Face Mask Use by Patients in Primary Care

Jessica S. Tischendorf, BS; Jonathan L. Temte, MD, PhD

ABSTRACT

Context: Face masks are recommended for patients with respiratory symptoms to reduce influenza transmission. Little knowledge exists regarding actual utilization and acceptance of face masks in primary care.

Objective: Compare distribution of face masks to clinic and community trends in respiratory infection (RI) and influenza-like illness (ILI); estimate the annual need for face masks in primary care.

Design: Retrospective observational study of practice data from a 31-week period starting in October 2009.

Setting: Family practice clinic in Madison, Wis.

Patients: Patients with fever, cough, or other respiratory symptoms as evaluated by reception staff.

Main outcome measures: Age, sex, and weekly counts of individuals receiving a face mask, as well as counts of RI and ILI patients based on ICD-9 coding from 27 statewide clinics.

Results: Face mask counts were 80% of RI counts for the clinic and reflected the demographics of the clinic population. Distribution was correlated to prevalence of RI ($R = 0.783$, $P < 0.001$) and ILI ($R = 0.632$, $P < 0.001$). Annually, 8% of clinic visits were for RI.

Conclusions: The high percentage of face mask use among RI patients reflects the feasibility of this intervention to help control influenza transmission in a primary care setting. Using the present data, clinics can estimate the annual need for face masks.

INTRODUCTION

Seasonal and pandemic influenza viruses are transmitted via small particle aerosols, large droplets, and fomites.[1] Face mask use is presumed to be an effective barrier against droplet transmission of respiratory viruses and has shown some effectiveness in several studies.[2-4] During times of increased respiratory infection in the community, the Centers for Disease Control and Prevention (CDC) recommends use of masks in health care settings for patients with cough or symptoms of a respiratory infection and for personnel in contact with the patient.[5] In response to these guidelines and due to recent evidence suggesting no inferiority of surgical masks compared to N95 respirators,[6,7] many health care facilities implemented the use of surgical masks for patients presenting with symptoms suspicious of acute respiratory infection.

Swine-origin 2009 H1N1 influenza represented the first influenza pandemic since 1968.[1] In the United States, from April 2009 to April 2010, the CDC estimated about 61 million cases of H1N1 influenza, 274,000 related hospitalizations, and about 12,470 H1N1-associated deaths.[8] During the peak of the pandemic in fall 2009, sentinel providers reported influenza-like illness accounting for more than 7.5% of outpatient visits.[9] This reflects the importance of transmission control in the primary care setting.

While an estimation of cost for implementing guidelines to control respiratory infection transmission in a primary care clinic does exist,[10] the high infectivity of 2009 H1N1 sheds new light on the feasibility of face mask interventions and the stockpile of face masks needed in a primary care clinic. The H1N1 pandemic provided an opportunity to examine the demographics of mask use and whether mask use would reflect trends in illness in the population using routinely collected clinical information. We hypothesized that mask use reflected community trends of "all cause" acute respiratory infection (RI) and influenza-like illness (ILI). Also presented will be an estimate for stocking a family practice clinic with face masks based on clinic data and face mask acceptance and use.

• • •

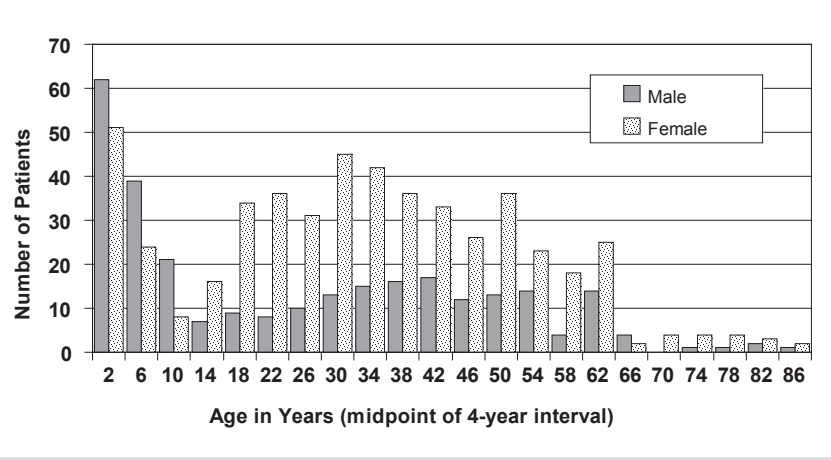
Author Affiliations: University of Wisconsin School of Medicine and Public Health (Tischendorf); Department of Family Medicine, University of Wisconsin School of Medicine and Public Health (Temte).

