

COVID-19 PPE Guidelines

Process for Using Xenex LightStrike™ Robots to Disinfect N95 Masks

Katherine Dorsey MSN, RN, NEA-BC
Nursing Director

Sara Hubbard MBA, MA, LSSBB, SHRM-SCP, CPT
Senior Consultant, Operational Performance Improvement

Kyal Rector MSN, RN
Senior Strategic Sourcing Agent – Value Analysis

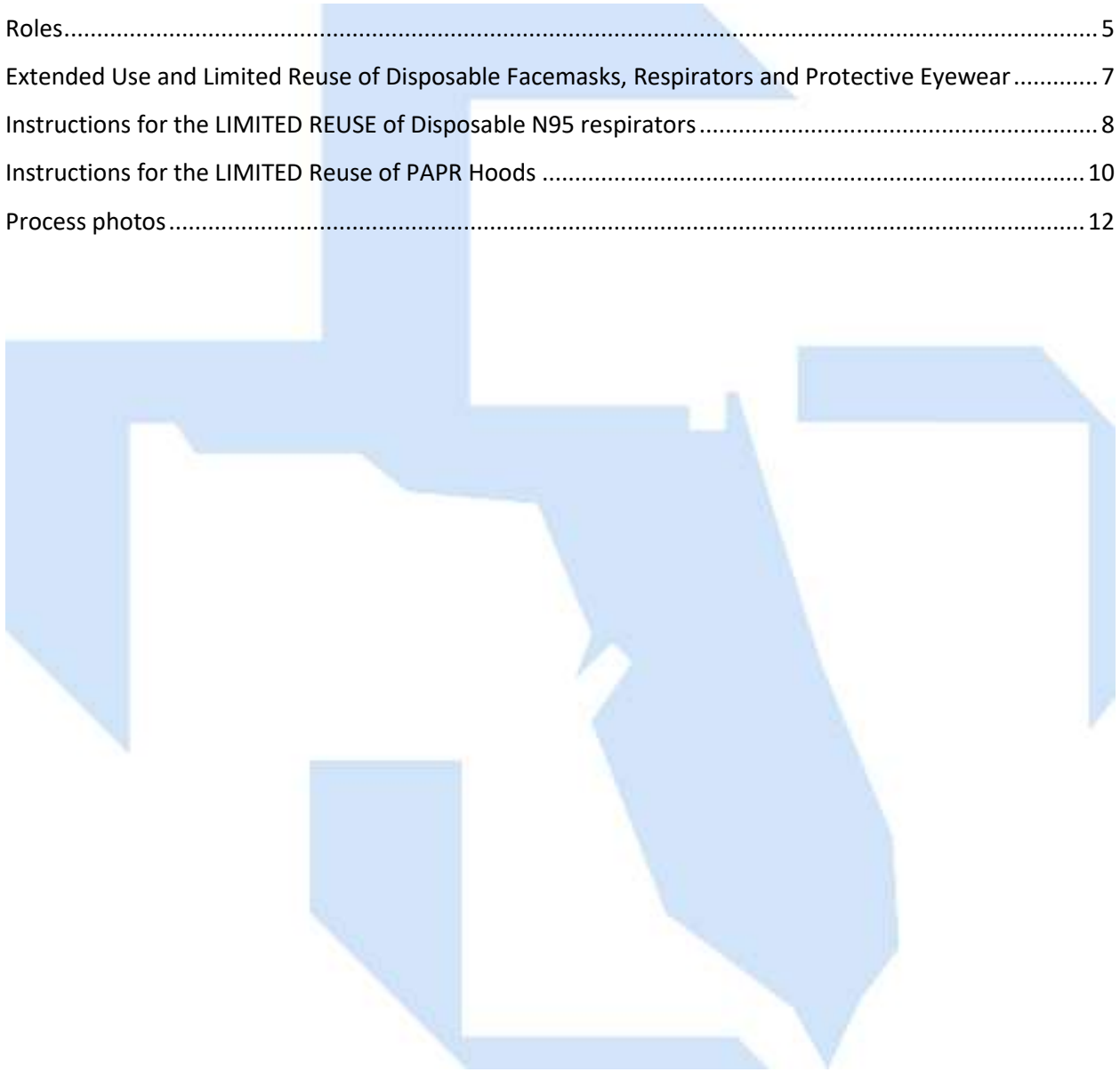


Changing Health Care for Good.®

Baptist Health • Jacksonville, Florida
baptistjax.com

Table of Contents

Introduction	2
Rationale and Method	2
XENEX Decontamination Room Configuration	3
Process Map.....	4
Roles.....	5
Extended Use and Limited Reuse of Disposable Facemasks, Respirators and Protective Eyewear	7
Instructions for the LIMITED REUSE of Disposable N95 respirators.....	8
Instructions for the LIMITED Reuse of PAPR Hoods	10
Process photos.....	12



Introduction

Rationale and Method

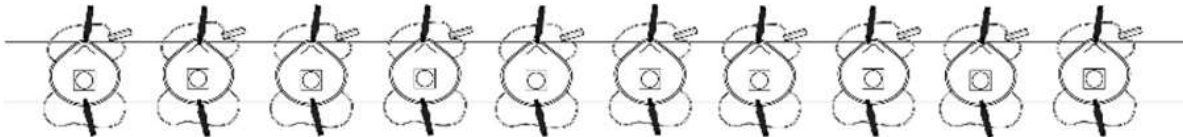
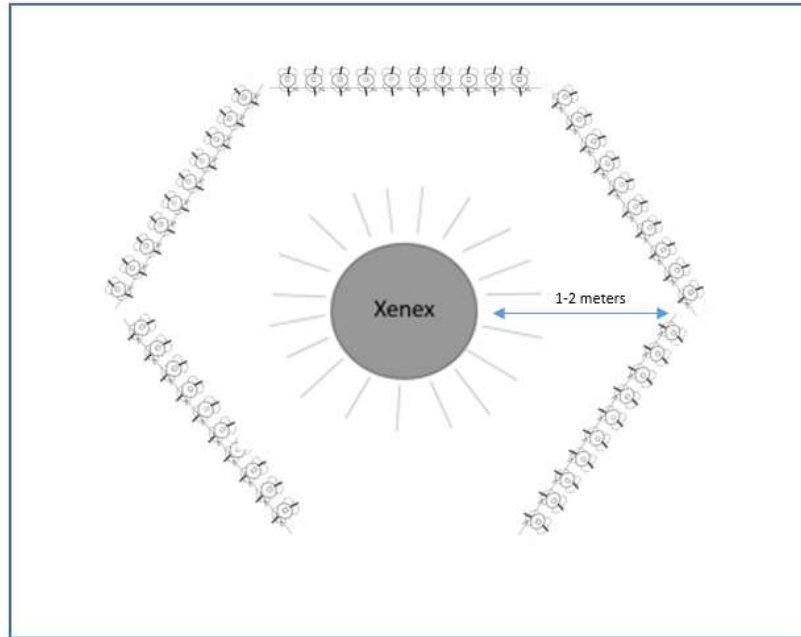
With the anticipated surge in COVID-19 patients in US hospitals, the available supply of N95 respirators is insufficient. The CDC is recommending that facilities consider reuse of respirators in order to conserve the supply for as long as possible. In an effort to extend the supply of N95s at our institution, we developed a decontamination procedure involving the delivery of pulsed xenon ultraviolet disinfection to used N95s. The evidence base supporting this program includes:

- 1) Pulsed xenon ultraviolet produces germicidal ultraviolet that deactivates pathogens on surfaces, including coronavirus (MERS-CoV) and other viruses, bacteria and bacterial spores
- 2) Germicidal ultraviolet has been demonstrated to deactivate viruses on PPE and various N95 masks
- 3) N95 masks have been exposed to pulsed xenon ultraviolet for one hour and have been inspected by a certified occupational health nurse who saw no physical changes in the mask; the pulsed xenon exposed mask (1 hour) also passed a fit test. Pulsed xenon ultraviolet needed to inactivate human respiratory viruses is well below the level of irradiation that adversely affects the fit and filtration characteristics of N95s.
- 4) Pulsed xenon ultraviolet can be safely administered when appropriate safeguards are in place. Herein, we briefly describe our procedure to decontaminate and reuse N95.

