ORIGINAL RESEARCH

Predictors of Nurses' Intentions to Work During the 2009 Influenza A (H1N1) Pandemic

Study findings suggest ways that employers can ensure an adequate workforce during crises.

The unwillingness or inability of health care workers to work in emergency situations has been well documented, from the 1918 influenza pandemic to the more recent 2002–2003 severe acute respiratory syndrome (SARS) outbreaks and Hurricane Katrina in 2005.[1-4] Beginning in the 1990s, researchers investigating terrorism and catastrophic events found that up to 96% of health care workers reported being unable or unwilling to work during some emergencies; infectious diseases for which treatment or vaccination is lacking have been associated with the highest unwillingness rates.[5-12]

Recognizing that different types of barriers may influence health care workers' ability and willingness to work during emergencies helps health care organizations to prepare and respond in ways that preserve an adequate workforce. Qureshi and colleagues make a distinction between barriers that reflect an inability to work and those that reflect an unwillingness to do so.[9] Barriers that reflect an inability to work don't involve choice: the health care worker is incapable of working. For example, a nurse hospitalized with a broken leg is physically unable to work. On the other hand, barriers that reflect an unwillingness to work do involve choice: the health care worker has made a personal decision not to work. For example, a nurse who chooses to stay home to care for a sick child even though other responsible family members are available has made a decision not to work. However, as Ives and colleagues have noted, barriers to willingness and ability to work tend to exist on a continuum, with preference (unwillingness) at one end, insurmountable circumstances (inability) at the other, and "increasingly difficult choices" in the middle.[13] Thus, the willingness and ability to work during emergencies is complex and based on real and perceived personal and social factors.[9, 10, 13]

Most research on willingness and ability to work during emergencies has used convenience samples, hypothetical situations, or untested survey instruments. We found no studies conducted solely among nurses, the largest group of health care workers. We decided to conduct a study examining factors affecting Maine nurses' self-reported willingness and ability to work, based on data collected during the 2009 influenza A (H1N1) pandemic; we also sought to identify potential predictors of willingness and ability to work. An inverse relationship between reported level of threat perception from pandemic flu and willingness to work was predicted.[14, 15] Our findings concerning factors have been published elsewhere.[16] Here we report on findings related to potential predictors.

METHODS

This study was approved by applicable institutional review boards before study activities began.

Study setting and participants. An initial sample of 1,200 nurses with Maine home addresses was randomly selected, using a random number generator, from a Maine State Board of Nursing database listing

ABSTRACT

Objective: This study examined potential predictors of nurses' intentions to work during the 2009 influenza A (H1N1) pandemic.

Methods: A questionnaire was mailed to a random sample of 1,200 nurses chosen from all RNs and LPNs registered with the Maine State Board of Nursing during the second wave of the flu pandemic.

Results: Of the 735 respondents, 90% initially indicated that they intended to work during a flu pandemic. Respondents were significantly more likely to work if provided with adequate personal protective equipment (PPE) but significantly less likely without adequate PPE or if they feared family members could become ill with pandemic flu. They were also significantly less likely to work if assigned to direct care of a flu patient; if a colleague were quarantined for or died of pandemic flu; if they feared their own family members might die of pandemic flu; if they themselves were ill for any reason; if a family member or loved one were sick at home and needed care; if they lacked a written family protection plan; or if certain incentives were offered: antiviral medication or vaccine for nurse and family, double pay, or free room and board at work. About 7% of RNs reported that they would not be willing to work during a flu pandemic, regardless of incentives or other factors. An inverse relationship was found between the perceived level of threat posed by a flu pandemic and nurses' willingness to work.

Conclusions: To maintain an adequate nursing workforce during a flu pandemic, employers should ensure that policies and procedures include providing adequate PPE for nurses and safeguarding the health of nurses and their families. The level of perceived threat is likely to affect the proportion of nurses willing to work. Some nurses will not work during a flu pandemic no matter what protections and incentives are offered; efforts intended to force or entice all nurses to work are unlikely to succeed.

Keywords: disaster care, influenza A (H1N1), intention to work, pandemic

all nurses registered in Maine (approximately 23,000 nurses). The sample size was determined by the funding available for the study and was stratified to reflect population percentages of RNs and LPNs.

