# HER Interim Report 2020

## COVID-19 Related Updates on PPEs: Masks, Gloves and Other Items

By
Kenneth Wiener, MS, MA,
Perlite Institute Consultant

# PPEs

- Types
- History
  - Medical
  - Industrial
- Efficiency
  - Exclusion
  - Retention
  - Fit
  - Comfort
- Disposability and reusability

# PPE Types

- Dust masks
- Surgical masks
- Face shields
- Gowns/Protective clothing
- Gloves
- Respirators
  - Full face
  - Half face
  - Powered & supplied air respiratory protection

# A Short History of Masks

Medieval Plague Doctor

19th Century Western Bank Robber

Dr. Wu Lien-teh's c. 1910 cloth plague mask

WWI Gas Mask

1930s Half-face mining respirator available on eBay


3M N95 Mask, developed in 1970s

# Real N95 vs. KN95 & EU Standards Masks (There are fakes out there!)

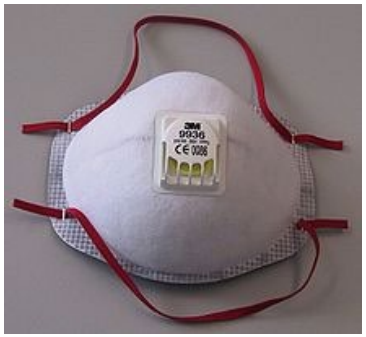
**N95**

- Filters out 95% of 0.3 micron particles
- "N" indicates that the mask is not oil resistant ("R" masks are partially resistant and "P" masks are resistant)
- Efficiency and pressure drop depend on non-woven polypropylene layer

**KN95/FFP2 or FFP3**

- Also classified based on filtering efficiency
- Note potential strap difference and fold difference, leading to differences in fit





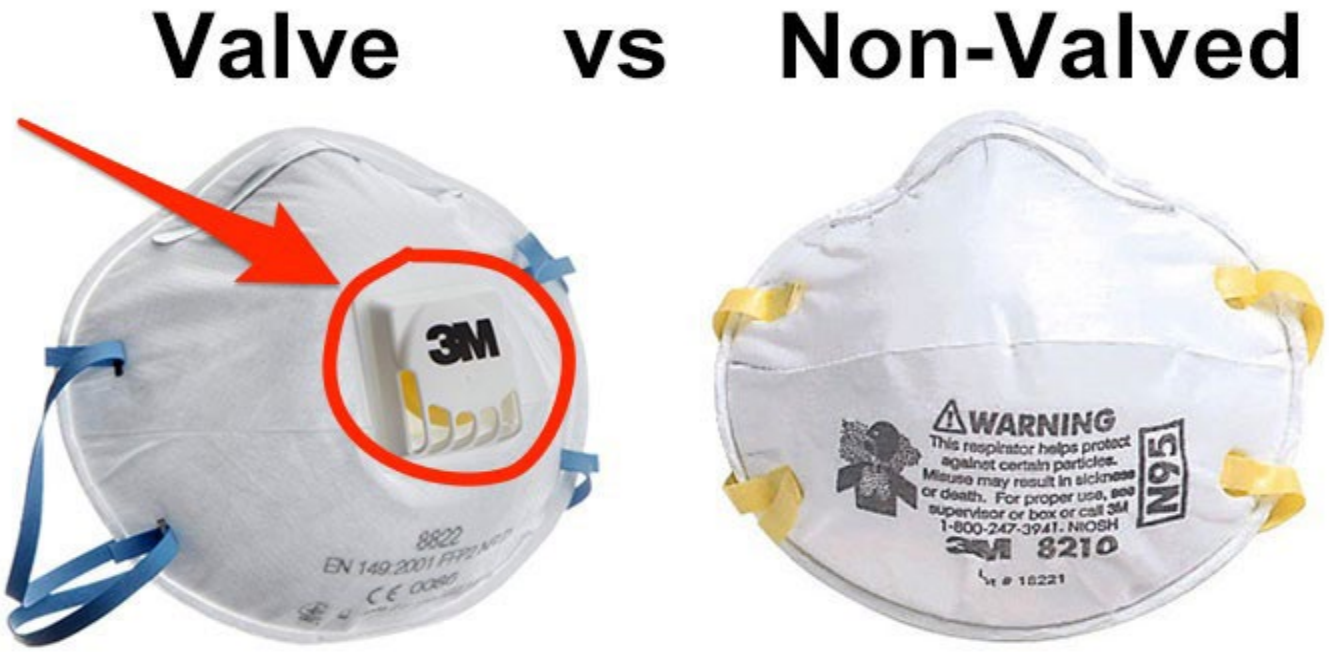
# 3M Personal Safety Division: .pdf Comparison of FFP2, KN95, and N95 Filtering Facepiece