The pulsed xenon ultraviolet exposure we have chosen exceeds by several fold the amount of exposure needed to inactivate MERS-CoV and provides a wide margin of safety.

N95s are secured on wires that are strung across multiple wire shelves on wheels in a manner that exposes the N95 surface and resembles clothes hanging on a clothesline. The shelves surround the pulsed xenon ultraviolet robot. Once the exterior surface of the N95 is decontaminated, the operator then turns the shelves around for the inner surface of the N95 to be decontaminated. The pulsed xenon ultraviolet robot is equipped with a single xenon bulb used routinely for the disinfection of patient rooms and operating rooms within our facilities. We decontaminate and reuse the N95s multiple times until the N95 is physically damaged, soiled, or until respirator fit is impacted. Our program involves the units with high N95 use such as our COVID-19 wards and the emergency departments, and we are rapidly expanding where needed. The following method described is the result of multiple tests, a review of the scientific literature, and incorporation of current institutional practice.

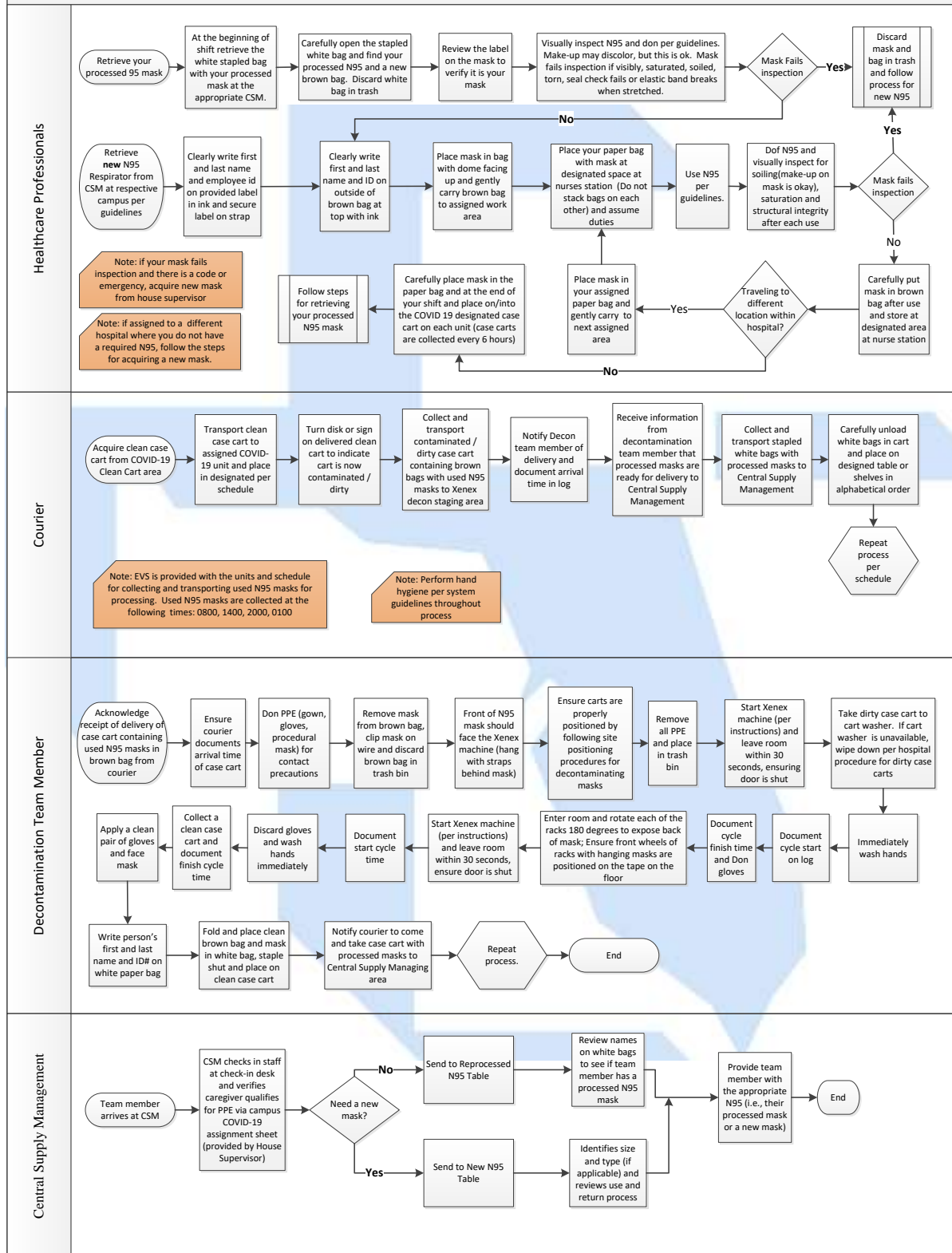
Xenex Decontamination Room Configuration



