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## Major article

## Hospital respiratory protection practices in 6 U.S. states: A public health evaluation study



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## Key Words:

Respiratory protection  
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**Background:** Lessons learned from the influenza A (H1N1) virus revealed a need to better understand hospitals' respiratory protection programmatic practice gaps. This article reports findings from a multistate assessment of hospitals' adherence to the Occupational Safety and Health Administration's respiratory protection program (RPP) requirements and the Centers for Disease Control and Prevention's infection control guidance.

**Methods:** Onsite surveys were conducted in 98 acute care hospitals in 6 U.S. states, including >1,500 hospital managers, unit managers, and health care workers. Descriptive statistics were used to assess hospital adherence.

**Results:** Most acute care hospitals adhere to requirements for initial medical evaluations, fit testing, training, and recommended respiratory protection when in close contact with patients who have suspected or confirmed seasonal influenza. Low hospital adherence was found for respiratory protection with infectious diseases requiring airborne precautions, aerosol-generating procedures with seasonal influenza, and checking of the respirator's user seal. Hospitals' adherence was also low with follow-up program evaluations, medical re-evaluations, and respirator maintenance.

**Conclusion:** Efforts should be made to closely examine ways of strengthening hospitals' RPPs to ensure the program's ongoing effectiveness and workers' proper selection and use of respiratory protection. Implications for improved RPPs and practice are discussed.

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Health care workers (HCWs) are exposed to many hazards and experience some of the highest rates of job-related injury and illness.<sup>1</sup> In 2012, registered nurses and nursing assistants were among the occupations with the highest rate of days away from

work because of work-related injuries and illnesses.<sup>2</sup> Infectious disease exposure is one of the many hazards encountered in the health care workplace. For instance, it has been reported that HCWs have a high risk of acquiring seasonal influenza and a high or very high risk of being exposed to pandemic influenza.<sup>3,4</sup> To minimize the risk of infectious disease transmission, workers are expected to follow infection prevention precautions, including the appropriate use of personal protective equipment (PPE).<sup>5,6</sup> However, marginal adherence to recommended precautions has been a well-documented and alarming trend.<sup>5</sup> Previous studies have found HCWs' PPE usage, including respiratory protection, to be at sub-optimal levels.<sup>7-10</sup> Common documented gaps in practice include improper use of respirators (eg, incorrect donning or doffing procedures) and failure to correctly use recommended types of respiratory protection.<sup>11-14</sup>

During the 2009 influenza A (H1N1) pandemic, HCWs not only had an increased risk of influenza, but they were also among the most affected by the virus.<sup>15,16</sup> For example, even though use of

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respiratory protection was found to have a protective effect against transmission of H1N1, 1 New York City hospital reported that for each patient with an influenza-like illness, approximately 5 un-protected HCWs were exposed during the first wave of the H1N1 pandemic.<sup>10,17</sup>

Lessons learned from H1N1 yielded a mandate to better understand respiratory protection programmatic practice gaps to help inform influenza pandemic planning. In this context, the Institute of Medicine tasked the National Personal Protective Technology Laboratory (NPPTL) to conduct an evaluation of hospitals' respiratory protection programs (RPPs) and HCWs' respiratory protection practices to better understand gaps in RPPs and health care practice for targeted training and reinforcement initiatives.<sup>18</sup> The NPPTL, which is part of the National Institute for Occupational Safety and Health (NIOSH), focuses on preventing work-related illness and death through PPE research, training, evaluation and certification.

An initial study conducted in 2010, the Respirator Use Evaluation in Acute Care California Hospitals (REACH I), focused on RPPs and practices in 16 California acute care facilities during the 2009-2010 H1N1 influenza pandemic. Findings from the REACH I study indicated that hospitals had implemented policies regarding the use of respirators and the Occupational Safety and Health Administration (OSHA) required programmatic elements related to medical evaluation, fit testing, and employee training. Nearly all interviewed HCWs stated that they would use respiratory protection when in close contact with patients suspected or confirmed with H1N1. However, there were gaps in hospitals' written RPPs, with program evaluation and designation of an RPP administrator as the most commonly missing elements. Deficiencies noted in a limited number of observations of HCWs included failure to perform a user seal check, incorrect doffing technique, and failure to perform hand hygiene after doffing the respirator.<sup>12</sup>

Following the REACH I study, the NPPTL collaborated with 5 independent study teams in 6 U.S. states to conduct a more comprehensive hospital evaluation called the Respirator Evaluation in Acute Care Hospitals (REACH II) study.