"Based on this comparison, **it is reasonable to consider China KN95, AS/NZ P2, Korea 1st Class, and Japan DS FFRs as "equivalent" to US NIOSH N95 and European FFP2 respirators**, for filtering non-oil-based particles such as those resulting from wildfires, PM 2.5 air pollution, volcanic eruptions, or bioaerosols (e.g. viruses). However, prior to selecting a respirator, users should consult their local respiratory protection regulations and requirements or check with their local public health authorities for selection guidance."

Note that there's a large chart out there with actual specifications that I can send to those who would like to see it. It won't fit on this format.

# Respiratory Protection

# Respirator Valves




✓Valved respirators make it easier to exhale air. This makes them more comfortable to wear, and leads to less moisture build-up inside the respirator. Ideal for things like DIY/construction work.

✕The problem with valved respirators is that they do not filter the wearer's exhalation, only the inhalation. This one-way protection puts others at risk in a situation like Covid-19. This is the reason that hospitals and other medical practices do not use valved respirators.

# Fakes

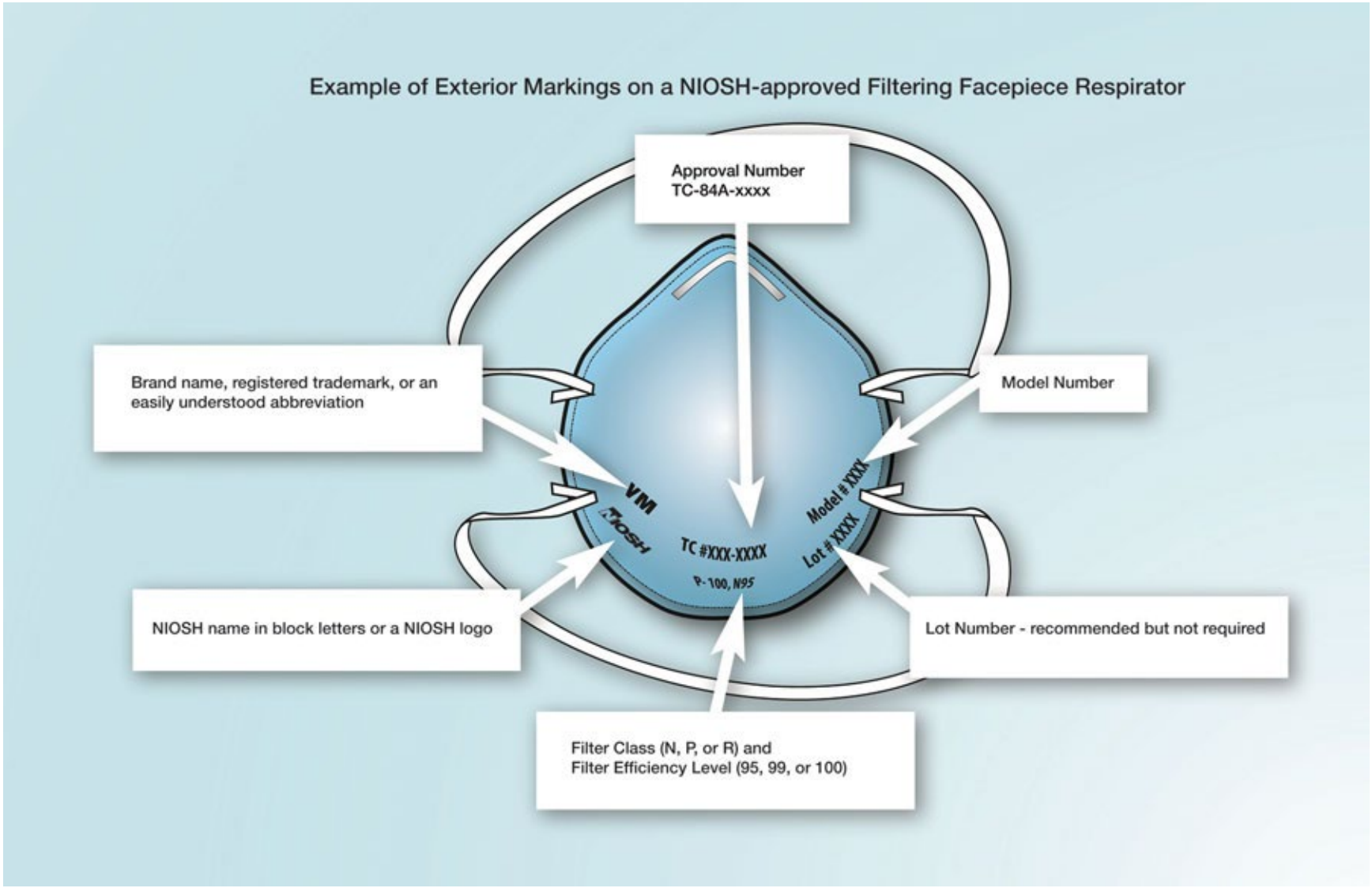
- Real vs. Fake N95 masks: You can check the TC number (Real registrations are marked as TC-84A-xxxx but that may not be the final answer) at: https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/default.html
  - Signs that a respirator may be counterfeit:
    - No markings at all on the filtering facepiece respirator
    - No approval (TC) number on filtering facepiece respirator or headband
    - No NIOSH markings
    - NIOSH spelled incorrectly
    - Presence of decorative fabric or other decorative add-ons (e.g., sequins)
    - Claims for the of approval for children (NIOSH does not approve any type of respiratory protection for children)
    - Filtering facepiece respirator has ear loops instead of headbands

