who are not sick as there is no evidence of its usefulness in protecting them.
- Individuals with respiratory symptoms should wear a medical mask and seek medical care as soon as possible if they have fever, cough, and difficulty breathing

Hospital Setting:
- Individuals with respiratory symptoms:
  - Wear mask in triage/waiting areas and in areas dedicated to suspected or confirmed cases
  - Do not wear masks when in isolated, single rooms but cover coughs and sneezes.
- Healthcare workers:
  - Wear a medical mask when entering a room with patients with suspected or confirmed COVID-19
  - Use a particulate respirator when performing aerosol-generating procedures

Previous Research:
When we compare the COVID-19 pandemic with similar events in the past, we’ve learned that healthcare workers are at the highest risk for infection in the hospital, and that using respiratory PPE decreases nosocomial transmission of disease. MERS-CoV: A case study that evaluated the risk of infection from MERS-CoV revealed that nurses had the highest daily risk of infection, and that using an N-95 respirator reduced risk of infection by over 90% [1]. Influenza: an infection control bundle created to prevent nosocomial transmission of influenza A/H1N1 identified that wearing a surgical mask by either healthcare workers or patients reduced the risk of nosocomial transmission of influenza A/H1N1 pandemic [7]. SARS-CoV: meta-analyses combining 6 case-control and 3 cohort studies reveal the use of respiratory PPE conferred
significant protection against SARS among exposed healthcare workers [8].

**Current Research:**
While the literature surrounding universal masking in the COVID-19 pandemic is limited, a retrospective study from Wuhan revealed a significantly higher rate of infection in healthcare workers who just used hand hygiene as a protective measure against COVID-19 compared to healthcare workers who used hand hygiene and an N-95 respirator [5]. Another study from Hong Kong discusses protective measures they implemented to prevent nosocomial transmission of COVID-19. The following are the key measures that they identified which helped them achieve zero nosocomial transmission in the first 6 weeks of outbreak [3]:

- Enforcing hand hygiene
- Requiring all healthcare workers, patients and visitors to wear surgical masks while in the hospital
- Increasing the use of PPE while performing aerosol generating procedures in all patients (even those not infected)

**Barriers to Universal Masking:**
- Shortage of masks
- Dermatitis from prolonged mask use [6]
- Discomfort or inability to wear masks

**Take Away Points**
- Masks, especially N-95 respirators, are efficient in reducing transmission of disease and can be used to fight against COVID-19.
- A major barrier to universal masking is the current shortage - we need to prioritize universal masking in the hospital setting to protect our healthcare workers and expand from there.

**Conclusion:**
Until we have effective anti-viral agents or a vaccination to fight against COVID-19, evidence shows that use of respiratory PPE with hand hygiene reduces transmission of disease and protects our healthcare workers. However, the idea of universal masking is currently limited by shortage in supply. As circumstances and supply availability changes, maybe we should reconsider the current WHO guidelines and implement universal masking beginning in the hospital setting.

**Resources**
COVID-19 Infectivity and Nursing Home Discharge Recommendations

By Austin Krebs

Summary of Findings:

Current CDC recommendations for discharge of hospitalized COVID-19 patients include resolution of fever for without anti-pyretics, improved respiratory symptoms, and 2 consecutively negative nasal and throat PCR swabs at least 24 hours apart (4 swabs total). These recommendations are similar to discontinuation of home isolation, which can occur after 3 days fever-free without anti-pyretics, as well as improved respiratory symptoms and at least 7 days since symptom onset. The current Medicare/Medicaid guidelines for managing nursing homes align with these recommendations. If the CDC’s Interim Infection Prevention recommendations can be met, nursing facilities should follow these guidelines for accepting patients.

Medicare recommends dedicated wings for residents with confirmed or suspected COVID-19, with possible extension of this wing to include patients returning from hospitals with confirmed cases. These wings would serve as isolation units to house patients for 14 days, and they may be released to normal rooms if they show no symptoms in this time. It is recommended to minimize patient transfers, and to keep doors closed when possible.