The purpose of the REACH II study was to expand data collection to more accurately capture how well acute care hospitals were implementing required elements of an RPP as detailed by the OSHA<sup>19</sup> and HCWs adherence to the infection control recommendations of the Centers for Disease Control and Prevention (CDC).<sup>19</sup> This article reports the key findings from the REACH II study and specifically answers the following questions:

1. To what extent do acute care hospitals implement the required elements of an RPP?
2. To what extent do HCWs follow usage recommendations for respiratory protection?

## OSHA'S RPP REQUIREMENTS

The OSHA requires that employers establish and implement specific practices in workplaces where respirators are necessary to protect the health of employees.<sup>19</sup> Employers are required to have a comprehensive, written RPP that documents policies and procedures related to medical evaluations, employee respirator fit testing, respirator selection, use of respirators, respirator maintenance, respirator inspection, employee training, and program evaluation. For example, employers must ensure that employees using a tight-fitting facepiece respirator pass a medical clearance, and a passage of a qualitative or quantitative fit test prior to initial use of the respirator in the workplace, at least annually thereafter and whenever a different respirator is used or there are changes to the employee's physical condition that could affect the respirator fit.

The OSHA also requires employers to provide training to employees prior to requiring the employee to use a respirator. Retraining is required annually thereafter or when there are changes in the workplace or the type of respirator that renders previous training obsolete; when there are inadequacies in the employee's knowledge or use of the respirator; or when any other situation arises in which retraining appears necessary to ensure safe respirator use.

Employers must inspect and maintain respirators and must conduct programmatic evaluations to ensure that the RPP is being properly and effectively implemented. To ensure that employees are using the respirators properly, employers must evaluate respirator fit, the respirator, respirator use, and respirator maintenance.

## CDC'S RESPIRATORY PROTECTION GUIDELINES

After the 2009 H1N1 pandemic, the CDC updated its respiratory protection guidelines regarding seasonal influenza in health care settings.<sup>20</sup> The CDC recommends droplet precautions be implemented when entering the room of a patient with suspected or confirmed influenza: HCWs should don a surgical mask.

At the time of this survey, when performing aerosol-generating procedures, the CDC recommended that HCWs wear a fitted N95 filtering facepiece respirator (FFR), an equally protective respirator (eg, elastomeric half facepiece respirator [EHFR]), or a more protective respirator (eg, powered air purifying respirator [PAPR]).<sup>20</sup> An N95 FFR is an NIOSH-certified class of respiratory PPE that filters at least 95% of airborne particles, including biologic agents.

In addition to these influenza guidelines, the CDC's Healthcare Infection Control Practices Advisory Committee recommends the use of respiratory protection while in close contact with or while performing aerosol-generating procedures on a patient with suspected or confirmed infectious disease requiring airborne or droplet precautions: HCWs should use a respirator at least as protective as an N95 FFR with a patient who has a suspected or confirmed infectious disease requiring airborne precautions and use a surgical mask with a patient who has a suspected or confirmed disease requiring droplet precautions.<sup>5</sup>

## METHODS

The REACH II study was based on data from a convenience sample of in-person surveys conducted on a staggered basis between January 2011 and June 2012 in acute care hospitals in 6 states across 5 regions of the United States: California, Illinois, Michigan, Minnesota, New York, and North Carolina. The study surveyed 3 target health care personnel (HCP) groups within each participating hospital: hospital managers (HMs), unit managers (UMs), and HCWs. In addition, structured observations were made of HCWs' respirator donning and doffing procedures. An independent research organization analyzed the survey data.

The information presented in this article is taken from a subset of the survey questions for which we were able to compare the resulting data with established respiratory protection guidance. It does not cover all the information collected in the REACH II evaluation. This research was approved by the institutional review board at each study team's state health department or university and by the NIOSH's Human Subjects Review Board.

### Questionnaire design

Similar to the REACH I study, a structured questionnaire for each of the 3 target groups was used for data collection and consisted primarily of Likert-based response options. Based on field notes from the REACH I study, the study teams collaborated with the

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