

Practices and Perceptions of Face Mask Use in a Pediatric Health System During the COVID-19 Pandemic

L Denise Willis, Austin Lovenstein, Beverly J Spray, Michele Honeycutt, and Marlene Walden

BACKGROUND: Face coverings are recommended to help mitigate the spread of COVID-19. Guidelines regarding face mask use have evolved from the time when COVID-19 first emerged. Practices for face mask use in the United States vary widely. **METHODS:** Clinical and nonclinical staff from a pediatric health care system were invited to complete a survey regarding perceptions and practices of face mask use during the COVID-19 pandemic. Overall results were analyzed, and subgroup analyses were conducted to compare clinical and nonclinical staff, and clinical staff who do and do not provide direct patient care. **RESULTS:** The response rate was approximately 24% (1,128 of 4,698). Most respondents were clinical staff who provide patient care. A surgical/procedure mask was most often worn for patient care by 72% ($P < .001$). Most respondents (70%) reported wearing a cloth mask when not in the hospital ($P < .001$). Cloth masks were worn for a mean of 3.4 ± 3.9 d before washing. Frequent hand hygiene before putting on the mask, before removing, and after removing was reported as 56%, 44%, and 62%, respectively. The most common challenges reported were glasses fogging (69%), skin irritations (45%), and headaches (31%). Qualitative data revealed themes of feeling unsafe, beliefs and practices about COVID-19 and masks, mandates and enforcement of wearing masks, availability of personal protective equipment, and care delivery challenges. **CONCLUSIONS:** Practices and perceptions of face masks varied among staff in a pediatric health care system. Some staff did not feel that masks are effective in preventing virus spread, and others did not feel safe in performing job duties. Hand hygiene for mask handling was not practiced consistently. A large number of staff reported having experienced challenges or health issues when wearing a mask. Clinical staff who provide direct patient care reported more issues than both nonclinical and clinical staff who do not provide care. *Key words:* coronavirus; COVID-19; SARS-CoV-2; face mask; face covering; universal masking; pediatric; hospital staff; survey; personal protective equipment. [Respir Care 2021;66(7):1096–1104. © 2021 Daedalus Enterprises]

Introduction

The novel coronavirus disease outbreak (COVID-19) was declared a global pandemic on March 11, 2020, by the World Health Organization (WHO).^{1,2} The use of face coverings in public has been recommended to mitigate the spread of the virus by decreasing the amount of exhaled virus from

respiratory droplets in the environment.³ Guidelines regarding face mask use have evolved since the time when COVID-19 first emerged. Initially, both the WHO and the US Centers for Disease Control and Prevention (CDC) did not support universal masking for healthy individuals, and the US Surgeon General even advised against purchasing face masks.^{4,5} However, the rationale for this was to help

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ensure supplies were available for health care workers.⁴ On April 3, 2020, the CDC recommended cloth face coverings for the general public to help decrease the spread of COVID-19.³

Face mask utilization to aid in decreasing transmission of respiratory viruses is not a new concept. During the 1918 influenza pandemic, the medical community urged the use of face masks, but the idea was met with resistance even at that time (<https://www.historyextra.com/period/20th-century/wear-face-masks-backlash-opposition-why-spanish-flu-coronavirus-covid-history/>, Accessed May 3, 2021). An Australian clinical trial published in 2009 found that household adherence to mask use significantly reduced the risk for influenza-like illnesses.⁶ Despite limited evidence to support universal masking to decrease the spread of COVID-19,^{7,8} practices for face mask use in the United States vary widely and has become a controversial topic.³ In Asian countries, face mask use is more accepted as compared to Western countries.⁵

A study that evaluated the effects of state mask mandates in the United States early in the pandemic found a reduction in the COVID-19 daily growth rate.⁹ While several states and localities have executed a face covering mandate, there were still some states without a mask requirement even as cases surged during the winter season of 2020 (Cable News Network: December 8, 2020. <https://www.cnn.com/2020/11/09/us/biden-mask-mandate-nationwide-trnd/index.html>, Accessed January 15, 2021). In states where face mask use is mandated, it is often not enforced, and practices are inconsistent and lack uniformity.³ Several states that had a mandate began to relax mask requirements as early as February 2021.