Process Map

N95 Respirator Ultraviolet Process Decontamination and Reuse 3-30-2020

Process Flow Diagram by Role



Roles

Team Member

- Team member retrieves new N95 from defined COVID-19 Central Supply Management location
- One N95 mask will be issued per shift, per team member
- Team member writes name and employee ID on blank patient label with a permanent marker
- Label is affixed to straps of N95
- Team member dons N95 per guidelines, ensuring integrity of respirator and proper fit
- Team member uses N95 following extended use guidelines

Doffing of reusable N95

- Remove N95 FFR following appropriate doffing guidelines
- Place used N95 FFR in brown paper bag ensuring brown bag is correctly labeled with team member full name and employee ID
- Throughout use, return respirator in brown bag to designated “in use” station within care area
- When ready to send used respirator for decontamination, place bag in department/unit designated “dirty” drop off location
 - This is separate from the department/unit “in use” location.

Courier

- Designated courier collects all used respirators (in brown bags) in a cart
 - Scheduled pick-ups every 6 hours
- Courier takes cart to Decontamination Unit
- Courier places supply of brown bags (containing used respirators) in the Decontamination Unit’s Dirty Storage area.
- Courier performs hand hygiene throughout process
- Courier logs requested information onto the drop off log sheet (name of individual dropping off, contact number, date and time)

Upon Completion of Decontamination Process:

- Decontaminated respirators are in new, clean, stapled white bags displaying team member identification information.
 - The new brown bag that has been placed inside of the clean white bag will serve as new “dirty” bag.
- White bags containing decontaminated masks are delivered to COVID-19 Central Supply Management

Xenex Operator

- Acknowledge receipt of used respirators from courier in decontamination area on decontamination log
- Don PPE (gown, gloves, procedural mask) for contact precautions

- Transfer cart with used respirators to decontamination room
 - Wash dirty case cart via cart washer
 - Wipe case cart
- Open one brown bag at a time and collect respirators from bag, one at a time
- Verify name and employee ID is noted on label.
- Gently clip masks to carts surrounding Xenex, as instructed, minimizing the clipping area as much as possible
- Continue hanging respirators one at a time until complete batch is ready for decontamination
- Ensure respirators do not touch each other during any part of reprocessing
- Carefully fold empty brown bag in half and dispose
- Verify no objects block line of sight between Xenex and hanging respirators.
- Turn Xenex machine “on”
- Select user name
- Enter password
- Select room or zone
- Doff gown and gloves at threshold of door
- Exit room and shut door
- Perform hand hygiene (wash hands thoroughly) immediately outside of room
- Remove procedural mask
- Don gloves only and enter Xenex room after decontamination cycle is complete
- Collect respirators from line, one owner at a time
- Deposit respirators into a new white bag, indicating owner name and employee ID (name only for non-employees)
- Staple white bag shut
- Continue collecting used respirators in white bags labeled by owner until all respirators are collected
- Transfer reprocessed respirators in stapled white bags to courier clean pickup location outside of Xenex room
- Notify courier that respirators are ready for pickup for their location
- Indicate process finish time and number of respirators processed on process log sheet
- Check for delivery of respirators ready for reprocessing