Research instrument. After conducting a thorough review of the literature, an initial pilot questionnaire was developed by one of us (SDM). The questionnaire was evaluated by three content validity experts—PhD-level faculty from a college in Maine and a university in Florida with expertise in public health or psychology—and was revised based on their feedback. Pilot subjects representing a variety of demographic characteristics were then recruited by e-mail and word of mouth from among nurses working at various health care agencies in southern Maine. The 16 nurses who indicated a willingness to participate in the pilot were offered, by e-mail, two options for doing so: a mailed questionnaire or a cognitive interview. They were given this choice in order to increase the number of participants. As Dillman and colleagues have explained, in a cognitive or "think-aloud" interview, the subject verbally expresses all thoughts as she or he completes the questionnaire in the presence of the researcher.[17] But although cognitive interviewing can yield excellent results, not all subjects are willing to share every thought with an interviewer, and some may prefer the anonymity and ease of participating by mail. Of the 16 pilot subjects, 12 chose the mailed questionnaire and four chose the cognitive interview. Further revisions to the questionnaire were then made, based on the pilot subject responses. The final questionnaire was again reviewed for content validity by the same three content validity experts.

The final questionnaire included both demographic questions and 23 items assessing willingness and ability to work during a flu pandemic. (Although the survey was conducted during the second wave of the 2009 flu pandemic, some questions were worded to suggest hypothetical situations.) We estimated that it would take 10 minutes to complete. Demographic characteristics were selected to be consistent with data collected by the Maine State Board of Nursing in order to allow sample to population comparisons, and included the highest level of education completed, advanced practice status, number of years as a nurse, employment status, employment setting, employment position, number of direct patient care hours worked per week, age, sex, race, and ethnicity.

Variables potentially related to willingness to work included intention to work during a pandemic flu, feeling knowledgeable about pandemic flu, feeling knowledgeable enough to safely care for a patient

Table 1. Demographic Characteristics of the Sample (N = 735) with Population Comparison

Characteristic		n	%	Population %[a]
Sex	Female	687	93.5	93.1
	Male	48	6.5	6.8
Race	White	714	97.1	97.6
	Other	15	2	1.4
	Blank	6	<1	1
Ethnicity	Hispanic	3	<1	NA
	Non-Hispanic	578	78.6	NA
	Blank	154	20.9	NA
Education	LPN	74	10.1	9.3
	Diploma RN	125	17	21.9
	Associate's RN	211	28.7	27
	Bachelor's RN	254	34.6	29.9
	Master's RN	67	9.1	8.8
	Doctoral RN	2	<1	0.3
	Blank	2	<1	NA
Currently employed as a nurse	Yes	628	85.4	88.6
	No, not working at all	78	10.6	6.7
	Working in another field or training	28	3.8	3.5
	Blank	1	<1	NA
Work setting	Hospital	357	48.6	53.9
	LTC/nursing home/assisted living	81	11	11.4
	Ambulatory care/community clinic	64	8.7	7.9
	Home/occupation/community/school	80	10.9	13.1
	Other	140	19	6.3
	Blank	13	1.8	NA
Primary role	Staff/direct care	436	59.3	60.2
	Administrative/managerial	119	16.2	19.3
	Advanced practice	41	5.6	6.1
	Other	119	16.2	13.4
	Blank	20	2.7	NA

	Mean	SD	Range	Population mean[a]
Age, y	49	11.53	20–77	50.3
Years as a nurse	23	13.31	<1–55	NA
Direct care hours/wk	23	15.94	0–40	NA

LTC = long-term care facility; NA = not available.

[a]Population data are from Morris L. *Maine minimum data set: Maine's nurses who renewed their licenses between September 1, 2006 and September 1, 2008.* Portland, ME: Muskie School of Public Service, University of Southern Maine; 2010 Jun.

Note: Percentages may not sum to 100% due to rounding.

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with pandemic flu, feeling that the employer would ensure the safety of both the nurse and the nurse's family, feeling that the nurse's family was at risk for illness or death, geographic proximity of patients with pandemic flu, availability of personal protective equipment (PPE), and availability of antiviral medications and vaccine for the nurse and the nurse's family. Variables that might alter a respondent's perception of risk (such as knowing a coworker had contracted flu and died), incentives (such as double pay), and other factors (such as pregnancy) were also presented. Variables that could potentially predict the ability to work included having child, elder, or pet care responsibilities; having conflicting obligations, such as to a significant other who was also a health care worker or to loved ones who were sick and required care; personal health concerns for self or family; transportation problems; personal illness; and fears for the

health of self or family. Each question assessing willingness and ability to work asked whether the respondent would care for a patient with pandemic flu if the given variable was present. Each question was answerable only with "yes" or "no" to prevent "unsure" responses. (For more information about the questionnaire, contact the lead author.)