# Masks with Fake Approvals

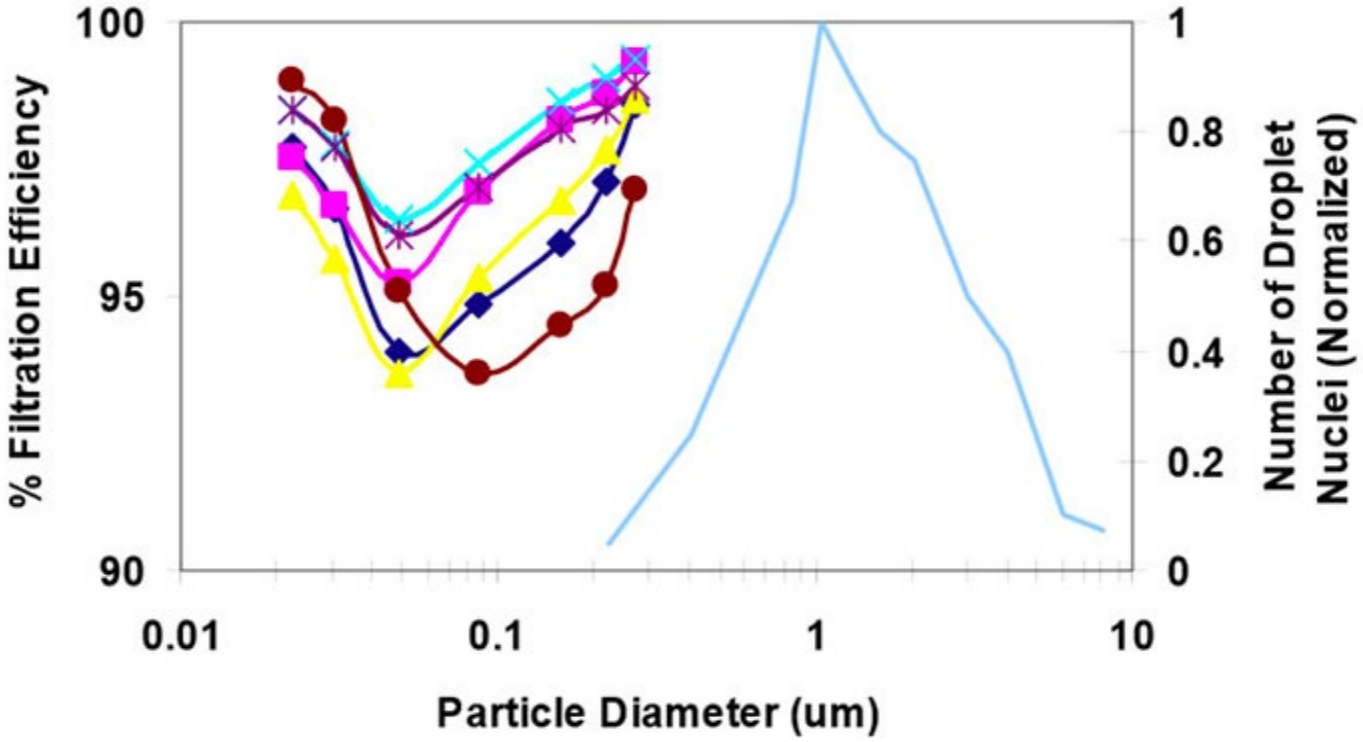
The following vendors or ”Manufacturers” are known to sell products with fake approvals. The list below at https://www.cdc.gov/niosh/npptl/usernotices/counterfeitResp.html was last updated in March 2020. Various reasons are involved.