Corresponding Author: Jonathan L. Temte, MD, PhD, Department of Family Medicine, University of Wisconsin School of Medicine and Public Health, 1100 Delaplaine Court, Madison, WI 53715; phone 608.263.3111; fax 608.263.6663; e-mail jon.temte@fammed.wisc.edu.

Table 1. Mask Use by Male and Female Patients During the 31-week Study Period

	Total	Male	Female
Masks Distributed (%)	793	286 (36.1%)	507 (63.9%)
Age of mask use (years ± SD)	29.72 ± 20.48	24.99 ± 21.69	32.38 ± 19.28

Figure 1. Demographics of Surgical Mask Distribution in Primary Care During Study Period, From Week Beginning October 25, 2009, to Week Beginning May 23, 2010.



METHODS

This retrospective observational study of practice data following the peak of the H1N1 pandemic in October 2009 encompasses data from the week beginning October 25, 2009, to the week beginning May 23, 2010—a total of 31 weeks. The family practice clinic examined is located in a multi-ethnic urban neighborhood that includes individuals of varying socioeconomic status.

Following CDC guidance, the clinic adopted a policy to provide surgical masks to any arriving patient with acute respiratory symptoms. Receptionists were instructed to offer a mask to all patients presenting with cough, sore throat, or fever or those identified prior to arrival by the triage nurse as needing a mask. For each mask dispensed by reception staff, an entry was logged indicating the date of mask use and the age and sex of the patient offered the mask. Each week, the data from the log was entered into a spreadsheet.

Using de-identified clinical data extracted from the University of Wisconsin-Department of Family Medicine (UW-DFM) Clinical Data Warehouse, counts of individuals diagnosed with RI and ILI were identified weekly. RI in this study was defined using ICD-9-CM codes 460.00 – 466.99 ("acute respiratory infections"), 381 – 382.9 ("nonsuppurative otitis media and Eustachian tube disorders" and "suppurative and unspecified otitis media"), and 480 – 488.1 ("pneumonia," "influenza," and "H1N1"). We used this broad definition to allow for an extreme "upper limit" of respiratory virus activity. ILI was defined as the subset of RI, which had a measured temperature of 100°F (37.8°C) or higher at the time of visit, thus setting a lower limit for respiratory virus and influenza activity.

To more accurately estimate annual face mask need, data were compiled for the clinical practice and for a regional composite using the entire UW-DFM, which consists of 27 statewide clinical practices. Total patient visits, total RI visits, and total ILI visits were compiled for a 4-year period from June 2006 to May 2010. Average visits per week, average RI visits per week, and average ILI visits per week ALSO were ascertained for the clinic and UW-DFM. From this data, percentage of yearly visits resulting in a diagnosis of RI was calculated. Based on the face mask distribution data collected during the study period, an estimation of the yearly supply of face masks needed for a primary care clinic was calculated.

Statistical Analysis

All statistical analyses were performed using Minitab statistical software (Minitab Inc, Release 13.1, 2000). Descriptive statistics were used to describe age distribution of the study population, both in aggregate and by gender. One-way Analysis of Variance (ANOVA) was performed to examine differences in age distribution based on gender. Threshold significance was set at $P \leq 0.05$.

Pearson Correlation was used to examine the relationship between weekly mask use and clinic population prevalence of RI and ILI during the study period. Additionally, Pearson Correlation was used to compare weekly clinic counts to the broader department-wide counts of RI and IRI to assess whether clinical trends followed community trends in illness.

To estimate face mask need, the percentage of individuals with RI receiving face masks during the study period was determined and applied to the estimated percentage of yearly visits for RI.

