TITLE: Powered Air Purifying Respirators for Infection Prevention in Patients with Suspected or Confirmed Communicable Disease: Clinical Effectiveness, Cost-Effectiveness and Guidelines

DATE: 21 July 2015

RESEARCH QUESTIONS

1. What is the clinical effectiveness of powered air purifying respirators used by healthcare workers when providing care for patients with suspected or confirmed communicable disease?

2. What is the cost-effectiveness of powered air purifying respirators used by healthcare workers when providing care for patients with suspected or confirmed communicable disease?

3. What are the evidence-based guidelines regarding the use of powered air purifying respirators used by healthcare workers when providing care for patients with suspected or confirmed communicable disease?

KEY FINDINGS

One economic evaluation and one evidence-based guideline were identified regarding powered air purifying respirators used by healthcare workers when providing care for patients with suspected or confirmed communicable disease.

METHODS

A limited literature search was conducted on key resources including PubMed, The Cochrane Library, University of York Centre for Reviews and Dissemination (CRD) databases, ECRI Institute, Canadian and major international health technology agencies, as well as a focused Internet search. No methodological filters were applied to limit retrieval by publication type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2010 and July 5, 2015. Internet links were provided, where available.

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The summary of findings was prepared from the abstracts of the relevant information. Please note that data contained in abstracts may not always be an accurate reflection of the data contained within the full article.

SELECTION CRITERIA

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

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<th>Table 1: Selection Criteria</th>
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<td><strong>Population</strong></td>
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<td><strong>Intervention</strong></td>
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| **Comparator**              | Q1 & 2: N95 respirator or any other active comparator (e.g., surgical mask); No infection control measure; No comparator  
                                | Q3: No comparator |
| **Outcomes**                | Q1: Clinical effectiveness outcomes including: infection prevention, infection transmission rates; Safety  
                                | Q2: Cost-effectiveness outcomes  
                                | Q3: Evidence-based guidelines regarding best practice for the use of PAPRs |
| **Study Designs**           | Health technology assessment reports, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies, economic evaluations, and evidence-based guidelines. |

RESULTS

Rapid Response 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, non-randomized studies, economic evaluations, and evidence-based guidelines.

One economic evaluation and one evidence-based guideline were identified regarding powered air purifying respirators used by healthcare workers when providing care for patients with suspected or confirmed communicable disease. No relevant health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, or non-randomized studies were identified.

Additional references of potential interest are provided in the appendix.

OVERALL SUMMARY OF FINDINGS

One economic evaluation\(^1\) examined the costs of stockpiling respiratory protection devices for use during an Influenza pandemic. Reusable half face respirators were reported to be more cost-effective than disposable N95 masks and the authors recommended against stockpiling powered air purifying respirators due to their cost.
One guideline was identified regarding infection control practices for cystic fibrosis. The guideline recommends healthcare providers use N95 masks or powered air purifying respirators when caring for cystic fibrosis patients who are under airborne precautions for suspected, or confirmed, tuberculosis.

REFERENCES SUMMARIZED

Health Technology Assessments
No literature identified.

Systematic Reviews and Meta-analyses
No literature identified.

Randomized Controlled Trials
No literature identified.

Non-Randomized Studies
No literature identified.

Economic Evaluations


Specific guidance on the size and composition of respiratory protective device (RPD) stockpiles for use during a pandemic is lacking. **We explore the economic aspects of stockpiling various types and combinations of RPDs by adapting a pandemic model that estimates the impact of a severe pandemic on a defined population, the number of potential interactions between patients and health care personnel, and the potential number of health care personnel needed to fulfill those needs.** Our model calculates the number of the different types of RPDs that should be stockpiled and the consequent cost of purchase and storage, prorating this cost over the shelf life of the inventory. Compared with disposable N95 or powered air-purifying respirators, we show that stockpiling reusable elastomeric half-face respirators is the least costly approach. Disposable N95 respirators take up significantly more storage space, which increases relative costs. Reusing or extending the usable period of disposable devices may diminish some of these costs. We conclude that stockpiling a combination of disposable N95 and reusable half-face RPDs is the best approach to preparedness for most health care organizations. **We recommend against stockpiling powered air-purifying respirators as they are much more costly than alternative approaches.**
Guidelines and Recommendations

PubMed: PM25025126
See: 14.c

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APPENDIX – FURTHER INFORMATION:

Previous CADTH Reports


Non-Randomized Studies

Simulation


Impact on Speech


Clinical Practice Guidelines – Methodology Not Specified

See: Additional considerations, pages 2-3

See: PPE recommendations for RSQ staff managing patients with EVD, page 1
See: Option 2 [Powered Air Purifying Respirator (PAPR) with Coveralls, pages 7-8


Review Articles

PubMed: PM25695176

Additional References

PubMed: 25996018


PubMed: PM25522493

PubMed: PM20810676