DISPOSABLE RESPIRATORS FOR FLU PREVENTION

Environmental Health and Safety Department
University of Colorado at Boulder

GENERAL FLU PREVENTION

Influenza or "flu" can be spread by touching the skin of other people or objects contaminated with infectious droplets and then touching the eyes, nose, or mouth. Contamination typically occurs when an infected person coughs or sneezes droplets onto themselves, other people, or nearby surfaces.

The best protection from flu exposure in public places (i.e., other than health care and medical transport settings) is to wash your hands frequently and avoid touching your eyes, nose and mouth. People are also urged to properly cover/contain their coughs and sneezes and to practice "social distancing," that is, ensuring that you are at least three feet away from someone who is coughing or sneezing or staying home when you are ill to prevent making others sick. Outside the health care and medical transport settings, the CDC does not recommend the routine use of respirators. However, a pandemic outbreak would present an exceptional situation, demanding the need for non-routine disease transmission controls and practices.

SURGICAL MASKS

Surgical masks (different from N95s) are considered "loose fitting barriers" and are primarily intended to protect patients from health care workers in clinical or emergency medical situations. Surgical masks are also used on patients with communicable conditions to help contain respiratory droplets and reduce the spread of infectious particles, blood and body fluids. Typically, surgical masks are multi-layered and have at least 95% bacterial and viral collection efficiencies for aerosols greater than about 2 microns. The old washable cotton styles have essentially been replaced with synthetic disposable devices held on the face with ear

loops or elastic ties. Prices range from $0.05 - $0.25 per mask and some are available in child sizes.
Surgical masks are not designed for use as particulate respirators and do not provide as much protection as a properly fitted N95 respirator. Most surgical masks do not effectively filter tiny particles from air and do not prevent leakage around the edge of the mask when the user inhales. However, since flu appears to be transmitted mainly through direct contact with infectious materials (including large respiratory particles), surgical masks will provide barrier protection against droplets that are considered to be the primary routes of transmission.
It is recommended that disposable surgical masks being made available to members of the general public who are not working in direct contact with flu victims. These masks can be worn with relative comfort for many hours at a time, helping to control the spread of flu droplets, as well as hand to mouth and nose contact. And since many wearers will be using their masks during routine activities (eating, drinking, etc.), having a tight face seal becomes somewhat irrelevant. It is also recommended that anyone with a cold or cough wear a surgical mask to avoid infecting others.

N95 MASKS – GENERAL USE

N95 disposable respirators can be used to protect your respiratory system by filtering particles, aerosols and droplets, bacteria and viruses from air that you breathe. "95" means that filtration is 95% efficient for particles 0.3 microns and larger. Similarly, N99s filter out at least 99% of 0.3 micron particulate, and N100s filter at least 99.97%. The "N" designation means that the mask is not resistant to oil, an important designation in industry because some industrial oils can degrade the filter performance. N95s are <u>not</u> to be used for filtering gases or chemical vapors.

Be sure to choose masks that are National Institute for Occupational Safety and Health (NIOSH) approved, N95-rated, with an adjustable nose clip and two elastic straps. Prices vary considerably. A "bare-bones"

disposable, NIOSH approved, N95 particulate mask (without nose padding or moisture control) that you'd wear for a maximum of a few hours, can be purchased for around $0.30. Less expensive, nuisance or "allergy" dust masks (without the N95 rating) can be obtained for as little as $0.05 each, but particle-size protection would be a concern, i.e., there's no guarantee that the paper would be effective in preventing the infiltration of bacteria and viruses. A "top-of-the-line" disposable particulate mask with exhalation valve, nose padding, moisture layering, and adjustable straps costs around $1.25.

Some masks have one-way exhalation valves that keep the user cooler under the mask and reduce moisture build-up. These valves prevent particles from being inhaled, but they will not keep contaminated particles from being exhaled - so don't put a mask with a valve on a sick person because they will still be able to exhale contaminated particles (use a surgical mask instead). Particulate respirators are not recommended for use by small children, and people with medical conditions, such as asthma or claustrophobia, might not be able to wear respiratory protection.

It is critical to use other personal protective equipment (gloves, eye protection, etc.) where appropriate, and to follow disease control practices, including frequent hand-washing, and avoiding touching your eyes, nose and mouth. Hygienic practices must be implemented when removing and disposing of a contaminated mask.