RESULTS

During the study period, there were 989 total visits for RI and 37 visits for ILI at the study clinical practice; that is, ILI accounted for 3.74% of RI visits. A total of 793 masks were distributed to patients during the study period (80% of those with RI).

Females received the majority of masks (63.9%), which closely reflects demographics of the clinic population for a year period ending in June 2010 (63.7% of total visits were with females). One-way ANOVA revealed a statistically significant difference for age of mask user between genders ($P < 0.001$), with the mean age of mask users greater in females than males (Table 1, Figure 1).

Distribution of face mask use on a weekly basis was correlated highly to RI prevalence ($r = 0.783$, $P < 0.001$) and ILI prevalence ($r = 0.632$, $P < 0.001$) within the clinic population. Face mask count exceeded the number of ILI cases every week (range: 9 - 54), and for several weeks, face mask count exceeded RI case count (Figure 2). Weekly counts of RI and ILI in the clinic were reflective of the larger community trends in RI ($R = 0.810$, $P < 0.001$) and ILI ($R = 0.753$, $P < 0.001$) for the study period.

Compilation of data from June 2006 to May 2010 revealed roughly 8% to 12% of visits to the clinic and department-wide were attributable to RI, reflecting a large portion of total visits for which face masks may be considered (Table 2).

Figure 2. Surgical Mask Distribution Per Week (line) Compared to Respiratory Infection (RI) and Influenza-like Illness (ILI) Patient Counts (bars - ILI is a subset of RI).

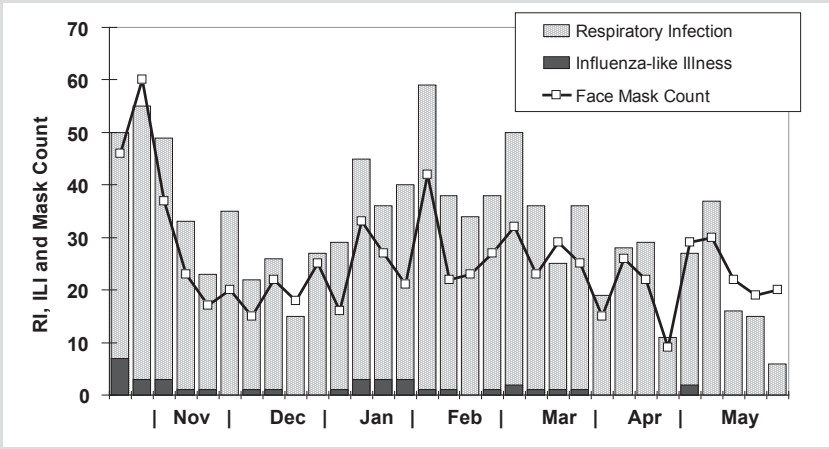


Table 2. Outpatient Visits for Respiratory Infection (RI) and Influenza-like Illness (ILI) over a 4-year Period

Four-year period from June 2006 through May 2010		
	UW-DFM (% of total)	**Study Clinic (% of total)**
Total visits	3,446,856	90,056
RI visits	274,468 (7.96%)	11,170 (12.40%)
ILI visits	6593 (0.19%)	216 (0.24%)
Average Weekly Visits over 4-year period		
	UW-DFM (% of total)	**Study Clinic (% of total)**
Visits per week	16,492	431
RI visits per week	1313 (7.96%)	53.4 (12.40%)
ILI visits per week	31.5 (0.19%)	1.03 (0.24%)

Abbreviations: UW-DFM, University of Wisconsin-Department of Family Medicine

DISCUSSION

The effectiveness of face masks in preventing transmission of influenza relies on the efficacy of the face mask and the willingness of a symptomatic patient to wear it. The 2009 H1N1 pandemic provided a unique opportunity to assess this strategy for respiratory virus transmission control. This study suggests that roughly 80% of individuals presenting to an outpatient clinic with "all-cause" RI will receive a face mask, demonstrating the willingness of patients to wear face masks and health care facility staff to distribute them. The uptake of mask use in the outpatient clinic is reflected by surveys suggesting 4% to 8% of the public reported themselves or their family members wearing a face mask in the early months of the H1N1 pandemic.[11] The acceptance of face mask interventions also has been demonstrated in other studies surrounding the possibility of pandemic influenza.[12,13] During the recent pandemic, policies aimed at masking individuals with symptoms of cough, sore throat, or fever were an attempt at reducing transmission of viral influenza. With ILI accounting for only 3.74% of RI visits and the high incidence of masking shown in this study, presumably all individuals with infectious influenza were indentified and masked upon arrival to the clinic.