- Zubi-Ola
- Kosto
- Wein Products
- FitSeal
- Pacifico Salud/Benehal China
- Valpro Safety
- PitBull Safety Products
- Anhui Tongcheng YaGe Health Materials
- Guangzhou Weini Technology & Development Co.
- Yark
- Medicos
- Maskin
- G & F Products
- SOUND
- Shenzhen Ende Medical Technology Co.
- Shanghai Dasheng Health Products Manufacture Co. Ltd’s (SDH): Non-approved models include, but may not be limited to, DTC3X (marked as TC-84A-4329), DTC3W (marked as TC-84A-4335), DTC3B (marked as TC-84A-4336), DTC3Z (marked as TC-84A-8150), and Raxwell RX9501P.

# Markings on Real Respirator Masks



# Filtration Efficiency of N95 Respirator Masks (Left) & Sneeze Droplet Size (Right)




Perlite Dust: 10 microns?
Coronavirus size: 0.1 microns

# Reuse and Renewal Options

## Better

✓ Time & Heat – The combination of time and heat will inactivate the virus. At room temperature (~20°C/68°F) this requires more than 3 days

✓ Oven Heat – 70°C (148°F) heat for between 5 and 30 minutes may inactivate the virus

✓ Steam – hot water vapor from boiling water for 10 mins was able to kill the virus

✓ UV-C Light – 67 J/m2 of UV-C inactivates the virus with low levels of damage to the respirator

✓ Aerosol Hydrogen Peroxide may be successful without damaging the respirator

## Worse

✗All of the below involve mechanical disturbance of the mesh of the respirator!

✗ Washing with soap: Washing respirators can remove viruses but reduces the filtering capacity significantly

✗ Alcohol: Cleaning with 70%+ alcohol can inactivate viruses but reduces the filtering capacity significantly

✗ Bleach Immersion: Bleach can be an effective way to inactivate viruses but immersing respirators in bleach containing solutions can degrade filtration efficiency

# Powered & supplied air respiratory protection

- Easier, more comfortable breathing
- Integrated protection from the neck up
- Allows some facial hair while maintaining fit
- Reduced risk of eye injury
- All day comfort
- Can be used by individuals who can't use unpowered negative pressure masks such as N95 masks
- Limited peripheral vision

