NETEC COVID-19 Webinar Series:

N95 Filtering Facepiece Respirators
Ultraviolet Germicidal Irradiation (UVGI)
Process for Decontamination and Reuse
Welcome

Shelly Schwedhelm, MSN, RN, NEA-BC
Welcome: Shelly Schwedhelm, MSN, RN, NEA-BC

N95 Filtering Facepiece Respirators Ultraviolet Germicidal Irradiation (UVGI) Process for Decontamination and Reuse: John-Martin Lowe, Ph.D.
Terry Micheels, MSN, RN, CIC, FAPIC

Guidance for Respiratory and Eye Protection: Extended Use, Reuse and Reuse After Decontamination: Kate Boulter, RN, BAN, MPH
Jill Morgan, RN, BSN
Trish Tennill, RN, BSN

NETEC Resources: Shelly Schwedhelm, MSN, RN, NEA-BC

Questions and Answers with NETEC
Welcome

National Emerging Special Pathogens Training and Education Center Mission

To increase the capability of the United States public health and health care systems to safely and effectively manage individuals with suspected and confirmed special pathogens

For more information

Please visit us at www.netec.org
or email us at info@netec.org
NETEC Overview

Assessment

- Empower hospitals to gauge their readiness using Self-Assessment
- Measure facility and healthcare worker readiness using Metrics
- Provide direct feedback to hospitals via On-Site Assessment

Education

- Provide self-paced education through Online Trainings
- Deliver didactic and hands-on simulation training via In-Person Courses

Technical Assistance

- Onsite & Remote Guidance
- Compile Online Repository of tools and resources
- Develop customizable Exercise Templates based on the HSEEP model
- Provide Emergency On-Call Mobilization

Research Network

- Online Repository Built for rapid implementation of clinical research protocols
- Develop Policies, Procedures and Data Capture Tools to facilitate research
- Create infrastructure for a Specimen Biorepository

Cross-Cutting, Supportive Activities
N95 Filtering Facepiece Respirators
Ultraviolet Germicidal Irradiation (UVGI)
Process for Decontamination and Reuse

John-Martin Lowe, Ph.D.
Terry Micheels, MSN, RN, CIC
Warnings

- Last Resort—first apply Strategies for Optimizing the Supply of N95 Respirators: Crisis/Alternate Strategies
- Voids the NIOSH approval
- Decontamination technologies should be used cautiously
  - UVGI, vaporized hydrogen peroxide, warm moist heat, etc.
- Should only be done by the organization and trained professionals
- This was the result of multiple tests, a review of the scientific literature, and incorporation of current institutional practice
No one likes that we have to do this

**CDC Crisis/Alternate Strategies**

**Personal Protective Equipment and Respiratory Protection**

HCP use of non-NIOSH approved masks or homemade masks

In settings where N95 respirators are so limited that routinely practiced standards of care for wearing N95 respirators and equivalent or higher level of protection respirators are no longer possible, and surgical masks are not available, as a last resort, it may be necessary for HCP to use masks that have never been evaluated or approved by NIOSH or homemade masks. It may be considered to use these masks for care of patients with COVID-19, tuberculosis, measles, and varicella. However, caution should be exercised when considering this option.¹²

Number of methods previously evaluated

**Food and Drug Administration (FDA)**
- Optimizing Respirator Decontamination to Ensure Supplies for Emergency Preparedness
- Assessed UGVI on 15 FFR models
- Assessing VHP on FFRs for up to 50 disinfection cycles

**National Institute of Occupational Safety and Health (NIOSH), CDC**
- Reusability of Filtering Facepiece Respirators
  - [https://www.cdc.gov/niosh/topics/flu/respiratory.html](https://www.cdc.gov/niosh/topics/flu/respiratory.html)
Initial
• Initial
• Process Design
• Process Evaluation
• Operationalization
• Feed Back

Communication
• Strategy

Safety
• Those Processing
• Those Using

Trust

Discussion with HCW
• Initial
• Process Design
• Process Evaluation
• Operationalization
• Feed Back