PCR results are inconsistent currently. Some patients may test positive intermittently after discharge without showing symptoms. One study found patients to be positive between 5- and 13-days post-discharge. Sputum specimens may remain PCR positive longer than upper respiratory swabs. SARS-CoV-2 is believed to behave more similar to influenza than SARS-CoV in terms of its viral shedding properties. This has led to PCR of the upper areas being used for discharge criteria. Persistently positive PCR specimens have been demonstrated in stool samples, where RNA can be detected for up to 4-5 weeks. Fecal to oral transmission has not been demonstrated yet, but was possible in the SARS-CoV and MERS-CoV infections. Emerging research in this area may be informative.

Positive PCR results do not imply infectivity. Viral culture from these specimens is necessary to show infectivity. Woelfel et al’s findings show that patients with viral load of less than 100,000 RNA copies per mL can be reasonably discharged to home isolation, as cell culture at these levels shows low risk of infectivity.

Viral load has been examined in the literature several times. It appears that viral load correlates with disease severity. Additionally, severe cases of COVID-19 are associated with increased time to viral clearance. In one study, 90% of mild cases tested negative on PCR 10 days after symptom onset.

Viral load and prolonged virus-shedding may be helpful prognostic factors.

Resources

Multiple Patient Ventilation
By Helen Pozdniakova

Summary of Studies
1. Studies were able to show adequate ventilation of human lung simulators and adult sheep using 1 ventilator for multiple “patients”
   a. Adequate ventilation was defined as ETCO2 within parameters and adequate tidal volumes for oxygenation
   b. Hypercapnia seems to be a consistent problem but may be an acceptable side effect of this method of ventilation
2. No studies have shown information on
   a. “Patients” with abnormal anatomy or compromised respiration
3. Limitations
   a. Cannot control tidal volume for each subject, tidal volume is dependent on compliance which may result in unequal ventilation between matched patients
4. Re infectious transmission
   a. One study in 1998 showed gram negative bacilli could be cultured from the expiratory arm of a ventilator after intubation and those bacilli matched the bacilli found from NG tube samples
   b. One study recommended inspiratory arm filters if ventilator draws air from the room
   c. Did not find a study regarding viral transmission

Ventilator Details
1. Control over driving pressure seems to be better than controlling volume in ARDS patients
   a. In multiple ventilators: Using driving pressure settings to treat hypothetically may have less deleterious interactions between patients (ex. Due to a kinked endotracheal tube)
2. Continuous Mandatory Ventilation
   a. CMV can control the respiratory rate for multiple patients, no inspiratory trigger
   b. If the vents do not have a CMV setting:
      i. Increase trigger threshold as high as possible
      ii. Respirolytic sedation to reduce respiratory drive, paralysis as last resort
3. Optimizing Carbon Dioxide clearance
   a. Hard to track tidal volumes on a multiple-patient vent
   b. Tubing branching increases dead space
   c. Allow permissive hypercapnia? Goal: lung protective ventilation, not normalized blood gases
4. Profound hypoxemia patients
   a. Covid–19 patients are responsive to PEEP
   b. In addition to PEEP, you could use inverse ratio ventilation (and increase time in the inspiratory phase)

Specific Information Regarding Each Study
A Single Ventilator for Multiple Simulated Patients to Meet Disaster Surge by Society of Academic Emergency Medicine
1. Human lung simulators were attached to a ventilator in parallel to simulate ventilating four adults, run for 12 consecutive hours
   a. Pressure control: set at 25 mm H2O, mean TV 471 mL per lung simulator with an average minute ventilation of 30.2 L/min.
   b. Volume control (2L): the mean peak pressure was 28 cm H2O and minute ventilation was 8.1 L/min/lung simulator
2. Over 12 hours: pressure did not exceed 35 cm H2O, and individual tidal volumes reached about 7mL/kg for a 70kg individual. No evidence of respiratory stacking or preferential filling was found
3. Limitations:
   a. Simulation study
   b. Equal ventilation may not occur if lung physiology is different between patients (ex. Asthmatic)
   c. Unable to directly measure volumes delivered to the individual test lungs
   d. No information about potential infectious complications from sharing a ventilator