Extended Use and Limited Reuse of Disposable Facemasks, Respirators and Protective Eyewear

Overview:

Respirators include powered air purifying respirators (PAPRs) and disposable N95 respirators. These recommendations are temporary while there are national and international shortages of protective equipment.

Purpose:

- To prevent a shortage or exhaust our supply of respirators.
- To ensure that our staff have access to the necessary supplies to perform patient care safely.

Definitions:

Reuse refers to the practice of using the same N95 respirator for multiple encounters with patients but removing it ('doffing') between at least some of the encounters. The respirator is stored in between encounters and reused.

Guiding Principles:

- N95s and PAPR Hoods can be re-used in a careful and limited way during periods of short supply.
- Guidance is for reuse by a single person (no sharing).
- Disposable N95 respirators worn for COVID-19 patients may be re-used or worn for extended use as long as they are able to seal and have not reached the end of their use by being soiled, damaged or moist from sweat or insensible fluid loss through breathing.
- The use of N95 respirators is prioritized for those personnel at the highest risk of contracting or experiencing complications of infection.
- Limit room traffic where possible by ensuring that only those essential for patient care enter the room; strategies include bundling of care; limiting or avoiding bedside clinical teaching; limiting operating room traffic; and use of telemedicine where possible.

Applicability

These guidelines apply to all team members who need to wear respiratory protection during patient care or as a requirement of their work responsibilities.

Instructions for the LIMITED REUSE of Disposable N95 respirators

General Guidelines

- Extended use or re-use is not recommended if the N95 respirator has reached the end of its use through being damaged or moistened.
- All supplies of N95 respirators will be stored in locked or secured designated areas (ex. a central supply management station, designated areas on specific units, etc.) and will be issued to staff as deemed appropriate.

First time N95 respirator use:

- Team members will be issued new N95 masks via the central supply management center.
- N95s will be issued to team members caring for patients with suspected or confirmed COVID-19.
- Label the N95 respirator and paper storage bag with the user's name before using to prevent reuse by another individual.
 - Write name and Employee ID on provided label, affix to straps of mask
 - Write name and employee ID (or name only for non-Baptist employees) on the exterior of the storage bag
 - A brown bag will be utilized for storage of masks in-use/dirty masks, a white bag will be utilized for storage of reprocessed/decontaminated masks
- Donning
 - Perform hand hygiene
 - Don N95 and perform seal check prior to entering room
 - During patient care, take care to NOT TOUCH your masks or eye protection.
- Doffing
 - While in the patient's room, remove gown close to the doorway
 - Remove gloves
 - Exit the patient's room & perform hand hygiene
 - Remove N95 respirator & perform hand hygiene
 - Store N95 per instructions (see below)
 - Perform hand hygiene.

Storage of Previously Worn Disposable N95 Respirators:

- After removing N-95, visually inspect for contamination, distortion in shape/form
- If contaminated/wet, creased or bent, N95 should be discarded.
 - If the N95 is NOT visibly contaminated or distorted, carefully store to avoid destroying the shape and consistency of the mask
 - The N95 should be stored in the designated brown paper bag with user name and employee ID
 - Store masks in-use within your unit's designated "in-use" location

- Satellite ED Sites
 - One N95 mask will be assigned to each qualifying team member per shift
 - Continue to follow the above process throughout assigned shift
 - Dispose of N95 at the conclusion of your shift

