

Barriers and Facilitators for Implementation of Infection Prevention Practices for Device Care in High-Acuity Skilled Nursing Facilities: A Human Factors Approach to Tracheostomy and Stoma Care

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1 Background

Inappropriate or inadequate infection prevention practices related to tracheostomy and stoma care is associated with an increased risk for infection with mechanical ventilation (1,4). Guidelines for infection prevention related to ventilator and tracheostomy care exist in acute care settings, however, it is uncertain whether they are transferable for use with prolonged ventilator management in long-term care (LTC) (3,5,7). Bundles created to reduce the incidence of ventilator-associated pneumonia (VAP) do not include clear step by step instructions for nursing or respiratory care, or specific recommendations to prevent healthcare-associated infections (6, 8, 9). Long term care populations are particularly at risk for infectious complications related to ventilator and tracheostomy care due to their prolonged healthcare exposure, older age, antibiotic exposure, and dependence on caregivers (10). It is important to provide LTC institutions clear, evidence-based tracheostomy device-care guidelines to decrease the ambiguity of care and the risk of hospital-acquired infections in LTC (6).

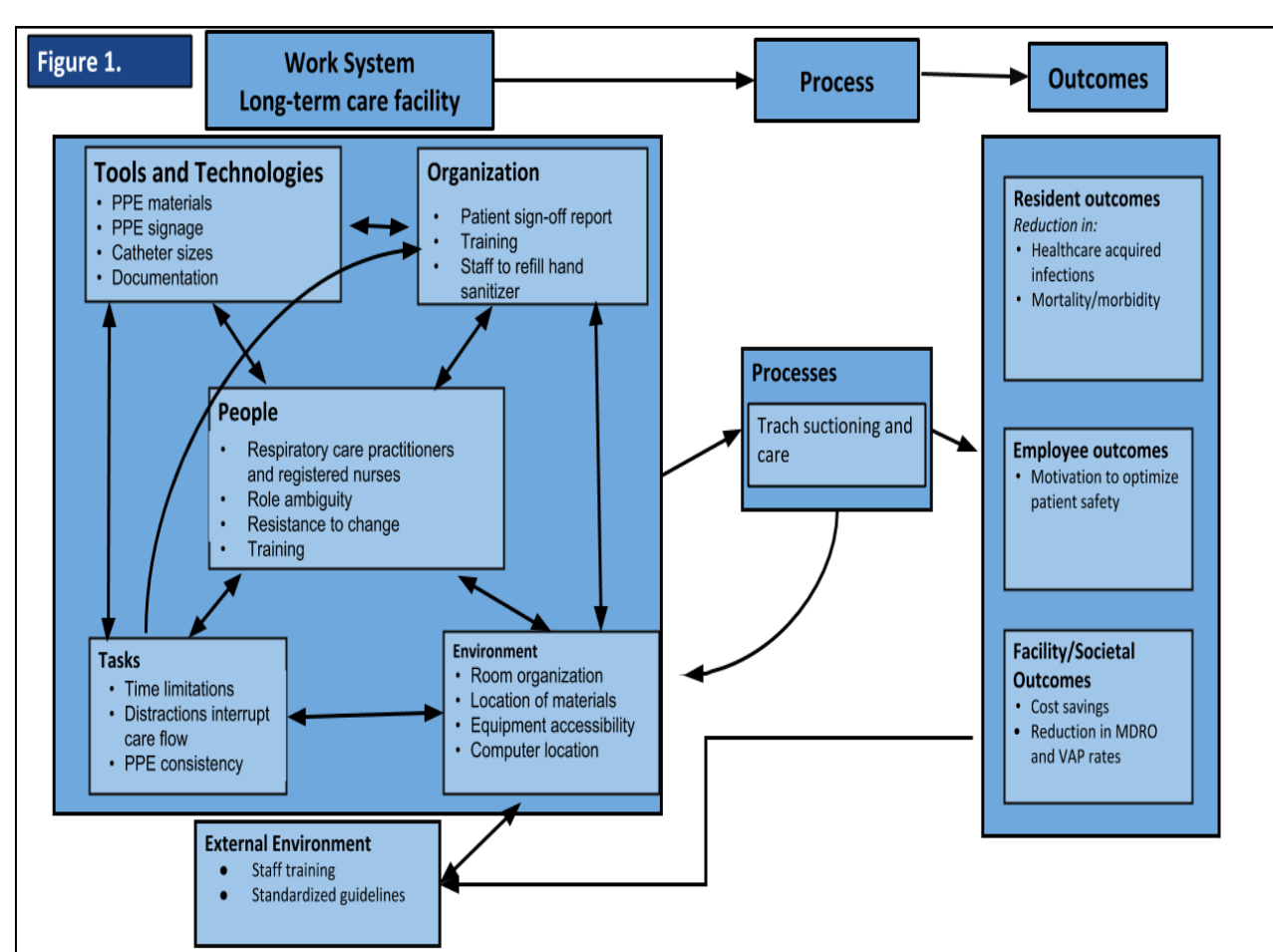
2 Objectives

- Evaluate tracheostomy and stoma care in LTC setting using a human factors engineering (HFE) approach
- Identify potential failure modes that may risk patient safety during LTC tracheostomy and stoma care
- Use Failure Modes Effects and Analysis (FMEA) to identify interventions and strategies to guide the formation of LTC tracheostomy guidelines

3 Methods

SEIPS Model

This project was guided by the Systems Engineering Initiative for Patient Safety (SEIPS) model which is a human factors engineering (HFE) framework comprised of three main parts: structure, process, and outcome [2]. The SEIPS model looks at how the elements of an organization's work system interact with each other to contribute to the safety and quality of processes and outcomes of the system [2]. The work system element of the SEIPS model consists of five components (person, tasks, tools and technologies, physical environment, and organizational conditions) which all interact with one another and may affect the overall process, and therefore the outcome for patients, staff, and the organization [2]. By systematically evaluating the various work system components in the LTC setting that may contribute to breaches in infection prevention, we were able to identify risk mitigation strategies that may improve the process of respiratory care in LTC.



Observations

We observed respiratory care practitioners providing tracheostomy and stoma device care with a focus on infection prevention in a pilot study in three Maryland LTCFs (Johns Hopkins Bayview Medical Center, Lorien Mount Airy Facility, and Lorien Columbia Facility).