Mass casualty respiratory failure by Elizabeth L. Daugherty, Richard Branson and Lewis Rubinson
1. Even with adequate numbers of ventilators, availability of medical grade oxygen could be a problem
   a. Most common source is bulk liquid oxygen and probably is the best one to use for multi-patient ventilation
   b. Oxygen concentrators produce 1-6 L/min of 90-100% oxygen but cannot generate pressurized gas for a
pneumatically powered ventilator. Only allows low flow.
c. We can conserve oxygen using reservoir cannulas or pulsed dose technology. Closed loop controller can also reduce oxygen usage.

2. They recommend to place filters on the inspiratory inlet if the ventilator draws air from the room and place filters on the expiratory limb to protect the device, (not for infection control)

**Increasing ventilator surge capacity in disasters: Ventilation of four adult-human-sized sheep on a single ventilator with a modified circuit**

by Lorenzo Paladino a et al

1. Four limb ventilator circuit created using four 70kg sheep intubated, sedated, and on neuromuscular blockade for 12 hours
   a. Synchronized intermittent mandatory ventilation with 100% oxygen at 16 breaths/min and TV 6ml/kg
   b. Monitored with arterial blood gas, heart rate, MAP
   c. CO2 went up in all animals over the first 6 hours but was resolved with prone positioning

2. Limitations:
   a. Sheep have worse respiratory variables on supine respiration, but humans have not shown improvement in hypoxic respiratory failure using prone positioning (supine positioning is standard)
     i. They put the sheep supine but switched to prone if they experienced problems

3. Criticisms via editorials:
   a. Animals were perfectly sized matched
   b. Model probably only relevant for respiratory failure due to neuromuscular ventilatory failure (ex. Botulism)
   c. Unable to detect changes in a single patient
   d. Given that sheep were healthy and had no pathology, the hypercapnia resulting is concerning and may be worse in sick patients

**Resources**


**When can patients with COVID-19 be discharged home from the hospital?**

*By Katie Veltri*

**Quick Link:**


**Background:**

Criteria for discontinuation of Transmission-Based Precautions [2]:

- **Test-based strategy:** used in hospitalized or severely immunocompromised patients, or patients being discharged to a long-term care / assisted living facility
  - Resolution of fever without the use of fever-reducing medications and
  - Improvement in respiratory symptoms (e.g., cough, shortness of breath), and
  - Negative results of an FDA Emergency Use Authorized COVID-19 molecular assay for detection of SARS-CoV-2 RNA from at least two consecutive nasopharyngeal swab specimens collected ≥24 hours apart (total of two negative specimens

- **Non-test-based strategy**
  - At least 3 days (72 hours) have passed since recovery defined as resolution of fever without the use of fever-reducing medications and improvement in respiratory symptoms (e.g., cough, shortness of breath); and,
  - At least 7 days have passed since symptoms first appeared

**Update:**

As of March 23rd, 2020, patients can be discharged home when clinically indicated. Patients do not need to meet criteria for discontinuation Transmission-Based Precautions. If discharged home before the criteria for discontinuation of Transmission-Based Precautions is met, isolation must be maintained. Isolation at home can be discontinued when the criteria is met [1].

**Public Health Risk:**

Two case studies from China report three asymptomatic, discharged patients who retested positive for COVID-19. The discharge standards for these patients were as following: (1) afebrile for more than 3 days, (2) alleviation of respiratory symptoms, (3) improvement in radiological abnormalities on chest CT or X-ray, and (4) two consecutive negative detection of COVID-19 at least 24 hours apart [4][5].

Another case study from China identified a neonate infected with COVID-19. After treatment, the nasopharyngeal swab changed from positive to negative, while the rectal swab remained positive. They propose that the virus could possibly...
be spread through fecal-oral route. Previous studies revealed that SARS-CoV stayed in stool for up to 73 days [3].