Process to re-use your disposable N95 respirator:

- After removing N95 from brown paper bag, team member visually inspects the mask for contamination, distortion in shape/form or any other physical compromise
- If contaminated/wet, creased or bent, N95 should be discarded
- Donning
 - Perform hand hygiene
 - Don gown.
 - Don the N-95 respirator (decontaminated by Xenex)
 - Perform a negative/positive seal check by doing the following:
 - No air should be felt around the perimeter while blowing out. If you feel air coming out it is not a tight seal.
 - When taking a small breath in, the mask should pucker in slightly. If it does not, it is not re-usable.
 - When breathing out you should feel the respirator expand slightly. If it does not, it is not re-usable.
 - If not a tight seal, the respirator cannot be re-used.
- Ensure the mask is breathable, if unable to breathe in the mask, the N95 should be discarded
- Perform hand hygiene and don gloves following seal check.
- Continuing donning order and enter patient's room
- Follow above outlined doffing procedure when exiting patient room

Instructions for the LIMITED Reuse of PAPR Hoods

General Guidelines

- Team members, who are unable to wear an N-95 as per Employee Health, or as otherwise decided by administration, will report to the COVID-19 Central Supply Management for PAPRs at the start of their shift.
- The hood and breathing hose assigned to each team member will be reutilized continuously until physically compromised or deemed no longer functional.
- When donning and doffing PAPRs, team member should follow the Baptist Health guidelines regarding donning and doffing of PAPRs and PPE as outlined on the homepage.

Issuing

- COVID-19 Central Supply Management will issue qualifying team members a designated hood and breathing hose as well as a reusable PAPR with filters as needed.
- The assigned hood and breathing hose will be issued for single user use and are not to be shared.
- A full inspection of the equipment should be performed at time of pick up to include:
 - Visual inspection
 1. PAPR body, checking for deformities or any damage
 2. Visual inspection of the filters, checking that the caps were removed and the two filter canisters are hand tightened to the PAPR body with the rubber gaskets in place
 3. Visual inspection of the bottom of the PAPR body, checking that the third inlet has a screw-in cap sealing it. This inlet is not used for HEPA filtration
 4. Check that the battery pack is attached and secured
 5. Check that the belt is secured to the PAPR body and is not damaged in any way
 6. Inspect the breathing hose for any deformities, cracks, dry rot, or discoloration
 7. Inspect the PAPR hood, paying additional attention to the seams, and also the threaded connection which should be hand tight to the breathing hose
 8. Ensure that the plastic or paper film is removed from the visor. This may be present on both sides
 - Airflow check with included gauge
 1. For a hooded PAPR, continuous airflow should be above 6 cfm (cubic feet per minute). This is shown by the ball floating above the line
 2. If there are two lines on the gauge, use the line showing 6 cfm
 - Assigned team member dons PAPR unit, and properly sizes their belt
 - With PAPR turned on, team member dons the hood, ensuring they are familiar with the device, and comfortable operating in it (All PAPRs and hoods must go through this process, even with new equipment)

- Team member signs out PAPR in log book
- After issuance, team member is responsible for the low-level decontamination of the PAPR whenever doffing the unit and between patient contacts
- For any issues with the PAPR functionality during the shift, the team member will return to the staging area for proper maintenance, including battery exchanges
- The PAPR will be returned to the central staging area upon completion of the team member's shift to be disinfected and inspected
 - Review of any concerns/challenges at check-in with managing team member
 - The decontamination team member will ensure all PAPR parts are returned and check them in for decontamination