Arkansas Children's Hospital (ACH) is part of a pediatric health care system that includes 2 hospitals, numerous clinics, a pediatric research institute, and a foundation for education and outreach. ACH has an academic affiliation with the University of Arkansas for Medical Sciences (UAMS) and is a teaching hospital for the university's department of pediatrics. ACH implemented a mask requirement for all staff, patients, and visitors > 2 y old in late April 2020. This occurred prior to a July 2020 directive from the Arkansas Department of Health requiring face coverings.¹⁰

At ACH, staff are provided masks and appropriate personal protective equipment (PPE) for patient care. However, staff who are not involved in patient encounters must provide their own mask. Due to variable state, local, and individual practices for face mask use, a survey was developed to explore staff perceptions and practices of mask wearing in a pediatric health care system. The aims of this study were to evaluate perceptions of face mask use by staff during the COVID-19 pandemic and to determine if there were differences between clinical and nonclinical staff and between clinical staff who provide direct patient care and those who do not.

QUICK LOOK

Current knowledge

Universal masking is recommended to help mitigate the spread of COVID-19. There are several different types of face masks available for use. The CDC has issued recommendations for hand hygiene associated with mask handling and frequency of replacement or washing of cloth masks.

What this paper contributes to our knowledge

The majority of staff from a pediatric health care system reported wearing a cloth mask when not in the work area. Inconsistent hand hygiene for handling and washing cloth masks was noted. Many staff also identified issues and health challenges associated with mask wearing. Clinical staff who provide patient care reported more issues than nonclinical and clinical staff who do not provide direct patient care.

Methods

This was a descriptive, exploratory research study using survey methodology to examine the practices and perceptions of face mask use by staff within an academic, pediatric health care system in Arkansas. An extensive literature search of major databases including PubMed and CINAHL did not reveal an instrument that specifically addressed the practices and perceptions of wearing face masks by health care staff during the COVID-19 pandemic. Therefore, an original 37-item instrument was developed for this study, and the survey was administered in REDCap, a secure web application for building and managing online surveys and databases. The actual number of items varied and depended upon responses and question logic technology.

The survey domains included the type of face mask worn, mask care and handling, and challenges or health issues experienced with mask wearing. Demographic data included age, gender, race, ethnicity, and type of role (eg, clinical or nonclinical and direct patient care or not direct patient care). There was also an optional open response item to describe other concerns related to face mask use. The survey was peer-reviewed to assess the face validity and to evaluate relevance and clarity of survey items and associated responses. Approval to conduct the study was granted by the UAMS institutional review board.

Eligible subjects included clinical and nonclinical staff working on any ACH campus or an affiliated clinic. Clinical roles were defined as positions involving the direct observation and treatment of patients such as respiratory therapists, nurses, physicians, and other allied health professionals, as well as clinical staff who do not provide direct patient care.

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Table 1. Respondent Demographics

Staff type	
Clinical	788 (78)
Nonclinical	221 (22)
Unspecified	2 (< 1)
Age range, y	
18–24	46 (5)
25–34	271 (27)
35–44	291 (29)
45–54	195 (19)
55–64	166 (16)
≥ 65	23 (2)
Prefer not to say	19 (2)
Gender	
Female	847 (84)
Male	132 (13)
Nonbinary	1 (< 1)
Prefer not to say	31 (3)
Race	
Asian	8 (< 1)
Black	64 (6)
Latino	19 (2)
Multiracial	10 (1)
Native American	6 (1)
Pacific Islander	2 (< 1)
White	828 (82)
Prefer not to say	70 (7)
Other, not specified	4 (< 1)
Ethnicity	
Hispanic	32 (3)
Non-Hispanic	873 (86)
Prefer not to say	106 (11)

Data are presented as *n* (%).

Nonclinical roles were defined as individuals who may support patient care but were not involved in the direct observation and treatment of patients (eg, administrative, clerical, billing, housekeeping, maintenance). Academic students, contract agency personnel, hospital volunteers, and employees < 18 y old were excluded from the study.

Subjects were recruited electronically through e-mail and advertisements posted in non-patient-care areas. Invitations to complete the anonymous, web-based survey were sent to departmental e-mail distribution groups, system-wide daily digest e-mail announcements, flyers distributed in non-patient-care areas, and internal social media postings. A hyperlink to access the survey was included on all invitations. The survey was available for a 2-week period from July 22 to August 5, 2020.

Attempts were made to reach the entire target population of staff throughout the health care system. An estimate of 4,698 staff members, including UAMS staff working on any ACH campus, was obtained from the human resources department. Assuming a population of 5,000 staff, an alpha

level of 0.05, and a margin of error of 0.03, the minimum sample size of returned surveys was expected to be 1,200.¹¹ Frequency counts and percentages of responses were calculated for each survey item to describe the results. Responses to the open-ended question were independently coded and organized into thematic categories.

To determine if categorical responses differed significantly between clinical and nonclinical staff as well as clinical staff providing direct patient care versus clinical staff with no patient care, chi-square or Fisher exact test were conducted as appropriate. For items that yielded continuous responses, either *t* tests, when parametric assumptions were met, or Wilcoxon rank-sum test for nonparametric data were performed. A 2-tailed *P* < .05 was considered statistically significant. All analyses were conducted in the SAS 9.4 (SAS Institute, Cary, North Carolina).