In October 2009, during the second wave of the relatively mild influenza A (H1N1) pandemic in Maine, the final questionnaire was mailed via the U.S. Postal Service to the 1,200 nurses. The following four steps were completed with one-to-two-week intervals between them, as suggested by Dillman and colleagues.[17] First, a postcard introducing the study was mailed to potential participants. Next, the questionnaire, together with an informed consent letter and a raffle ticket incentive, was mailed. Then a follow-up postcard was sent with two messages—an expression of appreciation to respondents who had completed and returned the questionnaire and a message of encouragement to those who hadn't yet done so. Lastly, the questionnaire with an informed consent letter was again mailed to those who had not yet responded.

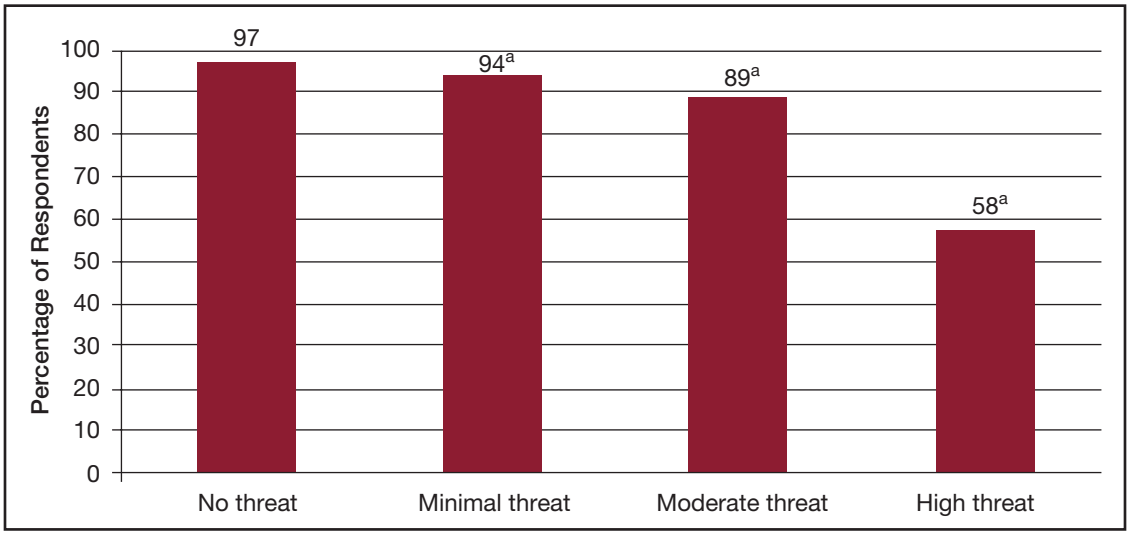
Statistical analysis included binary logistic regression with adjusted odds ratio and *P* value, using SPSS statistical software; significance was set at $P \leq 0.05$. The binary logistic regression reference question was, "In a flu pandemic, would you report to work as usual?"

RESULTS

Of the 1,200 questionnaires mailed, 735 usable questionnaires were returned (a 61% response rate). Of the 465 remaining questionnaires, 455 were not returned and 10 were returned with missing or incomplete answers. Generally, respondents were older (mean age, 49 years [SD, 11.53]), white (97%), and female (94%). The majority were RNs (90%); the most commonly held degrees were the bachelor's degree (35%) and the associate's degree (29%). Six percent reported completing an advanced practice degree program (NP, clinical nurse specialist, nurse anesthetist, or nurse midwife). Most respondents (85%) currently worked in nursing; about half of respondents (49%) worked in hospitals. A majority of respondents (59%) reported working in a staff or direct patient care role. Respondents were experienced (mean years as a nurse, 23 [SD, 13.31]) and worked an average of 23 hours (SD, 15.94) per week. The demographics of the sample and the population comparison are described further in Table 1. No significant relationships were found between demographic characteristics and the research reference question: "In a flu pandemic, would you report to work as usual?" Therefore, demographic characteristics were not included in the regression models.