The gender-specific age distributions of face mask use resulted in a significant difference in mean age of mask use between males and females. Beyond childhood, females were more likely to be masked, until about age 60 when levels tend to equate; this trend reflects results observed in the Tecumseh study and Cleveland Family study concerning respiratory infection rates.[14,15] This observation of increased respiratory infection in women may be explained by the fact that women may more often be the caretakers for ill children, who have been identified as common sources of household influenza transmission.[14,16]

While correlations between mask use and RI prevalence and mask use and ILI prevalence were reasonably high, several factors may have been at play that decreased the likelihood of a patient with RI or ILI to be masked. While not detected at

appreciable levels in this study, based on discussion with the reception staff there may have been patient refusal to masking upon staff request. While reasons for refusal were not recorded in this study, a previous investigation reported decreased adherence because individuals found the masks uncomfortable or ill-fitting.[4] Staff also may have failed to identify an individual requiring a mask. More likely, however, the discrepancy between numbers of masks and patients presenting with RI was due to our definition of RI. To be fully inclusive, we included data from patients diagnosed with otitis media and acute sinusitis, conditions that would not present with symptoms that required masking per CDC recommendations.

This study was limited in that no measures of transmission were made due to the retrospective nature of assessment. Moreover, this evaluation occurred in the wake of an influenza pandemic during which patients may have been more accepting of face masks.

The use of face masks in an infection control program has demonstrated effectiveness in reducing transmissibility of respiratory viruses.[2-4,17-19] With the high volume of patients seen in primary care clinics for RI, it is important to have an adequate stock of face masks on hand.

By reviewing a 4-year period, we determined that about 8% to 12% of annual clinic visits are for RI; cases often have symptoms for which face masks would be recommended. This study revealed roughly 80% of those individuals with a diagnosis of RI are masked upon arrival to the clinic. Applying these numbers to a clinic population can provide an estimate for the number of face masks to be ordered yearly. For example, a clinic with 20,000 patient visits per year can expect 8% to 12%, or 1600 to 2400 of those visits to be for RI. With 80% of individuals with RI receiving a mask, as was determined in this study, 1280 to 1920 face masks (6.4% to 9.6% of annual volume) would be needed for a 1-year period.

The 2009 Influenza A H1N1 pandemic, through mass media and public recognition, created an opportunity to improve infection control in primary care. In response, many institutions implemented the use of face masks to reduce potential transmission. Through this study, we have been able to demonstrate that a large number of symptomatic patients received face masks and that mask distribution reflected community trends in respiratory infections. Moreover, their use was in excess of that necessary for influenza-like illnesses. Consequently, it is feasible for a primary care clinic to adhere to current recommendations for infection prevention in outpatient settings.[20]

Financial Disclosures: None declared.

Funding/Support: Department of Family Medicine, University of Wisconsin School of Medicine and Public Health, Summer Student Research and Clinical Assistantship Program.

Acknowledgements: The authors wish to thank Mr Chuck Illingworth, who extracted and compiled data from the University of Wisconsin Department of Family Medicine Clinical Data Warehouse. Ms Tischendorf (now a third-year medical student) is the winner of the UW Department of Family Medicine's annual William E. Scheckler Award for research by a resident or medical student.

REFERENCES

1. Writing committee of the WHO Consultation on Clinical Aspects of Pandemic (H1N1) 2009 Influenza. Clinical aspects of pandemic 2009 influenza A (H1N1) virus infection. *N Engl J Med* 2010;362(18):1708-1719.

2. Cowling BJ, Chan KH, Fang VJ, et al. Facemasks and hand hygiene to prevent influenza transmission in households: a cluster randomized trial. *Ann Intern Med* 2009;151(7):437-446.