Results

There were 1,128 respondents, yielding a response rate of ~ 24% (1,128 of 4,698). Results from 117 subjects were excluded due to incomplete responses. The majority of respondents were female (*n* = 847, 84%), clinical staff (*n* = 788, 78%), in the age range of 35–44 y (*n* = 291, 29%), white (*n* = 282, 82%), and non-Hispanic ethnicity (*n* = 873, 86%). Nurses accounted for over half of all clinical staff (*n* = 418, 53%). Administrative type roles were the most common among nonclinical staff (*n* = 70, 32%). Of all clinical staff, 607 (77%) provided direct patient care. Table 1 includes demographic characteristics of the respondents. Table 2 provides detailed role types.

There were 731 (72%) subjects who reported that the institution provided the mask worn at work. This was significant for clinical staff (*P* < .001). A surgical/procedure mask was most often worn for patient care, according to 728 (72%) respondents (*P* < .001). The mean number of days a surgical/procedure mask was worn before replacing was 2.9 ± 3.2 d. Those who wore a N95 filtering facepiece respirator reported wearing it for a mean of 15.5 ± 20 d before replacing.

The majority of respondents (*n* = 703, 70%) wear a cloth mask outside of the hospital (*P* < .001). Cloth masks were worn for a mean of 3.4 ± 3.9 d before washing. Regarding the type of cloth mask, a sewn mask was worn by 474 (47%) respondents, while 381 (38%) purchased a cloth mask. Only 8 (1%) subjects reported wearing a no-sew cloth mask. There were 83 (12%) respondents who used a filter with the cloth mask. The filter was replaced after a mean of 3.8 ± 6.0 d. The surgical/procedure mask was worn outside the hospital by 268 (27%) respondents. One percent or less reported wearing either an allergy/dust mask, N95, combination of different masks, or no mask at all outside of the hospital setting.

Table 2. Staff Roles

Clinical/direct patient care	607 (55)
Nurse	328 (38)
Allied health professional	89 (9)
Respiratory therapist	65 (6)
Physician	53 (5)
Advanced practice provider	46 (5)
Psychologist	4 (< 1)
Other	22 (2)
Clinical/no patient care	181 (18)
Nurse	90 (9)
Allied health professional	51 (5)
Pharmacist	15 (1)
Respiratory therapist	7 (< 1)
Other	18 (2)
Nonclinical	221 (22)
Administrative	70 (7)
Clerical	30 (3)
Business/finance	29 (3)
Research	26 (3)
Unit secretary, scheduler, admissions, patient access	14 (1)
Simulation, outreach, fundraising, quality improvement	13 (1)
Information technology	11 (1)
Other	28 (3)

Data are presented as *n* (%).

Table 3. Overall Frequency of Hand Hygiene

Frequency	Before Putting on Mask	Before Removing	After Removing
Never	60 (6)	97 (10)	46 (5)
Rarely or occasionally	382 (38)	471 (47)	333 (33)
Frequently	568 (56)	441 (44)	628 (62)

Data are presented as *n* (%).

Most respondents (*n* = 875, 87%) indicated that masks are frequently replaced when damp or wet. Frequent hand hygiene before putting on the mask, before removing, and after removing was reported by 568 (56%), 441 (44%), and 628 (62%) respondents, respectively. Additional information on mask handling is included in Table 3.

Forty-six percent (*n* = 462) of respondents reported the most common method for mask handling during lunch or breaks was placing the mask in a nonshared area such as a pocket, purse, or locker. Other respondents reported placing their mask on a shared surface such as the break room table (*n* = 248, 25%), pulled down under the chin to eat (*n* = 159, 16%), or placing in a paper or plastic bag (*n* = 151, 15%). Other methods were noted by 157 (16%) respondents, such as placing their mask on a paper towel, moving the mask to the back of the neck, hanging the mask on a

badge or string around their neck, hanging from one ear, hanging on a hook in a private office, or discarded and replaced.

The predominant reason to wear a mask was to protect others (*n* = 506, 50%). Additional reasons included to protect self (*n* = 264, 26%), hospital policy (*n* = 204, 20%), and other reasons (*n* = 36, 4%). Other main reasons for wearing a mask were a combination of protect self and others, to protect those at risk, and the state mandate. The majority of respondents (*n* = 760, 76%) agreed that masks are effective in preventing the spread of COVID-19. Many respondents (*n* = 778, 78%) reported they also believe that N95 masks protect the wearer from contracting COVID-19. Most subjects (*n* = 682, 68%) felt safe when performing job duties with the type of mask worn at work.