Most respondents (90%) initially reported an intention to work during a flu pandemic. The initial overall perception of threat from pandemic flu reported by respondents was low, consistent with the impression that the 2009 pandemic was a mild one, with 12% (91) reporting no feeling of threat at all, 57% (417) feeling minimal threat, 27% (196) feeling moderate threat, and only 2% (17) feeling very threatened. (Values do not sum to 100% [735] because some respondents left this question blank.) The perception of threat was inversely related to willingness

Figure 1. The Percentage of Respondents Indicating Willingness to Work During a Flu Pandemic According to Their Self-Reported Perception of Flu Threat



[a] The differences between 94% and 89% and between 89% and 58% are statistically significant ($P \leq 0.05$).

Table 2. Significant Predictors of Nurses' Willingness and Ability to Work During a Flu Pandemic

Variables	AOR (95% CI)	*P* value
Positive predictors		
Personal protective equipment		
Gown, gloves, and N-95 mask provided	0.154 (0.062-0.380)	< 0.001
Gloves and N-95 mask provided, no gown	0.371 (0.159-0.867)	0.022
Negative predictors		
Geographic proximity		
PF patients in workplace, assigned to direct care	0.089 (0.031-0.261)	< 0.001
Family safety		
Lack of written personal PF plan for nurse and family	2.751 (1.032-7.339)	0.043
Felt that caring for patient with PF would put nurse's family at risk for illness or death	0.319 (0.109-0.932)	0.037
Incentives		
Employer-provided room and board for nurse	0.329 (0.154-0.701)	0.004
Vaccine offered to nurse and family	0.238 (0.063-0.895)	0.034
Double pay	0.051 (0.024-0.110)	< 0.001
Situations altering perception of risk		
Some HCWs at work quarantined	0.337 (0.122-0.931)	0.036
30-year-old HCW died of work-acquired PF	0.324 (0.139-0.754)	0.009
Fear		
Fear that family would become sick with PF	2.617 (1.016-6.740)	0.046
Health concerns		
Nurse sick for any reason	0.371 (0.149-0.921)	0.033
Caregiver responsibilities		
Family member or loved one sick at home and in need of care	0.096 (0.017-0.545)	0.008

AOR = adjusted odds ratio; CI = confidence interval; HCW = health care worker; PF = pandemic flu.

to work; as the level of perceived threat rose, the proportion of nurses indicating such willingness decreased (see Figure 1).

Respondents were significantly more likely to work during a flu pandemic if they were provided with a gown, gloves, and N-95 mask ($P < 0.001$). They were also more likely to work if they were provided with gloves and an N-95 mask ($P = 0.022$), and less likely if there was inadequate PPE ($P < 0.001$).

Respondents were significantly less likely to work if they were assigned the direct care of a patient with pandemic flu ($P < 0.001$), if they felt that caring for a patient with pandemic flu placed their own family at risk for illness or death ($P = 0.037$), if flu vaccine was provided for self and family ($P = 0.034$), and if they lacked a personal pandemic flu plan for self and family ($P = 0.043$).

The opportunity to receive double pay ($P < 0.001$) or free room and board at work in order to avoid bringing the virus home ($P = 0.004$) were negative predictors of willingness to work. Some respondents added comments emphasizing that neither additional money nor free room and board would improve their willingness to work.

Some questions presented specific hypothetical situations. "Reports" that some health care workers were being quarantined because of possible pandemic flu exposure ($P = 0.036$) and that one 30-year-old health care worker had died of workplace-acquired pandemic flu ($P = 0.009$) were both negative predictors of willingness to work. Negative predictors of ability to work included being afraid that a family member would develop flu-like symptoms ($P = 0.046$), being ill oneself for any reason ($P = 0.033$), and having a family member at home who was ill and in need of care ($P = 0.008$). For more on significant predictors of nurses' willingness and ability to work during pandemic flu, see Table 2.

DISCUSSION

A growing body of evidence suggests that many predictors affect health care workers' willingness and ability to work during disasters.[18] Because nurses make up the largest proportion of health care workers and are integral to the functioning of any health care system, this study focused on their ability and willingness to work under various conditions during a flu pandemic.

Earlier research exploring the relationship between demographic characteristics and the willingness and ability to work has been inconclusive. Various studies have indicated that being male,[5, 11, 19] being 35 years of age or older,[20] or holding a master's-level or higher degree[20] might positively affect willingness to work; yet other studies have found that age and sex may not be related to ability and willingness to work.[21-23] Although one study found an association between race and willingness to work,[24] we found no significant relationships between any demographic characteristics and ability or willingness to work. But this finding might reflect our sample's relative homogeneity regarding age, race, and sex.