Disinfection of PAPR components including the hood for re-use

- Don gloves and a procedure mask
- Carry the PAPR to the PAPR processing area without coming into contact with the device.
- Visually inspect the PAPR hood for contamination
- Discard and do not re-use if visibly contaminated
- If visible contamination is not observed, do not disconnect any of the PAPR components if it will be reused during the shift
 - Do not remove the PAPR filters from the motor unless flow test fails due to clogged filters
- Disinfect the PAPR motor, belt, hose and hood using EPA approved germicidal wipes labelled to kill human coronaviruses, while observing contact time using the following order:
 - PAPR motor and filters (avoid introducing liquid into the filter holes)
 - Belt
 - Hood (wipe the outside)
 - Be sure not to introduce cleaning solution into the filter.
- Once completely dry, remove the hood from the hose and place the PAPR in a clean area close to where it will be reused. The hood and hose will be stored for the team member to wear during their next shift

Storage of Decontaminated PAPRs

- PAPR body, filter canisters and battery will be inspected
- Batteries replaced or charged, and made ready for the next use.
 - Alkaline batteries only need to be replaced if the low battery alert is sounding
- Hood/hose combination should be stored in the tube that the hood came with (see picture, which follows)
- The team member's information should be written on the outside of the tube
- If tubes are not available for storage, decontaminated and dry PAPRs can be stored in a bag, labeled with the team members information

N95 Process Photos



Clipped Masks

N95 Control Log						
	Date	Cart Drop off time	Start Time of 1st Cycle	Start Time of 2nd Cycle	Total # of masks	Initials of Operator
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Page 1

Courier Log



Courier cart location for contaminated masks



Clipping N95 on wire



Positioning Xenex machine



Xenex machine on



Rotating mask for second cycle



Staging bags



N95 Identification (after decontamination)



N95 matched with white bag (after decontamination)



Team member receiving white bag with folded brown bag and N95 mask



Team member discard white bag, place N95 mask in brown bag

PAPR Process Photos

Current marking for decontamination cycles.

Team member name and date opened.

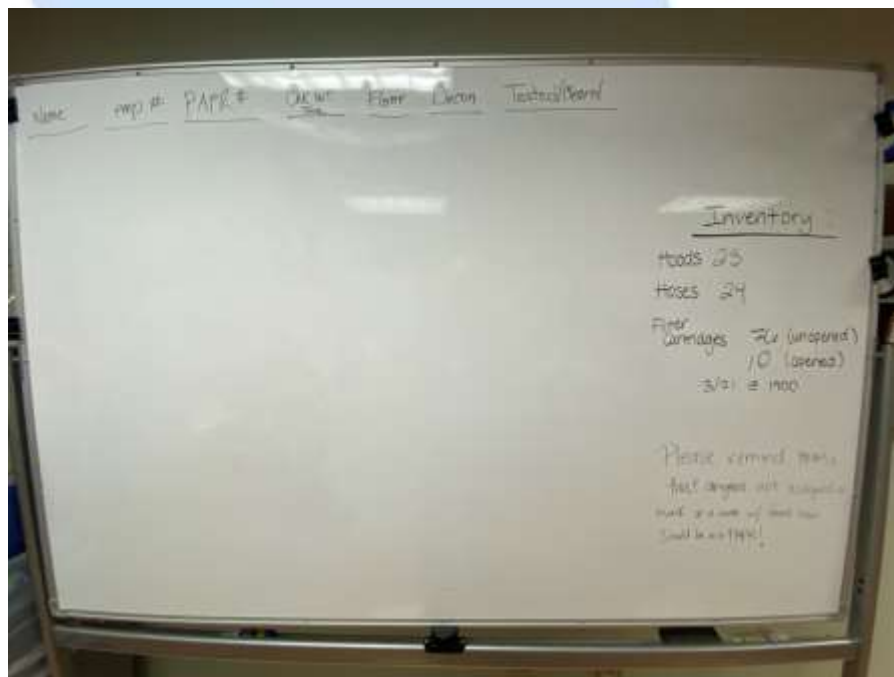


PAPR Identification



Float above the line, showing proper airflow.

PAPR Air-flow meter



PAPR Whiteboard



Decontaminated
hood/hose
combinations;
ready for the team
member's next shift

PAPR Storage Cart



Changing Health Care for Good.®

Baptist Health • Jacksonville, Florida
baptistjax.com