Investigating Infection Control Behavior in Nurses  
Determinants of donning and doffing behaviors

Elizabeth L. Beam, MSN, RN, Shawn Gibbs, PhD  
Colleges of Nursing & Public Health, University of Nebraska Medical Center, Omaha, NE 68198

Study Overview  
The successful completion of this mixed method study will allow us to better understand the use of PPE by nursing staff. It utilizes an inexpensive simulation method which keeps legal and ethical concerns in healthcare to a minimum while uncovering poorly understood human behaviors. This study will expand our previous pilot work (Beam, et al., 2011) for scoring proper PPE use in healthcare workers. Nurses were selected for this initial work because of the frequency with which they provide bedside care in the hospital setting.

Hypothesis  
Performance of clinical skills by nurses related to infection control procedures in a simulated environment will increase compliance to clinical standards which will be maintained upon returning to the clinical environment after an extended period of time from the simulation experience.

Specific Aims  
Specific Aim #1  
Identify infection control behaviors by nurses which may or may not adhere to clinical standards for isolation practice while performing clinical skills in a simulated patient care environment.

Specific Aim #2  
Describe participant rationales for the various infection control behaviors which deviate from standards followed by individual reflections on performance in comparison to the CDC guidelines for isolation care.

Specific Aim #3  
Explore the timing of changes in clinical infection control behaviors after simulation participation over an extended period of time.

Study Design  
Population: Registered Nurses expected to care for patients in isolation in an Academic Healthcare System who work at least part–time.
Sample Size: 24

Early Findings:  
Infection Control Behaviors

<table>
<thead>
<tr>
<th>Quality of Donning</th>
<th>Met</th>
<th>Not Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gown on right side out</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Tie done in front (secure but easy to untie)</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Don N95 Respirator (fit snug to face and below chin)</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Perform N95 Respirator (fit check the N95 Respirator)</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Respirator straps positioned correctly (crown to base)</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Don eyepiece protection</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>Don gloves with gown cuff under glove covering wrists of isolation gown</td>
<td>16</td>
<td>8</td>
</tr>
</tbody>
</table>

In Room Activities  
Yes | No

- Touch their face or other non-protected areas of body with gloves: 4 | 20
- Gap develops between gown cuff and glove: 9 | 15
- Performed unnecessary/unauthorized touching of the environment: 3 | 23
- Adjust N95 Respirator (breaking the seal) or other PPE: 9 | 15
- Unprotected areas of body in contact with potentially contaminated areas: 22 | 2

Quality of Doffing  
Yes | No

- Remove gloves using glove technique: 12 | 12
- Dispose of gloves properly: 21 | 3
- Remove eye protection without touching face: 3 | 0
- Reusable eye protection placed in the contaminated area: 0 | 3
- Link gown and remove by grasping gown at shoulders: 5 | 19
- Remove gown by slowly pulling it down, rolling inside out to form a bundle and keeping gown close to body: 6 | 18
- Open laundry hamper using foot pedal: 7 | 17
- Place entire gown into laundry hamper: 24 | 0
- Remove respirator by grasping elastics at the back of the head and moving them forward: 5 | 19
- Dispose of respirator in garbage: 24 | 0
- Use of hand sanitizer available before touching door to exit: 5 | 19
- Perform hand washing/hygiene: 20 | 4

Potential Outcomes  
Do we need to teach and evaluate learning on infection control behaviors differently?  
- This study will be a basis for future work on behavior change utilizing more complex test–retest designs.
- Consider development of detailed guidelines for individual PPE items.
  - Many safety concepts are misunderstood.
  - Are more innovative PPE designs needed for healthcare?
  - Small changes may alter performance.

Further Analysis Needed  
- Look at the context of certain errors with 'Think Aloud' interviews (examine intention).
- Eye protection: What is the best process for cleaning/eyewear? Does our current or existing system need adjustment?
- Investigate two obvious relationships/consequences:  
  - Respirator application and in-room N95 adjustment
  - Gown donning and in-room contamination

Common “Think Aloud”  
Comments on Clinical Challenges

<table>
<thead>
<tr>
<th>Code examples</th>
<th># of comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respirator discomforts</td>
<td>4</td>
</tr>
<tr>
<td>Vision challenges</td>
<td>3</td>
</tr>
<tr>
<td>Gown challenges</td>
<td>24</td>
</tr>
<tr>
<td>Patient care concerns prioritized over infection control processes</td>
<td>3</td>
</tr>
<tr>
<td>Paranoia about isolation/infection</td>
<td>4</td>
</tr>
<tr>
<td>Access to eye protection</td>
<td>6</td>
</tr>
<tr>
<td>Recognize need for N95 fit</td>
<td>32</td>
</tr>
</tbody>
</table>

• These were individual comments. One participant may have commented multiple times.

Simulation Layout  

Video and Data Capture  

Demographics  
- 3 male; 21 female
- 22 White, 2 Asian
- Birth year range: 1952-1989
- 10 of 24 with history of blood borne pathogen exposure
- Various units.

Pilot Work Reference  
Investigating infection control behavior in nurses: Determinants of donning and doffing errors

Elizabeth Beam, PhD (c), RN, College of Nursing, University of Nebraska Medical Center, Omaha, NE; Shawn Gibbs, PhD, MBA, CIH, Department of Environmental, Agricultural and Occupational Health, College of Public Health, University of Nebraska Medical Center, Omaha, NE

ABSTRACT: In a small mixed methods study, nursing behaviors related to infection control were evaluated as nurses participated in a video recorded patient care simulation. The scenario asked the nurse to care for a patient in both airborne and contact isolation precautions with small high definition cameras mounted in a real hospital room. The patient was simulated by a live actor with an artificial intravenous line. The simulation scenario asked the nurse to assess their patient and give them some pain medication. The simulation experience was followed by a Think Aloud session while participants watched their individual simulation performance. The session was audio recorded and then transcribed for qualitative analysis. In an effort to determine how physical restrictions or personal characteristics impacted nursing behaviors, participants were asked to complete a demographic survey and complete a range of motion demonstration in front of a video camera before the study session ended. Nursing behaviors noted in the video recordings and insights from the nurses in the Think Aloud sessions will be reviewed in relation to these determinants of behavior. Frequent errors in donning and doffing occur in spite of personal experiences with exposure. The errors seen in most participants did not correlate with range of motion issues such as joint mobility or flexibility. Educational interventions for nurses at the bedside may need to address common misconceptions in isolation care processes.

Contact Info:
ebeam@unmc.edu
402-559-6547