Willingness to work. It's not surprising that the overall perception of threat was low, as the 2009 pandemic was generally felt to be mild. There was no public panic or loss of public services as occurred during the 1918 pandemic. But our findings showed a clear inverse relationship between perceived threat and willingness to work. Indeed, of respondents who perceived a high threat level, just 58% indicated a willingness to work, one of the lowest proportions revealed by the survey. It is possible that had the overall perception of threat during the 2009 pandemic been higher, this proportion would have been even lower.

Many studies have found that concerns about the adequacy of PPE affect willingness to work,[5, 8, 11, 12, 16, 19, 20, 23, 25-28] and we found this to be one of the most powerful influences as well. While respondents reported being more likely to work if given adequate PPE (gown, gloves, and N-95 mask; or gloves and N-95 mask), some reported that they wouldn't work even with full PPE. Furthermore, as the proposed level of PPE to be given decreased, so did nurses' willingness to work. A significant drop in willingness to work without PPE has been noted with both smallpox[5] and pandemic flu.[27] As we reported in an earlier article, as few as 6% of nurses indicated a willingness to work if there was no PPE.[16] The provision of adequate PPE is a recognized strategy for mitigating absenteeism during a pandemic.[5, 8, 11, 12, 29] Recent studies suggest that during the 2009 influenza A (H1N1) pandemic, the virus was transmitted to health care workers most often through exposure resulting from inadequate PPE.[30-32]

Concern for family safety is a widely recognized predictor of willingness to work during disasters,[11, 16, 25, 28, 30-33] and we found it to be a powerful influence in this study. Willingness to work decreased if respondents lacked a personal family pandemic flu plan, if they weren't confident that their employer would ensure their family's safety while they cared for patients with pandemic flu, and even if vaccine and antiviral medication were provided for both nurse and family. Indeed, the willingness to work decreased among all respondents who felt their family would be at risk for illness or death. Earlier research, as well as the findings from this study, suggests that giving preferential access to antiviral therapy, PPE, or both to health care workers and their immediate families can be an effective strategy for mitigating absenteeism during a pandemic.[5, 8, 11, 12, 29] But concern for the families of employees may not be reflected in health care workplace policies and procedures. For example, what percentage of employers currently offers immunizations, antivirals, or PPE (or a combination of these) to both health care workers and their families during a disaster? Given the impact of concern for family safety on willingness to work, this warrants further research.

There has been limited research examining the impact of monetary incentives on willingness to work. Even an offer of triple pay may not increase willingness to work during a pandemic in some health care workers.[19] Our study found that increased pay was not an effective motivator. Some respondents reported that double pay would not increase willingness to work, while others indicated that they'd work for their usual wages, and showed no increase in willingness to work if wages were doubled or tripled. It seems likely that such willingness is associated with a sense of ethical duty to provide care, and this area might merit further research.

A few studies found that the provision of room and board, which would allow workers to work without risk of bringing the virus home to their families, had a positive influence on willingness to work.[23, 34, 35] But in our study, respondents were not more likely to work when offered room and board.

It was interesting to note that certain incentives—including provision of antiviral medication and vaccine for nurse and family, double pay, and free room and board at work— were associated with *fewer* respondents indicating willingness to work. This apparent paradox might be understood through written comments from some respondents, which suggested that no incentive was worth the health and well-being of their families. Other comments suggested that some respondents perceived these incentives to be coercive.

Earlier research has suggested that health care workers perceive the prospect of quarantine negatively,[26, 36] and also fear for their own health.[13, 19, 20] This study supports those findings. We found that when given hypothetical situations in which colleagues were being placed in quarantine or were dying of the flu, significantly fewer respondents reported a willingness to work.

Ability to work can be affected by numerous conditions. A majority of respondents indicated that having a family member or loved one sick at home and in need of care or being sick oneself for any reason would significantly affect their ability to work. Earlier research has suggested that elder or child care responsibilities have a major influence on the ability

to work during emergencies,[9-11, 34] including a flu pandemic.[13, 20, 22, 24, 37] A majority of respondents indicated that elder or child care responsibilities would affect their ability to work, although this finding was not significant.

