



Personal Protective Equipment (PPE) Conservation Measures

Adopted 4/1/2020

Revised 4/20/2020

Normal expectations for Personal Protective Equipment (PPE) for first responders may not be sustainable during the COVID-19 pandemic in King County. Fire and EMS providers are encouraged to implement strategies in support of extending existing stocks of PPE. **The safety of first responders shall continue to be a priority.**

Purpose

To establish pre-designated strategies for capacity use of PPE during a pandemic crisis by providing guidance for extending existing PPE inventories, the reuse of respiratory protection, and the use and decontamination of alternative PPE.

Capacities

- **Conventional Capacity:** Measures consist of providing patient care without any change in daily contemporary practices. This set of measures, consisting of engineering, administrative, and PPE controls, should already be implemented in general infection prevention and control plans in healthcare settings.
- **Contingency Capacity:** Measures may change daily standard practices but may not have any significant impact on the care delivered to the patient or the safety of healthcare personnel (HCP). These practices may be used temporarily during periods of expected PPE shortages.
- **Crisis Capacity:** strategies that are not commensurate with standard U.S. standards of care. These measures, or a combination of these measures, may be needed to be considered during periods of known PPE shortages.

Definitions

Extended Use: the practice of wearing the same N95 respirator for repeated close contact encounters with several patients, without removing the respirator between patient encounters. Extended use has been recommended as an option for conserving respirators during previous respiratory pathogen outbreaks and pandemics.

Reuse: The practice of using the same N95 respirator for multiple encounters with patients but removing it (“doffing”) after each encounter. The respirator is stored in between encounters to be put on again (“donned”) prior to the next encounter with a patient. N95 respirator reuse is often referred to as “limited reuse”. Limited reuse has been recommended and widely used as an option for conserving respirators during previous respiratory pathogen outbreaks and pandemics.

Decontamination: Removing the contagion threat from PPE in a manner that is harmless to the user. The process of decontamination cannot compromise the integrity or protective performance of the PPE.



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Management Strategies

- Encourage responder to use sound judgment when choosing to don full MEGG for non-symptomatic responses.
- Implement “Scout Model” to minimize the number of individuals who need to use respiratory protection.
- Practice extended use and/or limited reuse of N95 respirators when acceptable.
- Prioritized the use of N95 respirators for those personnel at the highest risk of contracting or experiencing complications of infection.
- Decontaminate N95 respirators following appropriate protocols as needed during ‘contingency’ or ‘crisis’ capacity situations.
- Employ non-traditional PPE when operating in ‘contingency’ or ‘crisis’ capacity.
- Utilize non-traditional PPE in a proactive manner on low-to-moderate-risk patients.

Reuse of N95 Masks

- Use a single N95
 - When transferring patients at area hospitals,
 - Treatment of non-COVID patients,
 - Treatment of patients outdoors.
- Reduce surface contamination of the respirator with a face shield that can be decontaminated (preferred) or a surgical mask over an N95. When appropriate, mask patients, and use engineering controls to limit contaminants.
- Hang used respirators in a designated storage area.
- Decontaminate respirators with department approved measures.
- Minimize cross-contamination by storing masks in a way that does not allow contact between masks.
- Keep masks in a clean, breathable container such as a paper bag between uses.
- Clearly identify mask’s owner with obvious labels.
- Storage containers will be disposed at the end of each shift and when the mask is disposed of due to use.
- Clean hands with soap and water or an alcohol-based hand sanitizer before and after touching or adjusting the respirator.
- Do not touch the inside of the respirator.
 - If inadvertent contact is made with the inside of the respirator, perform hand washing protocols as described above.
- Use a pair of clean (non-sterile) gloves when donning a used N95 respirator and performing a user seal check.

Techniques for Decontamination and Subsequent Reuse of N95 Respirators

King County EMS and King County Fire Departments, in conjunction with UW Industrial Hygienists and Evergreen Hospital, have explored decontamination options. The options provided are for guiding decision-making King County Fire Departments during pandemic outbreaks. This document is not intended to be a comprehensive guide on decontamination and extended use of PPE.

With the understanding that agencies are now utilizing Contingency Capacity practices for N95/respiratory protection for first responders, decontamination and extended use practices should be in place. Each agency may select an option that best integrates into their optional practices.

This document is summary of research and not an absolute guide for possible decontamination techniques. Criteria for assessing methods of decontaminating disposable N95 FFRs have been suggested by the National Academies; the decontamination method must remove the viral threat, be harmless to the user, and not compromise the integrity of the



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various elements of the respirator. While there is guidance from CDC, there are not definitive recommendations from manufactures of N95 style respirators.

NOT recommended methods of decontamination

- Alcohol based cleaners will cause degradation of mask performance.
- Soap and water will cause degradation of mask performance.
- Chlorine-based disinfection methods will remove the static charge in the microfibers in N95 facial masks, reducing filtration efficiency.
- Microwave irradiation studies noted multiple styles of masks melting when microwaved.
- Decontamination using an autoclave will cause degradation of mask performance.