3. Aiello AE, Murray GF, Perez V, et al. Mask use, hand hygiene, and seasonal influenza-like illness among young adults: a randomized intervention trial. *J Infect Dis* 2010;201:491-498.

4. MacIntyre CR, Cauchemez S, Dwyer DE, et al. Face mask use and control of respiratory virus transmission in households. *Emerg Infect Dis* 2009;15(2):233-241.

5. Interim guidance for the use of masks to control influenza transmission, 2009. Centers for Disease Control and Prevention. http://www.cdc.gov/flu/professionals/infectioncontrol/maskguidance.htm. Accessed January 6, 2012.

6. Loeb M, Dafoe N, Mahony J, et al. Surgical mask vs N95 respiratory for preventing influenza among health care workers: a randomized trial. *JAMA* 2009; 302(17):1865-1871.

7. Ang B, Poh BF, Win MK, Chow A. Surgical masks for protection of health care personnel against pandemic novel swine-origin influenza A (H1N1)-2009: results form an observational study. *Clin Infect Dis* 2010;50:1011-1014.

8. Updated CDC Estimates of 2009 H1N1 Influenza Cases, Hospitalizations and Deaths in the United States, April 2009 – April 10, 2010. Centers for Disease Control and Prevention. http://www.cdc.gov/h1n1flu/estimates_2009_h1n1.htm (accessed January 14, 2012).

9. Percentage of visits for influenza-like-illness reported by sentinel providers 2009-2010. Centers for Disease Control and Prevention. http://www.cdc.gov/flu/weekly/weeklyarchives2009-2010/data/senAllregt20.htm. Accessed January 6, 2012.

10. Hogg W, Huston P. Controlling droplet-transmitted respiratory infections: best practices and cost. *Can Fam Physician* 2006;52:1229-1232.

11. SteelFisher GK, Blendon RJ, Bekheit MM, Lubell K. The public's response to the 2009 H1N1 influenza pandemic. *N Eng J Med* 2010;362(22):e65(1)-(5).

12. Barr M, Raphael B, Taylor M, et al. Pandemic influenza in Australia: using telephone surveys to measure perceptions of threat and willingness to comply. *BMC Infect Dis* 2008;8:117.

13. So-kum Tang C, Wong C. Factors influencing the wearing of facemasks to prevent severe acute respiratory syndrome among adult Chinese in Hong Kong. *Prev Med* 2004;39:1187-1193.

14. Monto AS, Kioumehr F. The Tecumseh study of respiratory illness: IX. Occurrence of influenza in the community, 1966-1971. *Am J Epidemiol* 1975;102(6):553-563.

15. Badger GF, Dingle JH, Feller AE, et al. A study of illness in a group of Cleveland families. II. Incidence of the common respiratory diseases. *Am J Hyg* 1958;58:31-40.

16. France AM, Jackson, M, Schrag S, et al. Household transmission of 2009 influenza A (H1N1) virus after a school-based outbreak in New York City, April-May 2009. *J Infect Dis* 2010;201:984-992.

17. Larson EL, Ferng Y, Wong-McLoughlin J, et al. Impact of non-pharmaceutical interventions on URIs and Influenza in crowded, urban households. *Public Health Reports* 2010;125(2):178-191.

18. Jefferson T, Foxlee R, Del Mar C, et al. Physical Interventions to interrupt or reduce the spread of respiratory viruses: a systematic review. *BMJ* 2008;336:77-80.

19. Jefferson T, Del Mar C, Dooley L, et al. Physical interventions to interrupt or reduce the spread of respiratory viruses: a systematic review. *BMJ* 2009;339:b3675.

20. Guide to infection prevention for outpatient settings: minimum expectations for safe care. Centers for Disease Control and Prevention. http://www.cdc.gov/HAI/pdfs/guidelines/standatds-of-ambulatory-care-7-2011.pdf Accessed January 6, 2012.

advancing the art & science of medicine in the midwest

WMJ

WMJ (ISSN 1098-1861) is published through a collaboration between The Medical College of Wisconsin and The University of Wisconsin School of Medicine and Public Health. The mission of *WMJ* is to provide an opportunity to publish original research, case reports, review articles, and essays about current medical and public health issues.

Visit www.wmjonline.org to learn more.