In earlier research, transportation issues have adversely affected ability to work.[9-11, 13, 34] But in this study, transportation issues were not a significant predictor of ability to work. This might be reflective of where we conducted the study. While workers in some areas can rely on public transportation, there are few such options in predominantly rural Maine; and Maine workers have a long history of traveling successfully in private vehicles through rough weather and poor conditions. Results might have differed if the study had been conducted in an urban population with concerns about public transportation and traffic jams.

Limitations of this study included the relative lack of diversity in the sample: most respondents were white, non-Hispanic, and female; and the study was conducted in a predominantly rural area. It would be useful to study a more diverse and urban-dwelling population during an actual flu pandemic, although doing so would be challenging. A second limitation is that because participation in the study was voluntary, the possibility of nonresponse bias exists. That said, the sample was randomly selected and large; and a comparison with population demographics suggests that our sample represented the population well, requiring no nonresponse weighting. Our response rate of 61% may also have been a limitation. Future research can better control for nonresponse bias by attempting to reach an 85% response rate.[38]

A third limitation is that there is a known tendency for discrepancy between respondents' stated intentions and their actual behavior. In particular, respondents tend to overestimate their willingness to engage in behaviors that appear "socially desirable."[39] It's possible that some nurses who said they would work as usual were providing a socially desirable response, but the anonymous nature of the survey probably helped to control for this. Also, although some of the questions posed hypothetical situations, we believe the fact that data were collected during an actual flu pandemic strengthens the likelihood that stated intentions would be predictive of actual behaviors.

CONCLUSIONS

Overall, the level of flu threat perception among respondents was low, consistent with the impression that the 2009 flu pandemic was a mild one; but as the perception of threat increased, the percentage of respondents willing to work decreased. It's likely that fewer nurses would report to work during situations perceived as posing a higher threat, especially those that would also threaten nurses' families.

Most nurses initially reported an intention to work during a flu pandemic. A small minority indicated that they did not intend to do so. Adequate PPE was a predictor of increased willingness to work. There were several predictors of decreased willingness or ability to work, including having less than adequate or no PPE, being afraid that one's family would become ill with or die of the flu, being assigned to direct care of patients with pandemic flu, knowing that other health care workers had been quarantined or had died of the flu, being sick oneself for any reason, lacking a written family protection plan, having a family member or loved one sick at home and in need of care, having antiviral medications or vaccine offered to self and family, being offered double pay, and being offered free room and board. Among the 7% of nurses who initially reported no intent to work during a flu pandemic, no predictors were identified that increased their willingness or ability to work.

Practice implications. To maintain an adequate nursing workforce during a flu pandemic and other emergency situations, it's clear that employers must plan ahead. Measures should include stockpiling the necessary materials to provide nurses with full PPE and offering nurses and their families vaccines and antiviral medication. Policies and procedures that would lessen nurses' fears that their families could become ill are likely to increase work attendance. But it's important to note that regardless of the availability of PPE and incentives, some nurses will simply not be willing to work. During any emergency situation, managers should expect some absenteeism and should focus their efforts on retention of most nurses, rather than on trying to force all nurses to work. The ethical aspects of nurses' duty to provide care were not addressed in this study but warrant future research.

The willingness to work during a flu pandemic was clearly linked to nurses' concerns about personal and family safety. All nurses—not just managers—can take action to protect themselves and their families. First, nurses can develop personal family emergency preparedness plans. Guidance can be found at Make a Plan (www.ready.gov/make-a-plan), a site sponsored by the Federal Emergency Management Agency, and at Plan and Prepare (www.redcross.org/prepare), a site sponsored by the American Red Cross.

Nurses should also become familiar with the disaster or emergency plans of their employers. Such plans should describe the nurse's role and responsibilities and the employer's expectations of the nurse during a disaster or emergency, as well as how these might differ from the usual. For example, an institutional emergency plan might reassign nurses from non–patient care roles (such as staff educator) to direct patient care roles as needed. Nurses can seek periodic orientation to the emergency plan, offer suggestions for improvement, and serve on emergency management committees. Nurses should also seek continuing education from their employers whenever an emergency plan calls for skills they don't already possess.

Lastly, nurses can initiate discussions with coworkers and management regarding how things went during the most recent pandemic or other emergency situation and how emergency planning can be improved. For example, during the most recent flu pandemic, were there enough N-95 masks available for nurses providing direct care to flu patients? Our findings suggest that it's important to plan for adequate resources during any emergency, including supplies and services that, when readily available, will ensure the safety of patients, nurses, and nurses' families. Doing so may increase many nurses' willingness and ability to work in times of crisis. ▼

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