N95 Respirator UVGI Process for Decontamination and Reuse

Key Points:
- All N95 Respirators MUST be labeled with your first initial, last name, date of first use and department location (this is important to ensure return of your mask)
- Please limit the daily donning of new respirators as much as possible (extended use, per policy, is strongly encouraged)
- All Used N95 Respirators are to be discarded in your brown “dirty” paper bag
- Respirators sent for decontamination will be returned to you in a new white “clean” paper bag stapled at the top
  - It will include a new brown bag to be used as your “dirty” discard bag
  - Tally marks will be added to the respirator by decontamination staff each time the mask undergoes the decontamination process. Ensure your name and return location are on supplied brown bag
- All disinfected N95 Respirators will be kept in the white “clean” paper bag
- Note the location of your department/facility’s “dirty drop off” and “clean pick up” stations
- Each health care professional is responsible for ensuring the proper fit and integrity of each respirator upon re-use

More detailed information, including a detailed training document, can be found on the link below by scanning the QR code with your phone:
https://www.nebraskamed.com/group/
N95 Respirator UVGI Process for Decontamination and Reuse
| Effects of Ultraviolet Germicidal Irradiation (UVGI) on N95 Respirator Filtration Performance and Structural Integrity |
| https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4699414/ |
| Ultraviolet Germicidal Irradiation of Influenza-contaminated N95 Filtering Facepiece Respirators |
| https://www.ajicjournal.org/article/S0196-6553(18)30140-8/fulltext |
| Inactivation of Viruses on Surfaces by Ultraviolet Germicidal Irradiation |
| https://www.tandfonline.com/doi/full/10.1080/15459620701329012?scroll=top&needAccess=true& |
| Ultraviolet (UV)-reflective Paint with Ultraviolet Germicidal Irradiation (UVGI) Improves Decontamination of Nosocomial Bacteria on Hospital Room Surfaces |
| Nebraska Biocontainment Unit Patient Discharge and Environmental Decontamination After Ebola Care |
| https://www.ajicjournal.org/article/S0196-6553(14)01375-3/abstract |
N95 Respirator UVGI Process for Decontamination and Reuse

Process Map

- Principles
- Clear
- Step by Step
- Flow from each use through reprocessing through reuse
- Everyone knows their role
- Refresher training on Donning and Doffing
- Principles
N95 Respirator UVGI Process for Decontamination and Reuse

Process Map: Healthcare Professionals

- Retrieve new N95 respirator from supply stock.
- On exterior of respirator, clearly write your first initial and full last name, unit, and date of first use in permanent marker.
- Ensure full name and return location are on brown paper bag. Keep this bag for used respirators during shift.
- Use respirator per policy.
- Doff N95. Visually inspect for soil, saturation, and structural integrity.
- Carefully place respirator passing visual inspection in brown bag for UVGI processing. Brown bags will be collected in totes or carts. Do not stack brown bags. Handle brown bags with gloves.
- Repeat previous steps until end of shift. At end of shift, place brown bag containing used respirators at unit’s used respirator collection point.

Healthcare Professionals

- At beginning of shift, retrieve white, stapled paper bag with your own reprocessed respirators from unit’s designated clean pickup point (separated from used dropoff point).
- Carefully open bag and find reprocessed respirators with new brown bag enclosed.
- Ensure your first initial and last name, and return location are written on new brown bag.
- Retrieve respirator with oldest ‘first use’ date from bag.
- Visually inspect respirator, and don per policy. Makeup may discolor but this is OK. Discard if elastic band breaks when stretched, is otherwise visibly soiled, saturated, or torn.
- Perform seal check. Discard and retrieve different respirator if seal check fails.
- Use respirator per policy and use new respirator only when all reprocessed respirators fail inspection.
N95 Respirator UVGI Process for Decontamination and Reuse

Process Map: Courier

1. Travel to designated pickup point.
2. Don gloves only.
3. Collect brown bags containing used respirators from designated pickup point.
4. Transport respirators to UVGI Cell (University Tower, Floor 7, ADU) for reprocessing.
5. Deposit brown bags containing used respirators in soiled utility room.
6. Doff gloves and perform hand hygiene at sink nearest soiled utility room.
7. Log delivery of tote and pickup location on sheet outside of soiled utility room.