These findings represent a public health risk even after patients have recovered from COVID-19. When discharging patients’ home, we need to educate patients on the risk they pose to others and should encourage careful hygiene to prevent further transmission of disease.

References


CDC & WHO Guidance Updates

By Helen Pozdniakova

CDC

Collecting Clinical Specimens for testing
CDC allows self or healthcare worker collected nasal swabs/nasal turbinate sample as an acceptable specimen type if NP swab is not possible

Priority tiers for testing
1. Tier 1: hospitalized patients and symptomatic healthcare workers
2. Tier 2: patients in long term care facilities OR 65 years and older OR underlying conditions OR first responders WITH symptoms
3. Tier 3: Critical infrastructure workers or individuals who do not meet the above categories or individuals with mild symptoms in areas with high COVID-19 hospitalizations
4. Non-priority: asymptomatic patients

Travel Restrictions
Most European Countries + UK + Ireland are now a level 3 travel health notice with restricted entry into the US.

Number of cases in the US
Up to 54,453 today from 44,183 yesterday

WHO

03/20/2020 - Maintaining a safe and adequate blood supply during the pandemic outbreak of coronavirus disease

1. Theoretical risk of COVID-19 transmission through blood products though transmission of respiratory viruses has never been reported
   a. Testing the blood supply is premature given the absence of cases/data
   b. Pathogen reduction technologies work against SARS-CoV and MERS-CoV in plasma and platelets

2. Recommend installment of strict donor screening methods for individuals who are unwell or have signs or symptoms of respiratory disease
   a. Donors should notify blood center immediately if they develop sx within 28 days of donation
   b. Fully recovered from COVID-19/direct exposure from a confirmed case/traveled from areas should refrain from blood donation for 28 days
   c. They discussed the idea of delaying release of blood products until donor is cleared but it would be difficult for platelets due to short shelf life

3. Managing demand
   a. Good transfusion management

4. Empirc use of convalescent plasma can be a treatment for COVID-19

References

Does ABO blood type influence Covid-19 susceptibility?

By Daniel Menza

Short answer: Too soon to say, but probably.

Long Answer: The reports that people with blood type A are more susceptible to Covid-19 infection compared to those with blood type O is based on one as of yet unpublished study from China. It is an observational study with a sample size of ~2,100 that has not yet been peer reviewed. It examined ABO blood types in a group of Covid-19 patients and compared that with blood types in a group of non-infected individuals. They found a higher proportion of blood type A and a lower proportion of blood type O in the infected group than the control. Their results reached statistical significance in 2 hospitals, and the third they examined showed the same trend but did not reach statistical significance. They also examined a group of patients who expired from the disease and found the same trend with statistical significance. They controlled for age and sex and these did not impact the findings. They did not control for any other confounders.

The preliminary nature of these findings, the relatively small sample size and the lack of controlling for a large number of confounders means that these results cannot yet be taken at face value. However, there are viruses that show preference for certain blood types, like Norwalk virus and Hepatitis B. Compellingly, SARS was shown to be less likely to infect hospital staff with O blood type than those with non-O blood type. One study found that Anti-A antibodies inhibited binding of SARS-CoV S protein expressing cells to ACE2 expressing cells, providing a mechanism for this association. The fact that a similar association was seen in the related SARS virus makes this association plausible, and more research is certainly warranted based on this preliminary study.

Reference

Using ultraviolet light to decontaminate N95 Respirators

By Daniel Menza

This NebraskaMed protocol is being used to decontaminate N-95 respirators. In summary, each member of the clinical team deposits their used respirators in a designated site at the end of each shift. The respirators from each area are brought to a central decontamination site where they are exposed to a set amount of UV radiation. They then deliver the decontaminated respirators back to each unit where they are redistributed to the same staff members. The flowsheet they developed is below. Below that are some considerations for adapting that protocol to HMH and last is a more detailed discussion of the evidence involved.

