

Discomfort Factors and Tolerance Times for Health Care Providers Wearing Fit-Tested Filtering Face-Piece Respirators



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Abstract

Background: The objective was to assess newly available data about respirator discomfort and tolerance times. Data were drawn from a larger study designed to develop and validate an instrument that determines maximum respirator tolerance time in healthcare providers (HCPs).
Methods: HCPs at 3 VA health care facilities who were fit-tested participated in a survey to assess factors and magnitude of comfort and tolerability (n=160). Bivariate comparisons of demographics and discomfort factors were made between HCPs who indicated being able to wear a fit-tested respirator for a maximum of ≤20 minutes vs. maximum tolerability time of >20 minutes.
Results: HCPs were mostly females (76%), 26-49 years of age (63%) who worked in medical/surgical units (36%) and ICUs (21%). Overall, 51% of HCPs indicated that the maximum length of time they could tolerate wearing a fit-tested respirator was ≤ 20 minutes. A greater proportion of male HCPs tolerated wearing the respirator for >20 minutes than did females (p= 0.03). There were no differences in tolerance time by age, position type, or average hours worked per week. Overall, the most common cited areas of discomfort a lot/all of the time were: tightness of straps (35%), lack of fresh air (41%), overall tightness (32%), and facial heat/warmth (42%). Greater proportions of HCPs with a maximum tolerance time of ≤20 minutes vs. >20 minutes indicated discomfort a lot of/all of the time with regard to: overall tightness (40% vs. 23%, p= 0.02); facial irritation (33% vs. 14%, p= 0.007); facial heat/warmth (52% vs. 32%, p=0.01); and lack of fresh air (54% vs. 27%, p= 0.0006).
Conclusion: About 1/3 of HCPs indicated discomfort due to tightness of straps, lack of fresh air, overall tightness, or facial heat/warmth. Gender was associated with perceived comfort (males had higher tolerability time). In order to improve future respirator designs, input from end-user HCPs is needed to identify length of tolerability and features associated with the greatest discomfort.

Objective

To evaluate comfort and tolerability factors associated with HCP wearing experience and tolerance times of filtering face-piece respirators (FFRs).

Methods

Participants:

HCPs at 3 VA health care facilities who were fit-tested participated in a survey to assess factors and magnitude of comfort and tolerability of FFRs.

Data Source/Instrument:

- Data were drawn from a larger study designed to develop and validate an instrument that determines maximum respirator tolerance time in HCPs.
- The FFR comfort/tolerability survey was developed and validated using Item Response Theory/Rasch methodology. The instrument was refined using content experts and pilot testing, and content validity, item relevance and clarity, content omission (items not included), and *substantive validity* was established.
- The survey contained 16 items with multiple sub-items, including scales to rate discomfort factors, wearing experience, and questions on maximum tolerance time, interference with job tasks, patient care, and other concerns, and demographic/work characteristics.

Statistical Analyses:

- Bivariate comparisons of demographics, discomfort factors, and wearing experience were made between HCPs who indicated being able to wear a FFR for a maximum of ≤20 minutes vs. maximum tolerability time of >20 minutes.
- All analyses were conducted using SAS 8.2, SAS Institute Inc., Cary, NC.

Results

- 203 individuals were approached: 17 were ineligible (e.g., not fit-tested within last year), 19 refused to participate (e.g., severe claustrophobia), and 2 did not complete the study.
- Of the 186 who were eligible, 165 participated, total participation rate = 89%.
- 5 participants were missing the outcome variable, tolerance time and were excluded. **Total number of HCP (n= 160).**
- HCPs were:
 - mostly women (76%),
 - 26-49 years of age (63%), and
 - employed in medical/surgical (36%) and intensive care units (21%).

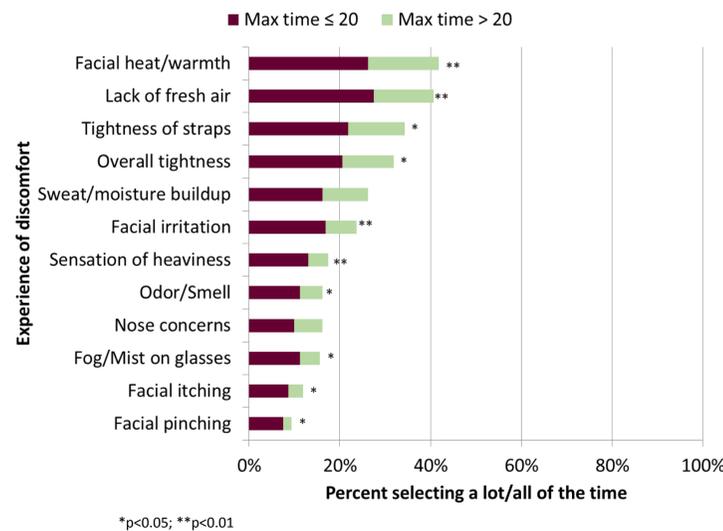
Table 1. Demographic, Health, & Work Characteristics (n=160, unless noted)

