



TITLE: Use of N99 Respirator Masks During a Pandemic: Clinical Effectiveness

DATE: 14 October 2009

RESEARCH QUESTION:

What is the clinical effectiveness of N99 respirator masks during a pandemic?

METHODS:

A limited literature search was conducted on key health technology assessment resources, including PubMed, the Cochrane Library (Issue 4, 2009), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI, EuroScan, international health technology agencies, and a focused Internet search. The search was limited to English language articles published between 2004 and October 2009. No filters were applied to limit the retrieval by study type. Internet links were provided, where available.

RESULTS:

HTIS reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, controlled clinical trials, observational studies, and guidelines.

Three relevant guidelines were identified. No relevant health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, controlled clinical trials, or observational studies were identified. Additional articles of interest may be found in the appendix.

OVERALL SUMMARY OF FINDINGS:

Respirators are certified by the National Institute for Occupational Safety and Health (NIOSH) and are rated based on the percentage of inhalable particles that they are able to filter from the air.² Therefore, an N99 mask is able to filter 99% of small inhalable particles from the air.

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No studies pertaining to the clinical effectiveness of N99 respirator masks were retrieved. Guideline information specifically pertaining to N99 respirator masks was limited to one recommendation by the United Kingdom Department of Health Guidance for Infection Control.³ This department states that health care workers (HCWs) should use N99 respirators during respiratory aerosol-generating procedures in patients with confirmed pandemic influenza, or pandemic influenza-acquired pneumonia. The appendix contains additional information that may be of interest including a list of NIOSH-Approved N99 respirators. Recommendations regarding N95 or higher masks are provided below.

Two of the three included guidelines recommend the use of respirators classified as N95 or higher for health care workers (HCWs) during activities performed on patients with suspected or confirmed pandemic influenza, or pandemic influenza-acquired pneumonia, that are likely to generate infectious respiratory aerosols, such as intubation and resuscitation.^{2,3} The US Department of Health & Human Services specifies that reusable respirator masks must be decontaminated after each use and a new filter must be inserted before the next use.² The Centers for Disease Control and Prevention (CDC) state that respirators are not recommended for use by the general public during an influenza pandemic.¹

The CDC states that respirators classified as N95 or higher are recommended for HCWs caring for patients known to be infected, or probably infected with H1N1 virus.^{1,3} Canadian recommendations limit the use of respirators classified as N95 or higher to those HCWs exposed to patients displaying a strong cough who are not wearing a mask, or during an aerosol-generating procedure during an H1N1 pandemic.³ The Ontario H1N1 pandemic plan recommends masks be worn by HCWs when treating suspected influenza cases and respirators classified as N95 or higher when treating confirmed H1N1 cases.³ All three included guidelines state that respirators classified as N95 or higher are recommended for all HCWs exposed to patients with confirmed H1N1 influenza during aerosol-generating procedures.¹⁻³

REFERENCES SUMMARIZED:

Health technology assessments

No literature identified

Systematic reviews and meta-analyses

No literature identified

Randomized controlled trials

No literature identified

Controlled clinical trials

No literature identified

Observational studies

No literature identified

Guidelines and recommendations

1. Centers for Disease Control and Prevention. *Interim recommendations for facemask and respirator use to reduce 2009 influenza A (H1N1) virus transmission* [Internet]. Atlanta (GA): Centers for Disease Control and Prevention; 2009. [cited 2009 Oct 9]. Available from: <http://www.cdc.gov/h1n1flu/masks.htm>
2. Interim guidance on planning for the use of surgical masks and respirators in health care settings during an influenza pandemic [Internet]. In: *Hospital planning*. Washington (DC): U.S. Department of Health & Human Services; 2006. [cited 2009 Oct 8] Available from: <http://www.flu.gov/professional/hospital/maskguidancehc.html>
Note: see Appendix B: types of surgical masks and respirators used in health care settings
3. Afilalo M, et al. *Healthcare worker protection in the emergency department during pandemic influenza: a position paper* [Internet]. v.6.3. Québec (PQ): l'Association des médecins d'urgence du Québec; 2009. [cited 2009 Oct 8] Available from: http://www.amuq.qc.ca/AxisDocument.aspx?id=2950&langue=fr&download=true&document=Position_Paper_Pandemic_Influenza_v6.2.pdf
Note: see Appendix III: Guideline Recommendations, page 102

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APPENDIX – FURTHER INFORMATION:

Observational studies

4. Eninger RM, Honda T, Adhikari A, Heinonen-Tanski H, Reponen T, Grinshpun SA. Filter performance of n99 and n95 facepiece respirators against viruses and ultrafine particles. *Ann Occup Hyg*. 2008 Jul [cited 2009 Oct 8];52(5):385-96. Available from: <http://annhyg.oxfordjournals.org/cgi/content/full/52/5/385> PubMed: PM18477653

Review articles

5. Liverman CT, Harris TA, Rogers MEB, Shine KI, eds. *Respiratory protection for healthcare workers in the workplace against novel H1N1 influenza a: a letter report* [Internet]. Washington (DC): Institutes of Medicine of the National Academies; 2009 [cited 2009 Oct 8]. Available from: http://www.shea-online.org/Assets/files/policy/IOM_Report.pdf
Note: see p. 22
6. Thiessen RJ. Filtration of respired gases: theoretical aspects. *Respir Care Clin N Am*. 2006 Jun;12(2):183-201. PubMed: PM16828690
7. The Campbell Commission. *SARS commission final report: Volume three spring of fear* [Internet]. Toronto: Ministry of Health and Long-Term Care; 2006. Chapter eight: It's not about the mask. [cited 2009 Oct 8]. Available from: http://www.health.gov.on.ca/english/public/pub/ministry_reports/campbell06/online_rep/Vol3Chp8.pdf
Note: see p. 1090

Additional references

8. National Institute for Occupational Safety and Health. *NIOSH-approved N99 particulate filtering facepiece respirators* [Internet]. Washington (DC): The Institute; 2009. [cited 2009 Oct 8]. Available from: http://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/n99list1.html
9. Cosgrove CE, Jenckes MW, Wilson LM, Bass EB, Hsu EB. *Tool for evaluating core elements of hospital disaster drills* [Internet]. Rockville (MD): Agency for Healthcare Research and Quality; 2008. Report No.: 08-0019. Contract No.: 290-02-0018. [cited 2009 Sep 8]. Available from: <http://www.ahrq.gov/prep/drillelements/drillelements.pdf> Prepared by Johns Hopkins Evidence-based Practice Center.
Note: checklist of items needed by Hospitals in emergency- mentions both N95 and N99 masks

Manufacturer information

11. Nexera Medical [Internet]. Richmond (BC): Nexera Medical. *SpectraShield™ 9900 and SpectraShield™ Plus FFP3 for broad spectrum protection*; 2009 [cited 2009 Sep 8]. Available from: <http://www.nexeramed.com/cfiles/products.cfm>

12. Nexera Medical. *Nexera Medical obtains a medical device establishment license for SpectraShield(TM) 9900 antibacterial respirator mask in Canada* [press release on the Internet]. Toronto: CNW Group; 2007 [cited 2009 Sep 8]. Available from: http://www.devicespace.com/news_story.aspx?NewsEntityId=68949