Comments:

In adapting this protocol, using a higher dose of UV light may be preferable, and so modification of the design of their decontamination room, length of exposure and source of UV light would be the best way to improve upon these protocols. Even at higher doses than used in this protocol, respirator integrity would not be impacted until after many cycles of decontamination.

Another consideration is the model of respirator being used in the hospital. While it may not be possible to change the model at this point due to the shortages, we can check the model being used to see if it was examined in the studies and further determine if this process will be effective.

Details

- They exposed their masks to 60mJ/cm^2, based on a study of using UV light to kill viruses. However, this study was done on different surfaces than respirators.
- Research done on respirators uses much higher doses (~1J/cm^2) because of the rough porous surface.
- This dose is still much lower than the dose needed to impact respirator integrity. Even at much higher doses, respirator function is not what is impacted so much as strength of the respirator materials.
- The model of respirator makes a difference both in ability to be disinfected and ability to retain strength after being disinfected.

In a study about disinfecting respirators with UV light, Mills et al examined influenza, which is a ssRNA virus, like Sars-Cov-2. They found that UV light resulted in a 3-log reduction in viable virus load, which they estimated would be enough to effectively decontaminate respirators in the clinical setting. Studies have shown that ssRNA virus are as a group more susceptible to UV light than other types of viruses, and so it is reasonable to believe that their susceptibility to UV light would be comparable.

In a study about respirator strength after UV light exposure, Lindsley et al, found that respirator filtration is not impacted very much by UV light, it is more strength of the respirator material.

References

Can COVID-19 be spread via Fecal-Oral Transmission?
By Austin Krebs

Bottom Line:
Fecal-oral transmission of COVID-19 has not been confirmed, but viral RNA is consistently present in saliva and stool samples. Some patients that test persistently negative on nasopharyngeal swabs test positive for fecal viral RNA. Duration of viral persistence in fecal samples may be negatively correlated with CD4+ T lymphocyte counts.

Summary of Evidence:
Similar to SARS and MERS, the most common presenting symptoms of COVID-19 are fever, dry cough, and dyspnea. These symptoms are suggestive of droplet and contact transmission, similar to COVID-19’s predecessors. However, nausea, vomiting and abdominal discomfort have also been reported in confirmed COVID-19 cases. Viral RNA has been isolated in the saliva and stool of patients, and live virus has been cultured from both saliva and stool samples. This has implications not only for possible transmission, but also for testing. Saliva testing is non-invasive to the patient and could potentially reduce nosocomial transmission to healthcare workers.

The timing of testing could also affect the likelihood of a positive result. Zhang et al. found that oral swabs were more frequently positive on day 0 of hospitalization, but anal swabs were more frequently positive after day 5 of hospitalization. This raised the possibility that patients might not be suitable for discharge if still actively shedding through the fecal route. In fact, there have been cases of COVID-19 with the sole positive test sample coming from fecal specimens. A 25-year-old woman presenting with respiratory symptoms and fever tested negative on nasopharyngeal swab but positive on a fecal sample. Furthermore, her nasopharyngeal swab and sputum samples were consecutively negative even seven days after admission. This further implies replication in the digestive tract and possible fecal-oral transmission.

Possible fecal-oral transmission is further supported by levels of ACE2 mRNA expression. SARS-CoV-2 binds to ACE2 via its S protein, and this enzyme is the virus’ presumed entry mechanism. ACE2 is predominantly expressed in the small intestine, colon, kidney, testis, and gallbladder with only minimal lung expression. Chen et al. suggest that both fecal-oral and body fluid transmission may be possible, given the extensive expression in the intestines and kidneys respectively.

It has been noted that fecal samples test positive for viral RNA for much longer than nasopharyngeal swabs. Ling et al. explored factors affecting persistence of viral RNA and found that CD4+ T lymphocyte count was negatively correlated with viral clearance. They also found that corticosteroids were associated with delayed viral clearance and did not recommend their use for treatment of mild COVID-19.

In summary, the fecal-oral transmission of COVID-19 has not been confirmed, however evidence points to the possibility of the virus being transmitted via this route.