Several challenges were associated with mask wearing. The most common issues reported were glasses fogging (*n* = 701, 69%), skin irritation (*n* = 456, 45%), headache (*n* = 316, 31%), and difficulty breathing (*n* = 294, 29%). Other notable issues or health challenges were vision obstruction (*n* = 255, 25%), claustrophobia (*n* = 152, 15%), and allergies (*n* = 138, 14%). Some respondents (*n* = 124, 12%) did not report any challenges related to wearing a mask. Table 4 includes a detailed list of all reported issues and health challenges.

Data from the open-ended question revealed 5 top themes and 32 subthemes (Table 5). The top 5 themes were staff feel unsafe, beliefs/practices about COVID-19 and mask use, mandates/enforcement of wearing masks, availability of masks/PPE, and care delivery challenges. Themes and illustrative quotes are available as supplementary materials (available at <http://www.rcjournal.com>).

Clinical Versus Nonclinical Staff

Significant differences between staff types were observed for mask replacement when damp or wet, hand hygiene, beliefs about mask protection, and issues or health challenges with mask wearing. Clinical staff were more likely to replace the mask when damp or wet compared to nonclinical (clinical *n* = 707, 90%; nonclinical *n* = 166, 75%; $\chi^2 = 31.59$, $P < .001$). There were differences in the number of days a cloth mask was worn before washing. Nonclinical staff reported washing the mask slightly more often than their clinical colleagues, although this difference did not reach statistical significance (nonclinical 3.3 ± 5.3 d; clinical 3.4 ± 3.4 d, $P = .07$).

Overall, clinical staff performed hand hygiene with mask handling more often than nonclinical staff. Hand hygiene is performed frequently before putting on a mask (clinical *n* = 461, 58%; nonclinical *n* = 106, 48%; $\chi^2 = 10.98$, $P = .03$), before removing (clinical *n* = 371, 47%; nonclinical *n* = 70, 32%; $\chi^2 = 20.49$, $P < .001$), and after removing it (clinical *n* = 504, 64%; nonclinical *n* = 123, 56%; $\chi^2 =$

Table 4. Health Issues and Challenges Associated With Mask Wearing

Glasses fogging	701 (69)
Skin irritation	456 (45)
Headache	316 (31)
Difficulty breathing	294 (29)
Vision obstruction	255 (25)
Claustrophobia	152 (15)
Allergies	138 (14)
Dizziness	106 (10)
Unable to take stairs	78 (8)
Asthma	43 (43)
Being pregnant	25 (2)
Tooth or teeth problems	4 (< 1)
Other issues*	112 (10)

Data are presented as *n* (%).

*Other issues include hot/sweaty, unsanitary concerns, communication challenges, anxiety, Sjögren's symptoms, nausea, dehydration, dry lips, eye issues, chest pains, neck/shoulder pain, affects thinking, fatigue, smothering, facial breakout, wheezing, runny nose/congestion, annoyance, ear pain.

14.25, $P = .006$). Both groups of respondents more commonly reported performing hand hygiene after removing their masks. For mask handling during lunch or a break, clinical staff were more likely to place the mask on a shared common surface (clinical $n = 210$, 27%; nonclinical $n = 38$, 17%; $\chi^2 = 8.44$, $P = .003$), whereas nonclinical staff were more likely to place their mask in a nonshared area (nonclinical $n = 122$, 55%; clinical $n = 340$, 43%; $\chi^2 = 9.82$, $P = .001$).

Results were similar in both groups for the main reason a mask is worn. Most respondents stated the mask was worn primarily to protect others (clinical $n = 388$, 49%; nonclinical $n = 118$, 53%; $\chi^2 = 4.57$, $P = .20$). Slightly more nonclinical than clinical staff agreed that correctly worn masks are effective in preventing the spread of COVID-19, but the difference was not statistically significant (nonclinical $n = 177$, 80%; clinical $n = 583$, 74%; $\chi^2 = 4.59$, $P = .33$). A significantly greater percentage of clinical staff felt that N95 masks worn while caring for patients confirmed positive or under investigation for COVID-19 protected them from contracting the virus compared to nonclinical staff (clinical $n = 642$, 82%; nonclinical $n = 136$, 62%; $\chi^2 = 45.09$, $P < .001$). There were no differences between staff types in feeling safe in performing job duties with the mask worn at work (clinical $n = 525$, 67%; nonclinical $n = 156$, 71%; $\chi^2 = 3.49$, $P = .47$).