Plan on using massive supplies of disposable gloves. Latex gloves are available for less than $.05 each, and nitrile gloves (better because there's less risk of allergic reactions) cost around $0.10 each. Gloves are available in several sizes (SM, M, L, XL) but I've found that the Large size has the best chance of fitting most people. Consider the purchase of hand sanitizer as well.

REUSE OF DISPOSABLE MASKS

If a sufficient supply of respirators is not available, one can consider the reuse of non-contaminated devices as long as they have not been obviously soiled, creased, torn or moisture-degraded. The Institute of Medicine recently evaluated the issue of re-using, and thereby prolonging the life of, disposable particulate respirators. They decided that paper respirators cannot be decontaminated or disinfected without degrading the masks. However, if an individual needs to re-use their own disposable mask, they should place a surgical mask over the N95 to help prevent surface contamination, and use appropriate hand hygiene when donning and removing the face pieces.

Keep new masks or non-contaminated used masks (in good condition) in plastic bags and store them in dry locations away from excessive heat and sunlight. Worn-out, non-contaminated masks can be disposed directly into the trash. Contaminated masks should be removed carefully, avoiding direct contact with the outside surface; place it into a plastic bag, close the bag, put the bag in the trash, wash your hands, and disinfect potentially contaminated surfaces.

N95 FIT-TESTING

More important than whether the respirator is an N95 or another type, fit-testing and training are key elements in maximizing the effectiveness of respiratory protection. Respirator protection is maintained only if an adequate seal can be achieved around the nose and mouth, otherwise particulates will pass around the mask. It is important that an initial fit test be performed, and that the test is repeated at least annually, or whenever a different brand, size, or type of mask is issued, or when the wearer has experienced significant physical changes since the last test (weight loss $\geq$ 20 pounds, dental work, etc.).

Some people can be quantitatively fit-tested using *Bitrex* solution. Fit-test kits should be Occupational Safety and Health Administration (OSHA) approved for fit testing disposable particulate respirators. The *Allegro Bitrex Fit-Test Kit* sell for around $150, and does about 25 tests;

replacement test solutions (25 additional tests) can be obtained for around $30. Some people, however, are unable to adequately smell/taste the aerosol, excluding them from quantitative fit testing. In any case, every N95 wearer can proceed with qualitative fit testing as follows.

Respirator wearers should perform these tests in the field every time they don a mask

1. Choose a suitable sized mask and don the respirator with the bottom elastic strap behind the neck and the top strap across the back crown of the head, above the ears. Lengthen or tighten the straps (if adjustable) to achieve a snug, but comfortable fit.
2. Using both hands, squeeze the metal nose piece to conform the mask around the top of the bridge of the nose. Adjust the position of the mask so there are no observable gaps, especially around the nose and under the chin.
3. Cover the mask with both hands and blow out slightly; air should not pass around the seal.
4. Breathe in quickly through the mouth – the mask should collapse slightly without detecting that air is entering around the face seal.

HEALTH CARE WORKERS

Most transmission of flu to health care workers occurs after contact with infected individuals. It is recommended that in addition to an N95 respirator, patient care staff and medical transport workers use standard hygienic practices, gloves and gowns, and eye protection. Health care staff and others involved in contact with flu victims or infectious materials (custodians, quarantined service staff, etc.) should consider wearing NIOSH approved N95 masks like the 3M-1860, which is fluid resistant against microorganisms. These respirators cost around $1 each and can be worn for several hours at a time.

Remember that infectious material deposited on personal protective equipment may cause it to become a vehicle for direct or indirect transmission. Therefore, care is needed when removing personal

protective equipment to avoid contaminating skin, clothing, and mucous membranes. Once worn in the presence of a flu patient or infectious materials, the respirator should be considered potentially contaminated, and touching the outside of the device should be avoided. Upon leaving the contaminated area, the respirator should be removed, sealed in a plastic bag and discarded, followed by hand hygiene.

Health care staff and other workers in proximity to flu victims or in contact with contaminated materials should plan on using up to four N95 fluid resistant masks per person per day, or two N95s along with 4 surgical masks to use as replacement covers.

NON-HEALTH CARE EMERGENCY RESPONDERS

Hazardous material spill responders, fire fighters and other personnel who respond to emergencies should wear their individually issued and fit-tested negative or positive pressure, tight-fitting respiratory protection. Proper decontamination and hygienic practices should be emphasized after working in locations where flu victims or infectious materials were present. HEPA cartridges are adequate to filter bio-infectious organisms.