Recommended methods of Decontamination

Ultraviolet germicidal irradiation (UVGI)

UVGI has been demonstrated to be effective in the hospital setting and for controlling airborne infectious diseases. UVGI treatment does not affect effectiveness of the mask. Structural stability (wear and tear) will be compromised before the filtration ability is compromised. UVGI lights can be purchased in small, commercially available units that can be placed at each fire station. Mask should be stored in paper bags, out of direct light, between uses or decontamination cycles.

Light wave, joules, and dose time must be clearly defined by each department based on equipment purchased. A limiting performance factor is potential folds and shadows that may continue to hold infectious particles. UVGI can be used for tablets, radios, BP cuffs, stethoscope, and other items we utilize during EMS responses.

Vaporized hydrogen peroxide

VHP decontamination for a single cycle did not significantly affect mask performance. The metallic nosebands may tarnish. Significant levels of residual hydrogen peroxide vapor off-gassing from mask materials following decontamination are unlikely and not of concern because the vapors decompose readily into water vapor and oxygen. Vaporizing hydrogen peroxide is normally used for clearing of enclosed spaces. Small, readily available machines may not be available or cost effective for all departments.

This option is hardest to implement due to cost, specialized training, and equipment. Currently, an equipment/mask decontamination unit cannot be found on the market. The most common use of vaporized hydrogen peroxide is enclosed spaces/rooms.

Departments will need further engineering to determine time and amount of hydrogen peroxide used bases one square footage of room used.

Ethylene oxide (EtO)

EtO is used in a wide range of work settings including healthcare, diagnosis, and treatment facilities and libraries and museums. EtO decontamination did not affect masks performance.

The time necessary to use an EtO process is limiting factor. EtO decontamination can take up to 5 hours (1-hour EtO decontamination cycle, followed by 4 hours of aeration). Residual EtO remaining on a mask following decontamination is not believed to be a concern because of the final aeration cycle. Like vaporized hydrogen peroxide, EtO is primarily used for enclosed space decontamination. Departments would need additional engineering to establish appropriate times and dose for decontamination based on square footage.



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Microwave Steam

Using commercial based steam bags, microwave steam did not impact mask performance. There are limitations for use of the microwave steam, as nosebands may arch when microwaved. Also, not all microwaves are created equally, and power fluctuations will influence decontamination times. Departments will have to determine most effective duration of steam based on microwave power and type of steam bag used. Throughput is also a consideration – only one mask may be decontaminated at a time. In the study cited, researches followed the direction on the steam bags for amount of water and cycle based on microwave wattage. Because the mask must sit in the water, it may become saturated requiring a prolonged drying time.

Steam bags and microwaves are readily available and cost effective. Departments could place microwaves at select locations for decontamination of masks.

Discarding N95 Masks

- Discard N95 respirators following use during aerosol generating procedures:
 - Cardiac Arrest,
 - Nebulizers or respiratory therapy treatments,
 - Intubations.
- Discard after contaminations with:
 - Blood,
 - Respiratory or nasal secretions,
 - Bodily fluids from patients.
- Discard after close contact with, or exiting from, the care of any confirmed COVID-19 patient.
- If the respirator becomes damaged or hard to breathe through.

Half-Mask Respirators

- Decontaminate half-mask respirators at the beginning and end of each shift.
- Consider reuse of replaceable filters, similar to reuse of N95 masks.
- Discard replaceable filters following use after aerosol producing procedures:
 - Cardiac Arrests,
 - Nebulizers or respiratory therapy treatments,
 - Intubations.
- And contact with:
 - Blood,
 - Respiratory or nasal secretions,
 - Bodily fluids from patients.
- Discard replaceable filters following close contact with, or exit from, the care area of any confirmed COVID-19 patient.
- Obviously damaged or filters that become hard to breathe through should be discarded.

Aprons/Alternative (reusable) gowns

- Have two aprons / gowns available every shift for each responder.
- Consider the use of aprons and sleeves for low- to moderate-risk patients.
- Don aprons in same order as standard Mask, Eye, Gown, Gloves (MEGG) nomenclature.
- Employ Tyvek sleeves for additional protection.
 - Dispose of after every use.



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- Decontaminate aprons gowns after every use according to department decontamination policies.
- Store aprons /gowns in designated area to dry between uses.

Coveralls/Lab Coats/Brush Coats

- Garments used in place of disposable gowns shall be washed at the end of each shift.
 - Wash in hot water.
 - Dry on high heat.
- Alternative fabric garments shall be washed when contaminated with:
 - Blood,
 - Respiratory or nasal secretions,
 - Other bodily fluids from patients.
- Implement higher levels of PPE when use during aerosol generating procedures
 - Cardiac Arrests,
 - Nebulizers or respiratory therapy treatments,
 - Intubations.

References

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- https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/respsource1quest3.html#half
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