Clinical staff overall reported more issues or health challenges associated with mask wearing including glasses fogging (clinical $n = 576$, 73%; nonclinical $n = 125$, 56%; $\chi^2 = 22.72$, $P < .001$), skin irritation (clinical $n = 390$, 49%; nonclinical $n = 66$, 30%; $\chi^2 = 27.16$, $P < .001$), and headache (clinical $n = 276$, 35%; nonclinical $n = 40$, 18%; $\chi^2 = 23.20$, $P < .001$). More nonclinical than clinical staff

reported issues with difficulty breathing (nonclinical $n = 77$, 35%; clinical $n = 217$, 28%; $\chi^2 = 4.33$, $P = .037$). Nonclinical staff were also more likely to report having no issues or health challenges with wearing a mask than clinical staff (nonclinical $n = 44$, 20%; clinical $n = 80$, 10%; $\chi^2 = 15.09$, $P < .001$).

Clinical Patient Care Versus No Patient Care

The majority of clinical respondents indicated they provide direct patient care. There were few significant differences between clinical staff providing patient care and those who do not for most domains except hand hygiene and health challenges with mask wearing. Clinical staff providing direct patient care reported more frequent hand hygiene before the removing their mask than did clinicians who do not provide patient care (patient care $n = 293$, 48%; no patient care $n = 79$, 43%; $\chi^2 = 11.87$, $P = .01$). More clinicians who did not provide direct patient care indicated the main reason for wearing a mask is to protect others, but the difference was not significant (no patient care $n = 99$, 54%; patient care $n = 289$, 48%; $\chi^2 = 5.93$, $P = .11$). Respondents providing patient care reported more issues and health challenges with mask wearing than clinicians who did not participate in patient care, including allergies (patient care $n = 94$, 16%; no patient care $n = 17$, 9%; $\chi^2 = 4.3$, $P = .037$), glass fogging (patient care $n = 463$, 76%; no patient care $n = 113$, 62%; $\chi^2 = 14.02$, $P < .001$), headache (patient care $n = 232$, 38%; no patient care $n = 44$, 24%; $\chi^2 = 12.04$, $P < .001$), and skin irritation (patient care $n = 337$, 55%; no patient care $n = 53$, 29%; $\chi^2 = 38.78$, $P < .001$). Clinical staff not providing patient care were more likely to have no issues as compared to those participating in patient care (no patient care $n = 34$, 19%; patient care $n = 47$, 8%; $\chi^2 = 18.26$, $P < .001$).

Discussion

This study explored the practices and perceptions of face mask use by staff in a pediatric health care system during the COVID-19 pandemic. As a whole, children are not as affected by severe COVID-19-related illness compared to adults, although those with certain underlying conditions may be at higher risk.¹² For this reason, many pediatric hospitals may not have experienced the same burden that adult hospitals have faced in caring for patients requiring hospitalization for COVID-19, such as lack of ICU beds, high census, staffing shortages, and lack of morgue capacity.

The majority of respondents in our study were nurses who provided direct patient care. This demographic is similar to another study that examined clinical and nonclinical health care worker perceptions of face coverings around the same time period.¹³ Alzunitan and colleagues evaluated the differences in

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Table 5. Top Themes of Perceptions of Health Care Workers During the COVID-19 Pandemic

Theme	Subtheme
Staff feel unsafe	Patient not tested for COVID or pending test results Screening process concerns Lack of evidence to decide which mask to use Improper mask practices Masks not 100% effective Concerns with the quality of PPE Safety/efficacy concerns with reusing PPE Inconsistent procedural guidelines for PPE or quarantine Changing standards of mask use during a pandemic Staff/families need mask education Concern with coworker COVID-related behaviors Management not concerned about staff
Beliefs/practices about COVID-19 and mask use	Response to COVID is exaggerated Type of mask worn varies Mask-wearing protects self and others Do not understand resistance to wearing masks Mask handling or cleaning practices varies Institution should compensate for all COVID exposure or provide extra compensation for essential workers
Mandates/enforcement of wearing masks	Staff supports mask mandate Wearing masks should not be mandated or enforced
Availability of masks/PPE	Mask requirements should be enforced for all, including managers Institution should provide high-quality masks for all employees Financial implications of employees providing own masks Providing own medical masks Provide staff with alternative PPE Challenges or concerns with obtaining a new mask, including fear of retribution or pressure to not replace if soiled
Care delivery challenges	Visitor restrictions for COVID prevention Unable to rule out work-related COVID exposure Concern with health or age restrictions for N95 masks Challenges performing job duties due to mask Physical or mental health challenges of wearing a mask Concerns with universal eye protection

PPE = personal protective equipment.

perception between face masks and face shields, whereas our study did not inquire about the use of face shields.¹³

Most respondents in our study indicated they wore a cloth mask outside of the work area and washed their mask after an average of 3 d of use. The CDC recommends washing cloth masks at least daily (<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-to-wash-cloth-face-coverings.html>, Accessed January 19, 2021). Respondents wearing surgical/procedure masks reported replacing their masks after nearly 3 d. Shortages of PPE during the COVID-19 pandemic led to supplies once considered disposable or single-use to be utilized longer or to be reused. Extended use refers to using the same mask with multiple patients without removing, whereas reuse is utilization of the same mask for multiple encounters followed by doffing, storage, and donning again.¹⁴ In the open-ended

responses, several subjects noted concerns and questions regarding safety and efficacy of these PPE practices.