References
Summary of CDC guidance for extended use and limited reuse of N-95 respirator

By Daniel Menza

In the event of influenza or other infectious respiratory disease pandemic, the CDC recommends the following to conserve the limited supply of masks:

- Minimize the number of individuals who need to use respiratory protection through the preferential use of engineering and administrative controls;
- Use alternatives to N95 respirators (e.g., other classes of filtering facepiece respirators, elastomeric half-mask and full facepiece air purifying respirators, powered air purifying respirators) where feasible;
- Implement practices allowing extended use and/or limited reuse of N95 respirators, when acceptable; and
- Prioritize the use of N95 respirators for those personnel at the highest risk of contracting or experiencing complications of infection.

The CDC recommends extended use over reuse of respirators because it minimizes touching of the respirator. They offer the following recommendations regarding reuse:

- Discard N95 respirators following use during aerosol generating procedures.
- Discard N95 respirators contaminated with blood, respiratory or nasal secretions, or other bodily fluids from patients.
- Discard N95 respirators following close contact with, or exit from, the care area of any patient co-infected with an infectious disease requiring contact precautions.
- Consider use of a cleanable face shield (preferred) over an N95 respirator and/or other steps (e.g., masking patients, use of engineering controls) to reduce surface contamination.
- Perform hand hygiene with soap and water or an alcohol-based hand sanitizer before and after touching or adjusting the respirator (if necessary for comfort or to maintain fit).
- Avoid touching the inside of the respirator. If inadvertent contact is made with the inside of the respirator, perform hand hygiene as described above.
- Use a pair of clean (non-sterile) gloves when donning a used N95 respirator and performing a user seal check. Discard gloves after the N95 respirator is donned and any adjustments are made to ensure the respirator is sitting comfortably on your face with a good seal.

The CDC makes the following recommendations when no respirators or facemasks are available:

- Exclude HCP at higher risk for severe illness from COVID-19 from contact with known or suspected COVID-19 patients.
- Designate convalescent HCP for provision of care to known or suspected COVID-19 patients.
- HCP use of homemade masks
- Use a face shield that covers the entire front (that extends to the chin or below) and sides of the face with no facemask.
- Consider use of expedient patient isolation rooms for risk reduction.
- Consider use of ventilated headboards

Reference

Guidelines for Team Member Decontamination  
_By Katie Veltri_

Background

Our goal is to develop a set of guidelines that team members can use to decontaminate themselves prior to returning home to their families.

Recommendations at Work

- Strict adherence to the use of personal protective equipment: masks, gloves, gowns, and eye wear.
- Perform as many tasks as possible away from patients with suspected/confirmed COVID-19 (e.g., do not remain in an isolation area to perform charting) [4]
- Enhanced hand hygiene
- Surface decontamination:
  - Keyboards
  - Stethoscopes
  - Dictation devices
  - Cell phones
  - Landline phones
  - Name tag/ID badge

Recommendations at Home

- Taking off your shoes, removing and washing clothes, and immediately showering have unclear evidence but may be sensible [1]
- Wash your hands often with soap and water for at least 20 seconds, or use a hand sanitizer that contains at least 60% alcohol [3]
- Clean frequently touched surfaces and objects daily (e.g., phones, tables, countertops, light switches, doorknobs, and cabinet handles) using a regular household detergent and water [3]
- Cover your coughs and sneezes with a tissue.

Self-Monitoring [2]

- Check your temperature twice daily
- Remain alert for respiratory symptoms

If you are at high risk or have symptoms

- Consider using a separate bathroom and bedroom from your household members, if possible.

Other suggestions

- Consider changing from personal clothing to hospital clothing when you arrive to work, and changing again before returning home. [1]

Conclusion

After reviewing the CDC and OSHA guidelines, the best way for Team Members to decontaminate themselves prior to returning home is to protect themselves at work by adhering to safe work practices. Team members should routinely use personal protective equipment, practice hand hygiene, and decontaminate surfaces/equipment.

References