For Courier:
- Notify UVGI associate of delivery.
- Collect white bags, stapled at top, with owner's name clearly written on the outside.
- Note delivery location and load white bags into delivery vehicle.
- Deliver reprocessed respirators in white bags to designated clean area in appropriate unit (separated from used pickup point).
N95 Respirator UVGI Process for Decontamination and Reuse

Process Map: UVGI Associate
Optimizing Process

- Trial and error
  - Placement
  - Exposure times

- Surface decontamination process not entire FFR

- UVGI is measured by room UV meter

UV Meter
Organism Kill

- Used BSL2 bacterial and viral surrogates seeded on FFR surface to refine dosage in room
  - *Staphylococcus aureus*
  - Chikungunya virus
  - 10 FFR at each UVGI exposure route
  - $10^6$ organism kill at each round

FFR Fit

- Ran 5 FFR through qualitative fit tests to assure maintained filtration efficiency and fit
- Didn’t use quantitative as it would destroy FFR
- Don’t know how many UVGI cycles the mask can take.
- Others indicate in unpublished data — filter loading from spittle
Guidance for Respiratory and Eye Protection: Extended Use, Reuse and Reuse After Decontamination

Kate Boulter, RN, BAN, MPH
Jill Morgan, RN, BSN
Trish Tennill, RN, BSN
Strategies for Optimizing the Supply of N95 Respirators: Contingency Capacity Strategies

Contingency Capacity Strategies

In the continuum of care, the following measures can be categorized as contingency capacity, which may change daily practices but may not have any significant impact on the care delivered to the patient or the safety of the HCP. The following measures may be considered in the setting of a potential impending shortage of N95 respirators. The decision to implement these practices should be made on a case by case basis taking into account known characteristics of the SARS-CoV-2 and local conditions (e.g., number of disposable N95 respirators available, current respirator usage rate, success of other respirator conservation strategies, etc.).

Administrative Controls

Decrease length of hospital stay for medically stable patients with COVID-19

Currently, CDC recommends discharge of patients with confirmed COVID-19 when they are medically stable and have an appropriate home environment to which to return. CDC lists considerations for care at home in: Interim Guidance for Implementing Home Care of People Not Requiring Hospitalization for Coronavirus Disease 2019 (COVID-19). If patients cannot be discharged to home for social rather than medical reasons, public health officials might need to identify alternative non-hospital housing where those patients can convalesce.

Personal Protective Equipment and Respiratory Protection

Use of N95 respirators beyond the manufacturer-designated shelf life for training and fit testing

In times of shortage, consideration can be made to use N95 respirators beyond the manufacturer-designated shelf life.

Recommended Guidance for Extended Use and Limited Reuse of N95 Filtering Facepiece Respirators in Healthcare Setting

Background

This document recommends practices for extended use and limited reuse of NIOSH-certified N95 filtering facepiece respirators (commonly called “N95 respirators”). The recommendations are intended for use by professionals who manage respiratory protection programs in healthcare institutions to protect health care workers from job-related risks of exposure to infectious respiratory illnesses.

Supplies of N95 respirators can become depleted during an influenza pandemic (1.3) or wide-spread outbreaks of other infectious respiratory illnesses. (4) Existing CDC guidelines recommend a combination of approaches to conserve supplies while safeguarding health care workers in such circumstances. These existing guidelines recommend that health care institutions:

• 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;
Strategies to Conserve N95 usage

- 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 face piece 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.

https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html
Guidance for Respiratory and Eye Protection: Extended Use, Reuse & Reuse After Decontamination

- Extended Use
- Limited Reuse
- Reuse after Decontamination
Guidance for Respiratory and Eye Protection: Extended Use, Reuse & Reuse After Decontamination

General Principles

- Training
- Hand Hygiene
- Fit Testing
  - Temporary relaxation of fit testing regulations
Wearing the same N95 for extended periods:

- Good condition
- Not soiled
- Free from defects or damage
- MUST be capable of forming a seal to the wearer’s face
Reuse N95s

Store between use

Same person, several times, one day only

Limited reuse – restrict the amount of reuse

When reusing – must be functional, not soiled, free from defects and the wearer must obtain a successful seal check

https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html
N95 Reuse

- Discard after aerosolizing procedures
- Discard if grossly contaminated with blood or other bodily fluids
- Discard if used for a patient co-infected with another respiratory infection
- Protect the N95 with a face shield or procedure mask
Guidance for Respiratory and Eye Protection: Extended Use, Reuse & Reuse After Decontamination

N95 Reuse

- Store used N95s in a clean breathable container
- Hand hygiene

https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html
Guidance for Respiratory and Eye Protection: Extended Use, Reuse & Reuse After Decontamination

N95 Reuse after Decontamination

UVGI
Combining the processes

- Extended Use
- Limited Reuse
- Reuse After Decontamination
Guidance for Respiratory and Eye Protection:
Extended Use, Reuse & Reuse After Decontamination