The CDC recommends extended use of face masks as part of a contingency capacity strategy and limited reuse with extended use for crisis capacity (<https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/face-maskshtml#contingency-capacity>, Accessed December 11, 2020). Contingency capacity involves discarding the mask after removed, at the end of the workday, and if soiled or damaged. Hand hygiene is required if the mask is touched. The crisis capacity recommendations include using face masks beyond the manufacturer shelf life, but the maximum number of safe uses is unknown. A systematic review of guidance documents for extended use and reuse of PPE concluded the evidence for these practices is limited, and gaps and inconsistencies exist.¹⁴

Reprocessing and decontamination of filtering facepiece respirators has become a common practice during the COVID-19 pandemic to conserve PPE. The study institution did offer this service, but it was discontinued after low utilization. The challenges encountered with this approach were that many masks were ineligible for reprocessing if they were stained with makeup, and a minimum number of masks were needed to efficiently use the sterilant, which led to a delay in mask return. Instead, a 5-d quarantine process was recommended for respirator reuse.

The majority of respondents in our study agreed that correctly worn face masks are effective in preventing virus spread and that N95 masks protect staff from contracting COVID-19. More clinical than nonclinical staff agreed that the N95 provides protection from contracting COVID-19. This may be attributed to lack of knowledge by nonclinical staff of how filtering facepiece respirators function. The purpose of universal masking is to decrease virus transmission from infected wearers rather than to provide protection. However, double masking with a cloth mask placed over a medical procedure mask combined with optimal fit to prevent air leakage has been reported to reduce exposure for uninfected wearers in simulated experiments.¹⁵

Hand hygiene associated with mask handling was not consistent with CDC recommendations across all staff types. Hand hygiene is advised before and after touching the face mask (<https://www.cdc.gov/handwashing/when-how-handwashing.html>, Accessed January 19, 2021). Subjects reported the most frequent hand hygiene occurred after removing the mask. Clinical staff tended to have more frequent hand hygiene with mask handling overall than nonclinical staff, which may be a result of their awareness of patient safety initiatives to prevent hospital-acquired infections.

Many respondents reported issues or health challenges associated with wearing a face mask. Clinical staff reported more issues than nonclinical staff. This is not surprising as those providing patient care are required to wear a mask at all times, whereas staff working alone in an office may be able to remove their mask periodically. The most common issues described were glasses fogging and skin irritation. ACH required eye protection when patient facing and upon entry to a patient room prior to the survey dates. Forty-five percent of respondents reported skin irritation as an issue related to mask wearing. Alzunitan et al¹³ found comparable results with 46% describing device-related skin irritation with face masks as compared to face shields.

Many respondents expressed concerns in the open-ended response revealing several themes and subthemes. One of the top themes identified was staff feeling unsafe. In addition to feeling unsafe due to PPE-related issues, another common subtheme was concern over improper mask use by other staff members, patients, and families. Several indicated they felt additional education was needed to address this problem.

While there were several differences noted between clinical and nonclinical staff, there were fewer dissimilarities identified among clinical staff who do and do not provide patient care. The majority of clinical respondents provided patient care. The most notable differences were that patient care providers reported more hand hygiene and more issues with mask wearing. It was not surprising that those providing care have more issues with mask wearing as they probably are wearing protective gear for longer periods of time.

Results from this study may have implications for practice regarding education. Education on hand hygiene associated with mask handling and recommendations for mask reuse could be beneficial. Cloth masks were not always washed daily nor disposable masks replaced every day. It is not known if these practices were due to lack of education or resource issues.

There were several limitations to our study. The survey used in this study was not validated or tested for reliability because this project was expedited to gather information on the perceptions of wearing masks during the height of the pandemic. As a result, the survey was not developed using psychometric theory. Our survey was administered early in the pandemic and should be considered in that context because much has changed since that time, especially the surge in the number of positive COVID-19 cases, hospitalizations, patients requiring ventilators, and deaths that occurred in the fall and winter of 2020. Figure 1 shows a COVID-19 timeline. Results from this study were obtained from a single pediatric health care system in the southern United States and may not be generalizable to all health institutions. Practices and perceptions may be different in adult institutions or in other parts of the country. This study did not inquire about the use of eye protection or face shields.