	Freq.(%)
Gender	
Male	39 (24%)
Female	121 (76%)
Age Category	
≤ 25	9 (6%)
26-49	101 (63%)
50-64	46 (29%)
65 and above	4 (3%)
Department/Unit (n=159)	
Med/Surg	58 (36%)
ICU	34 (21%)
ER	18 (11%)
Dialysis	9 (6%)
Respiratory	6 (4%)
Rehab/Long-Term Care	5 (3%)
Other	29 (18%)
VA position type	
Nurse	126 (79%)
Practitioner	10 (6%)
Respiratory Therapist	10 (6%)
Other	14 (9%)
Any respiratory-related condition*	19 (12%)
Upper respiratory infection/illness at time of survey	5 (3%)
	Mean (SD)
Hours/week at VA	40.0 (9.54)
Hours/week patient contact	34.0 (13.04)
Respiratory Infections in past year (n=157)	0.8 (1.01)

*Includes Chronic bronchitis, COPD, Emphysema, Asthma, Other

- Overall, 51% of HCPs indicated that the maximum length of time they could tolerate wearing a fit-tested respirator was ≤ 20 minutes and 49% indicated tolerance for >20 minutes.
- A greater proportion of male HCPs tolerated wearing the respirator for >20 minutes than did female HCPs (p=0.03).
- There were no differences in tolerance time by age, position type, average hours worked per week, or in respiratory conditions.

Figure 1. Experiences of Discomfort by Maximum Tolerance Time (n=160)



Overall, the most common cited areas of discomfort a lot/all of the time were: facial heat/warmth (42%), lack of fresh air (41%), tightness of straps (35%), and overall tightness (32%).

- Greater proportions of HCPs with a maximum tolerance time of **≤20 minutes vs. >20 minutes** indicated discomfort a lot of/all of the time with regard to:
 - facial heat/warmth (52% vs. 32%, p=0.01)
 - lack of fresh air (54% vs. 27%, p=0.0006)
 - tightness of straps (44% vs. 26%, p=0.02)

Table 2. Challenges While Wearing FFR (n=160)

	Overall Freq. (%)	Max. time ≤ 20 minutes Freq. (%) (n=82)	Max. time > 20 minutes Freq. (%) (n=78)	P-value
Difficulty verbally communicating to others				0.004
Strongly Agree/Agree	41 (26%)	29 (35%)	12 (15)	
Interfered with patient care duties				0.0005
Strongly Agree/Agree	38 (24%)	29 (35%)	9 (12%)	
Mask affected concentration while working				0.004
Strongly Agree/Agree	36 (23%)	26 (32%)	10 (13%)	
Difficulty putting mask on				0.01
Strongly Agree/Agree	34 (21%)	24 (29%)	10 (13%)	
Difficulty taking mask off				0.06
Strongly Agree/Agree	30 (19%)	20 (24%)	10 (13%)	
Obstructed my vision				0.007
Strongly Agree/Agree	20 (13%)	16 (20%)	4 (5%)	
Difficulty hearing others				0.11
Strongly Agree/Agree	6 (4%)	5 (6%)	1 (1%)	

Overall, the most commonly cited challenges while wearing the FFR included: difficulty communicating to others (26%), interference with patient care duties (24%), and affecting concentration (23%).

With regard to FFR wearing experience, greater proportions of HCPs with a maximum tolerance time of **≤20 minutes vs. >20 minutes** indicated agreement with:

- Difficulty verbally communicating to others (35% vs. 15%, p=0.004)
- Interference with patient care duties (35% vs. 12%, p=0.0005)
- FFR affected concentration while working (32% vs. 13%, p=0.004)



Limitations

- Use of a convenience sample
- Use of data collected in VA setting only
- Data collected from staff in a simulated setting or from staff not performing direct patient care activities

Conclusions

- Gender was associated with perceived comfort (males had higher tolerability time)
- Over 1/3 of HCPs indicated discomfort due to facial heat/warmth, lack of fresh air, and tightness of straps; the proportions of HCPs indicating each reason were significantly greater for those with a maximum tolerance time ≤ 20 minutes
- Communication, concentration, and interference with patient care while working are common reported challenges with wearing FFRs.
- To improve future respirator designs, input from end-user HCPs is needed to identify length of tolerability and features associated with the greatest discomfort and to address challenges while working and interfering with patient care.

Next Steps

- Test instrument in actual patient care setting
- Provide recommendations to VA leadership on comfort and tolerability factors to help with new FFR prototype development

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- The views expressed in this presentation are the authors and do not necessarily reflect the position or policy of VA or the United States Government.