Eye Protection

1. Disinfect surface
2. Doff
3. Disinfect eye protection
4. Store

- Face shield
- Goggles
**N95 Etiquette**

- No touching or readjusting the N95
- Tie long hair up and in a bun
- Do not wear jewelry
- Do not wear respirator on other parts of the body
- Follow directions for storage and/or disposal
Guidance for Respiratory and Eye Protection: Extended Use, Reuse & Reuse After Decontamination

Strategies

- Emory University Hospital and Children’s Healthcare of Atlanta-Egleston Hospital
- University of Nebraska Medical Center / Nebraska Medicine
- NYC Health + Hospitals – Bellevue Hospital
Strategies

Emory University Hospital and Children’s Healthcare of Atlanta-Egleston Hospital
Conduct a **physical inventory** - every unit, clinic, supply closet

**Immediately** take control – under lock and key – of PPE supplies, no matter how well-sourced you feel you are

**Immediately explain why** – In order to ensure that supplies are available when needed

**Initiate a system** for responsible dispensing – who is on isolation, why; use Omnicell/Pyxis or manual log sheets for record of where inventory goes

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**Emory University Hospital and Children’s Healthcare of Atlanta-Egleston Hospital Strategies**

- Conduct a **physical inventory** - every unit, clinic, supply closet
- **Immediately** take control – under lock and key – of PPE supplies, no matter how well-sourced you feel you are
- **Immediately explain why** – In order to ensure that supplies are available when needed
- **Initiate a system** for responsible dispensing – who is on isolation, why; use Omnicell/Pyxis or manual log sheets for record of where inventory goes
Consider a PPE calculator, example:

- 4 respirators/ICU bed/day (if reused per staff member one day only)
- 8 disposable isolation gowns/floor patient/day
- Make estimates for the largest number of beds you could possibly have occupied with COVID-19

**Plan** now for the next phase, **communicate** what **might** come next

- Reuse for multiple days
- Hospital based equipment disinfection
- Cloth and patient gowns as PPE

**Educate**

- We are a creative lot, but we do not want people putting themselves in danger (no wiping or soaking N95’s, do not microwave or bleach them)!

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**Guidance for Respiratory and Eye Protection: Extended Use, Reuse & Reuse After Decontamination**

**Emory University Hospital and Children’s Healthcare of Atlanta-Egleston Hospital Strategies**
Strategize for minimizing entry into patient rooms

• Telemedicine
• Tele-everything! Food and nutrition, social work, discharge planning
• Cluster tasks and meal-times
• Limit specimen collection times
• Reduce hospitality and housekeeping events, Q3d + PRN linen change
  • Ask pharmacy to review MAR’s to cluster meds in sequence (single access) or parallel (multiple access) for IV’s
Guidance for Respiratory and Eye Protection: Extended Use, Reuse & Reuse After Decontamination

Strategies

University of Nebraska Medical Center / Nebraska Medicine
In patient care room doffing (gown and gloves) should happen at least 6 feet from the patient.

Perform **hand hygiene** immediately before leaving the room.

Perform **hand hygiene** immediately after leaving the room.

Don a clean gown and gloves before entering the next patient room.

Continue this cycle until all patient care has been provided.
Guidance for Respiratory and Eye Protection: Extended Use, Reuse & Reuse After Decontamination

University of Nebraska Medicine / Nebraska Medicine Strategies

N95 designated for decontamination and reuse
Strategies

NYC Health + Hospitals
– Bellevue Hospital
NOW

PPE Conservation should start NOW

Time to correct dangerous habits

NYC Health + Hospitals – Bellevue Hospital

Time to deploy safe practices
Know what you have on hand

- And -

Monitor its distribution
Techniques vary
Do not limit yourself regarding PPE conservation
NETEC Resources

Shelly Schwedhelm, MSN, RN, NEA-BC
NETEC Resource

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https://www.cdc.gov/niosh/topics/flu/respiratory.html

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https://www.ajicjournal.org/article/S0196-6553(14)01375-3/abstract

https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html

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Slide 27: https://www.cdc.gov/niosh/topics/hcwcontrols/recommendedguidanceextuse.html
NETEC will continue to build resources, develop online education, and deliver technical training to meet the needs of our partners.

Send questions to info@netec.org - they will be answered by NETEC SMEs

Submit a Technical Assistance request at Netec.org
COVID-19 Specific Resources

NETEC COVID-19 Information
  • https://repository.netecweb.org/exhibits/show/ncov/ncov

CDC
  • https://www.cdc.gov/novelcoronavirus

WHO
  • https://www.who.int/westernpacific/emergencies/novel-coronavirus
Questions and Answers