Most of our respondents were clinical staff who provided direct patient care. It is possible that some degree of response bias is present due to underrepresentation of nonclinical staff. There were very few respondents from nutritional services and housekeeping. The survey invitation was included in system-wide e-mail announcements and departmental distribution groups. The extent of e-mail access for these employees is not known.

Respondents were asked about the type of mask worn in their work area and when outside of the work area. Medical-grade surgical/procedure masks appear identical to non-medical-grade disposable masks that can be purchased in retail stores. This distinction was not made in our questionnaire, and therefore it is possible that some respondents who reported wearing a surgical/procedure mask were utilizing non-medical-grade masks. The CDC recommends that disposable masks are replaced after being worn once (<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-to-wash-cloth-face-coverings.html>, Accessed January 19, 2021). Cloth face masks can be

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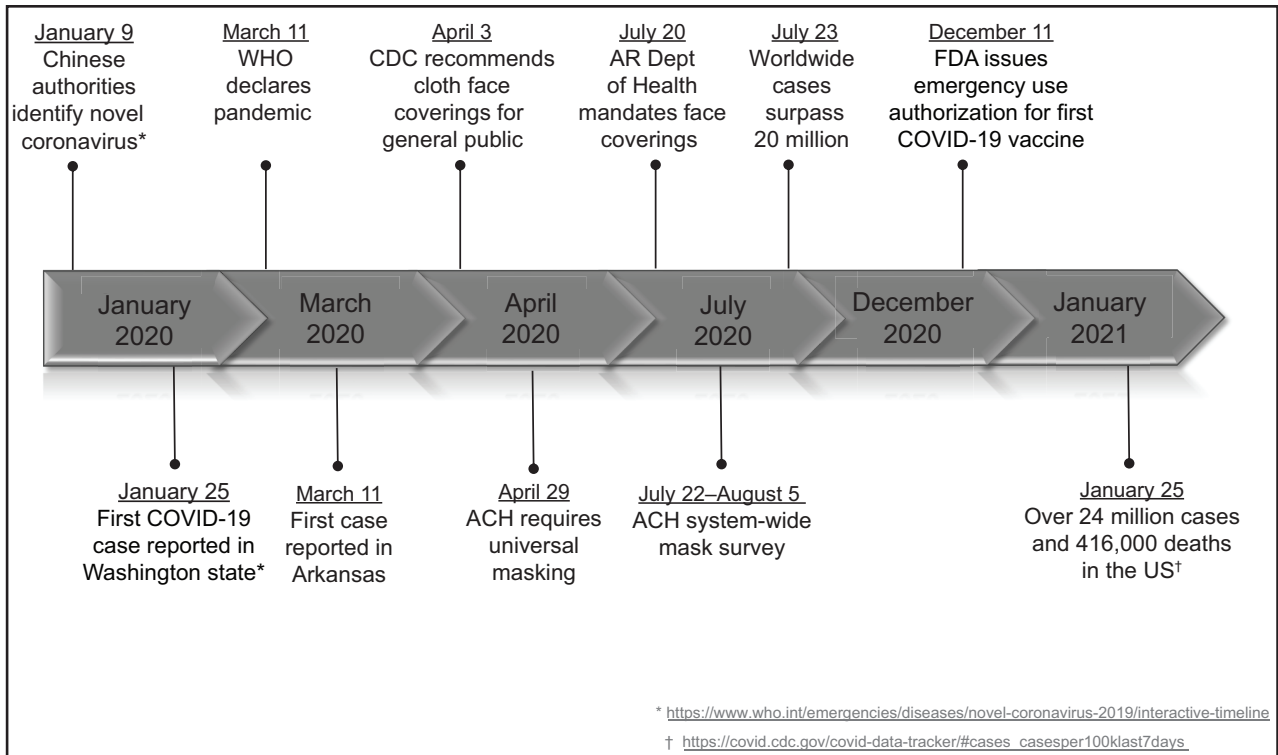


Fig. 1. Timeline of COVID-19 in context with survey administration. WHO = World Health Organization; ACH = Arkansas Children’s Hospital; AR = Arkansas.

made of many different types of materials and have varying numbers of layers. We did not investigate details of the cloth mask other than if they were sewn or no-sew, purchased, or whether a filter was utilized. Most subjects who reported wearing a cloth mask indicated they wore a sewn mask, and very few reported using a filter. At the time of the survey, neck gaiters and bandanas were still allowed for use by staff but were prohibited shortly thereafter. Masks with exhalation valves were already banned prior to the survey.