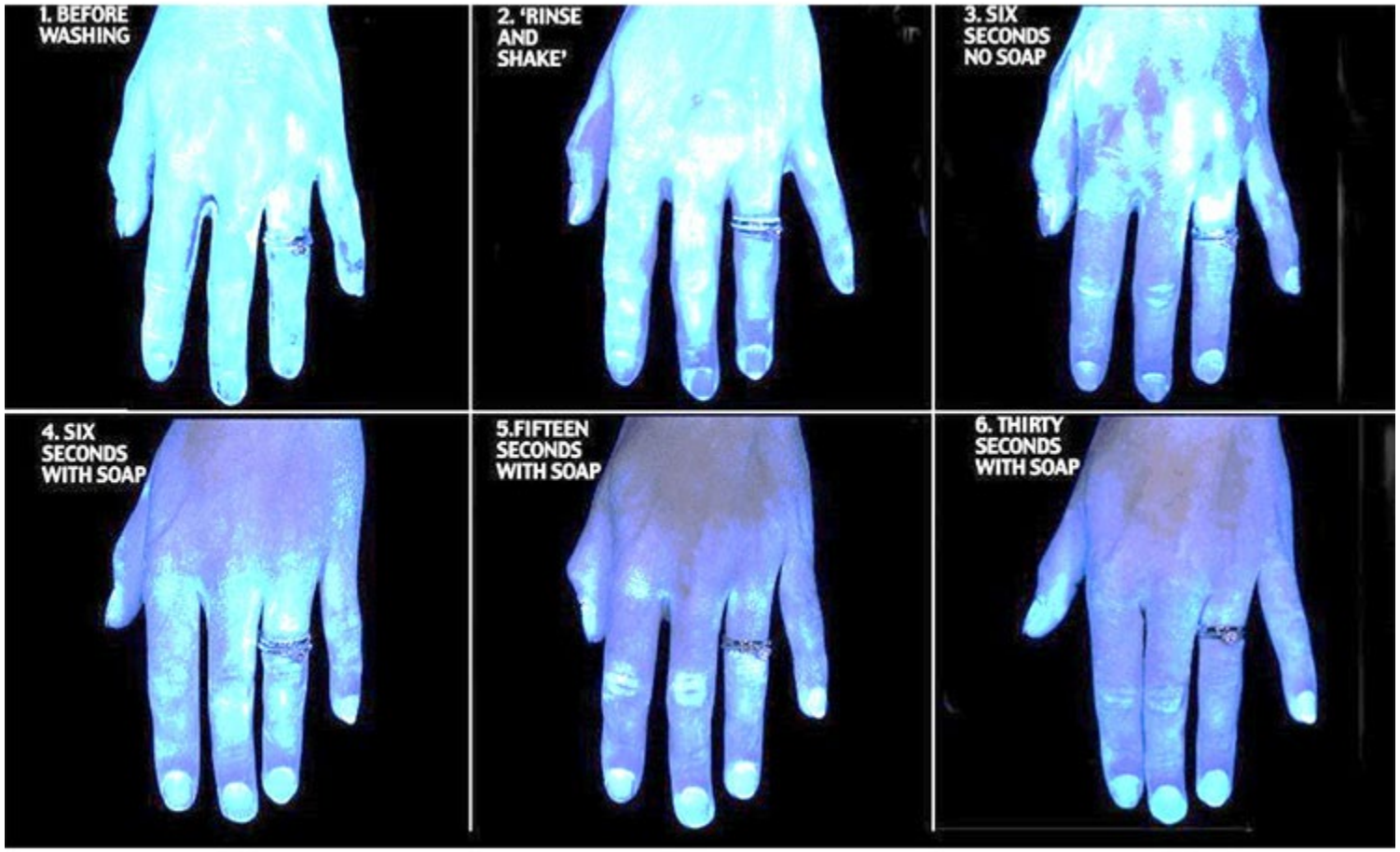
# Eye Protection

Less Protection


More Protection

**Note importance of fit**

# The Importance of Hand Washing



# PPE Gloves

**Leather, Canvas or Metal Mesh Gloves**

- Protection from cuts & punctures (all), burns & heat (leather or canvas only)

**Fabric and Coated Fabric Gloves**

- Fabric gloves and coated fabric gloves are woven from cotton or other materials, offering protection against abrasions, chafing, slivers, dirt and cuts.
- Coated fabric gloves are slip-resistant and are designed to handle wire and lab containers.

**Chemical- and Liquid-Resistant Gloves**

- These gloves are resistant to different kinds of harmful chemicals, body fluids, bacteria and viruses and liquids such as peroxides, rocket fuels, acids, gasoline, and caustics. ***Can come with or without powder.***
  - **Rubber** (Natural, butyl, neoprene, fluorocarbon, and nitrile)
    - **Natural (Latex) Rubber Gloves** – Made of natural rubber latex and offer protection against abrasions and most water solutions of salts, ketones, acids, and alkalis. ***Some people are allergic!***
    - Butyl Gloves – Made of synthetic rubber and offer protection against chemicals, oxidation, abrasion, and ozone corrosion
    - Neoprene Gloves – Made of synthetic rubber and offer protection against gasoline, alcohols, alkalis, organic acids, and hydraulic fluids
    - **Nitrile Gloves** – Made from a synthetic polymer composed of three monomers (acrylonitrile, butadiene, and a carboxylic acid) and offer protection against oils, acids, greases, alcohols, and chlorinated solvents. ***Commonly used.***
  - **Plastic** (Polyvinyl chloride, polyethylene, and polyvinyl alcohol)

**Insulating Rubber Gloves**

- Insulating rubber gloves and all other insulating products for electrical PPE are produced by a seamless process, marketed as its specific class (Class 1, 2, 3, etc.)., and are capable of separately withstanding a specific proof-test voltage after soaking for 16 hours.

# Other PPE: Clothing

Coveralls

Gowns & Face shields

Keep doing what you've been doing regarding these PPE types!

# Perlite Clothing

- Terrycloth sweatbands in hardhats are a nice touch

# In Conclusion

- All masks are better than nothing.
- Some masks are better than others.
- Don’t allow the wearing of a mask to permit unsafe behavior.
- The mask is only as good as the fit.  Workers need to be trained on proper methods of donning and doffing the equipment, as even many medical professionals don’t do this properly.
- Treat the outside of the mask as potentially contaminated.  To do otherwise defeats the purpose of a mask.
- Dispose of used PPE properly if treatment and reuse is not envisioned.