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## Method for investigating nursing behaviors related to isolation care



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**Background:** Although an emphasis has been placed on protecting patients by improving health care worker compliance with infection control techniques, challenges associated with patient isolation do exist. To address these issues, a more consistent mechanism to evaluate specific clinical behaviors safely is needed.

**Methods:** The research method described in this study used a high fidelity simulation using a live standardized patient recorded by small cameras. Immediately after the simulation experience, nurses were asked to view and comment on their performance. A demographic survey and a video recorded physical evaluation provided participant description. A questionnaire component 1 month after the simulation experience offered insight into the timing of behavior change in clinical practice.

**Results:** Errors in behaviors related to donning and doffing equipment for isolation care were noted among the nurses in the study despite knowing they were being video recorded. This simulation-based approach to clinical behavior analysis provided rich data on patient care delivery.

**Conclusion:** Standard educational techniques have not led to ideal compliance, and this study demonstrated the potential for using video feedback to enhance learning and ultimately reduce behaviors, which routinely increase the likelihood of disease transmission. This educational research method could be applied to many complicated clinical skills.

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Infection prevention continues to be an issue across the health care spectrum. A number of studies have been published looking at basic procedures, such as hand hygiene. However, methods have not been consistently applied between studies, and the results are often not completely explained.<sup>1</sup> Recent research approaches to hand hygiene have included qualitative data collection,<sup>2</sup> a combination of videotaping and self-report,<sup>3</sup> and performance improvement projects.<sup>4</sup> Additional methods to evaluate infection prevention behavior are needed to both enhance continued learning and determine infection control compliance within active health care workers.

Personal protective equipment (PPE) use also remains an important component of health care worker safety and infection prevention. Surveys and epidemiologic investigations have found

PPE use to be suboptimal or inadequate.<sup>5,6</sup> Some research studies have examined contamination after doffing multiple types of PPE<sup>7</sup> and glove removal.<sup>8</sup> These studies have noted the potential for contamination with these processes. Observational studies have commonly investigated PPE by examining the care of isolated patients,<sup>9</sup> care given during resuscitation,<sup>10</sup> and pediatric resuscitation using in situ simulation.<sup>11</sup> All of the studies noted the need to improve performance related to the use of PPE. A study by Mawdsley et al<sup>12</sup> showed a surveillance program for contact precautions can lead to improvements to adherence to implementing precautions, but it did not report any behavioral observations at the bedside or infection control outcome data. Although the challenges associated with patient isolation are noted in the literature, a more consistently applied mechanism to evaluate specific clinical behaviors safely is needed.

Simulation study designs need to be more consistent and robust to strengthen the evidence for use of the educational technique, and current study designs have not focused on the transfer of knowledge to clinical practice.<sup>13</sup> The research method described in

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this study used Schön's theory of reflective practice<sup>14</sup> in a high fidelity simulation using a live standardized patient recorded by small cameras. Immediately after the simulation experience, all study participants used retrospective verbal report techniques while viewing the patient care performance to describe the experience of the care processes.<sup>15</sup> This study has the advantages of reducing the intimidation of having an evaluator in the presence of the subject and removing any guilt related to harming a real patient.

## METHODS

This study evaluated the isolation behaviors of nurses for airborne and contact precautions in a simulated patient care setting at a Midwestern academic health science center. The hospital is an acute care 627-bed facility. The goal for enrollment was 20-30 staff nurses. This method of evaluation included a real hospital room and small high definition (HD) digital cameras. The study built on previous work related to infection prevention.<sup>16</sup>

Following an expedited review by the institutional review board, study participants were recruited by e-mail. Because of system limitations for mass e-mail, nursing managers were asked to forward the study invitation to their nurses. To improve recruitment, a flyer was later developed and posted in break rooms and nursing workspaces in the hospital. The nurses had to work at least 20 hours per week as a nurse in a direct patient care role to be included in the study. After consenting to participate in the study, each nurse was video recorded during a simulation experience. The nurses were assured prior to signing consent that all video would be maintained on encrypted drives and only be available to study personnel.

The nursing patient care scenario was similar to one used in our previous study.<sup>16</sup> The scenario and simulation experience were intentionally simple to reduce the demonstration of errors, which might arise from emergent care situations, and effectively test the methodology. The scenario involved a patient hospitalized to rule out tuberculosis. The patient had orders for airborne and contact precautions and continuous intravenous fluids. The care included an early shift head-to-toe assessment and a request for some pain medication. A computer workstation, essentially a laptop computer on a cart with a corded barcode wand, was part of the simulation. For simulation purposes, there was no active patient to select in the electronic medical record and no active barcode on the armband to scan. Nurses were told to pretend as if they were using the computer workstation in their unit or practice area.