Approximately 24% of subjects who completed the survey did not feel that face masks were effective in preventing the spread of COVID-19. Because our study was completed early in the pandemic, it would be interesting to re-survey to determine if practices or perceptions have changed over time. It would also be interesting to compare our results to those of other pediatric institutions as well as adult hospitals, where the experience in caring for patients hospitalized with COVID-19 may be different than in children’s hospitals.

A systematic review published prior to the COVID-19 pandemic reported that mask wearing coupled with use of hand sanitizer was more effective at reducing virus transmission than sanitizer alone.¹⁶ The use of face coverings is only one of several strategies used to mitigate the spread of COVID-19. Additional methods include frequent hand

hygiene and social distancing. As more is learned about the virus, recommendations are likely to continue to evolve. At the time of this writing, COVID-19 vaccines are being administered to health care workers. However, face coverings are still recommended at this time, and it is unknown when universal masking will no longer be required.

Conclusions

Practices for care and handling of face masks varied among staff in a pediatric health care system. While most agreed with universal masking, some staff did not feel that masks are effective in preventing virus spread. Hand hygiene for mask handling was not practiced consistently. A large number of staff reported experiencing issues or health challenges when wearing a mask. Many respondents expressed concern in wearing masks previously considered as single-use for an extended amount of time and did not feel safe in performing job duties.

REFERENCES

1. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Biomed* 2020;91(1):157-160.
2. Mahase E. Covid-19: WHO declares pandemic because of “alarming levels” of spread, severity, and inaction. *BMJ* 2020;368:m1036.

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- Gostin LO, Cohen IG, Koplan JP. Universal masking in the United States: the role of mandates, health education, and the CDC. *JAMA* 2020;324(9):837-838.
- Feng S, Shen C, Xia N, Song W, Fan M, Cowling BJ. Rational use of face masks in the COVID-19 pandemic. *Lancet Respir Med* 2020;8(5):434-436.
- Wong SH, Teoh JYC, Leung CH, Wu WKK, Yip BHK, Wong MCS, Hui DSC. COVID-19 and public interest in face mask use. *Am J Respir Crit Care Med* 2020;202(3):453-455.
- MacIntyre CR, Cauchemez S, Dwyer DE, Seale H, Cheung P, Browne G, et al. Face mask use and control of respiratory virus transmission in households. *Emerg Infect Dis* 2009;15(2):233-241.
- Wang X, Ferro EG, Zhou G, Hashimoto D, Bhatt DL. Association between universal masking in a health care system and SARS-CoV-2 positivity among health care workers. *JAMA* 2020;324(7):703-704.
- Brooks JT, Butler JC, Redfield RR. Universal masking to prevent SARS-CoV-2 transmission—the time is now. *JAMA* 2020;324(7):635-637.
- Lyu W, Wehby GL. Community use of face masks and COVID-19: evidence from a natural experiment of state mandates in the US. *Health Aff (Millwood)* 2020;39(8):1419-1425.
- Arkansas Department of Health. Face coverings directive. Modified October 5, 2020. Available at: https://www.healthy.arkansas.gov/images/uploads/pdf/Face_Covering_DirectiveAmendFinal10.5.20.pdf. Accessed December 7, 2020.
- Bartlett JE, Kotrlík JW, Higgins CC. Organizational research: determining appropriate sample size in survey research. *Inform Technol Learn Perf J* 2001;19(1):43-50.
- Moeller A, Thanikkel L, Duijts L, Gaillard EA, Garcia-Marcos L, Kantar A, et al. COVID-19 in children with underlying chronic respiratory diseases: survey results from 174 centres. *ERJ Open Res* 2020;6(4):00409-2020.
- Alzunitan MA, Perencevich EN, Edmond MB. Assessing health care worker perceptions of face coverings during the COVID-19 pandemic. *Am J Infect Control* 2021;49(4):521-522.
- Toomey EC, Conway Y, Burton C, Smith S, Smalle M, Chan XS, et al. Extended use or reuse of single-use surgical masks and filtering face-piece respirators during the coronavirus disease 2019 (COVID-19) pandemic: a rapid systematic review. *Infect Control Hosp Epidemiol* 2021;42(1):75-83.
- Brooks JT, Beezhold DH, Noti JD, Coyle JP, Derk RC, Blachere FM, Lindsley WG. Maximizing fit for cloth and medical procedure masks to improve performance and reduce SARS-CoV-2 transmission and exposure. *MMWR Morb Mortal Wkly Rep* 2021;70(7):254-257.
- Bin-Reza F, Chavarrias VL, Nicoll A, Chamberland ME. The use of masks and respirators to prevent transmission of influenza: a systematic review of the scientific evidence. *Influenza Other Respir Viruses* 2012;6(4):257-267.