The simulated care experience used a live volunteer as the simulated patient and took place in a fully functional patient room at the Nebraska Medical Center in Omaha, Nebraska (Fig 1). One camera outside the room captured donning behaviors and the room exiting process. Two cameras were placed in the room strategically to capture nursing care at the bedside and doffing behaviors at the patient room door from 2 angles. The lightweight HD cameras were hung with simple clamps from the ceiling tile brackets. The simulated patient wore a hospital gown, a fake intravenous line taped to their arm, and a drainage bag under the bed linens for the infusion of medication and fluids. The pain medication the nurse gave was tap water in a syringe marked as a diluted 2-mg dose of morphine sulfate. Isolation materials included typical signage for the facility and an isolation cart in the hallway outside the patient room containing gowns, gloves, masks, and eyewear. The gowns used come in 1 size and were washable. The gowns were made available to the participants because they would normally come from medical materials. Gloves in all sizes were available on the cart. An N95 respirator was to be used in the simulation because of the physician orders in the scenario, isolation signage, and patient condition.

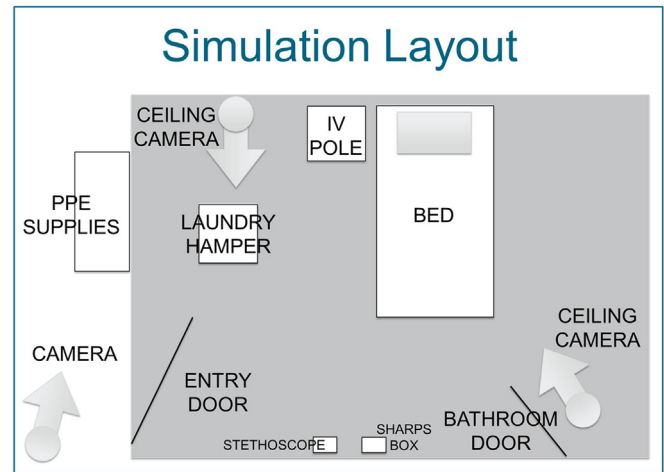


Fig 1. Hospital room simulation layout. IV, intravenous; PPE, personal protective equipment.

There were both N95 respirators and standard procedure masks on the cart. Many styles of eyewear were available for use. Waste receptacles and linen hampers were available in the room as appropriate.

Within 10 minutes of completing the simulation experience, the nurses were asked to think aloud as they reviewed their video recording describing the rationales for their patient isolation behaviors.<sup>15</sup> The nurses were cued on certain behaviors of interest, including cleaning the computer workstations and use of the N95 respirator. The HD cameras recorded to secure digital cards, which were transferred to a computer or laptop for immediate viewing. After the video review was complete, the nurses were given the Centers for Disease Control and Prevention (CDC) guidelines for the use of PPE<sup>17</sup> to review and comment. The audio of the think aloud session and CDC guideline review was recorded and later transcribed for analysis. Similar to our previous study,<sup>16</sup> a scoring sheet was developed to evaluate the nursing behaviors for analysis. Video recordings taken in the hospital room were edited to view side-by-side simultaneously. At least 3 reviewers scored each video recording of the nurse's performance individually, and then any discrepancies were discussed until consensus was reached on the scores for each component.

There were 3 more steps for the nurses to complete study participation. First, they were asked to complete a demographic survey on age, sex, race, education, years of experience, nursing practice, fatigue, and bloodborne pathogen exposure. Next, the nurses were asked to do some range of motion activities while being video recorded. This was to ensure that there were no physical limitations that might have impacted performance during donning and doffing activities. The movements specifically included the ability to reach the neck and waist areas and finger dexterity. The camera that was outside the patient room was used for this video recording. Finally, the nurse was asked for an e-mail address and told that they would receive a follow-up e-mail at 1 month with a short open-ended 3-question survey about practice change after the simulation, timing of practice change, and additional clinical challenges.

## RESULTS

There were 24 nurses that consented and participated in the study. Three of the 24 participants were men. The age range was 24-61 years old, with an average of 33 years old. Of the nurses,

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