Failure Modes and Effects Analysis with Risk Priority Number

Focus groups with infection prevention experts, RNs and RTs at these facilities were conducted and then transcribed by a JHH approved service. A qualitative analysis was conducted on the transcriptions in excel by the constant comparative method. During the focus groups, a Failure Modes and Effect Analysis (FMEA) methodology were implemented to each step of the tracheostomy procedure to determine the risk of compromising patient safety in terms of infection if the step was not completed correctly.

A Risk Priority Number (RPN) rating scale was used to formally quantify each step: i) the severity (the amount of harm or damage failure of this step could present to the patient in terms of risk of infection), ii) the probability (the likelihood that the failure occurs in daily care in the facility), and, lastly, iii) the detectability (likelihood that failure to complete this step will not be detected). RN's and RT's performing tracheostomy and stoma care were asked to go through each step of the policy with the FMEA and assign each step an RPN rating. A clinical lead and HFE expert described the rating scale and provided clarifications throughout the session. After RPNs were calculated, the top 3-4 steps with the highest RPN were identified, shared with the focus group, and then discussed to obtain a better understanding of the specific components that may contribute to the failure of that step. Information was recorded in a tabular format, and strategies to prevent these failures were discussed at the completion of the focus group.

Focus Group Themes

Person
 - "From a respiratory standpoint are you familiar with the new policy: change of not giving normal saline to break up mucus plugs?
 RT: I actually heard it at school. But I haven't heard so much about it." (RT)

Environment
 - "One of the things that I feel is that there's too much clutter in a room..." (RT)
 - "If it's something that I know, let's say, trach cleaning or something like that I know that I have to go in with staff. And then if I'm short, I will just take my gloves off and maybe use the hand sanitizer, come out and get it and go back in. Now, we have a lot of stuff on the in the basket so we will use it to." (RT)

Organization
 - "We have in-service training once a year. It's mandatory training..." "Usually three or four days. They go over all respiratory procedures depending upon if the individual would be working at the specialty hospital or at the main hospital." (RT)
 - "Never. Nobody cares about respiratory. So we hardly—I think I've seen only one person that was giving me a little training on vent staff." (RT)

Tasks
 - "I think you should put the gown on first then get then put the gloves on." (RT)

Tools and Technology
 - "[The] third floor here, they have computers in all the rooms, patients' rooms. This actually allows for more efficient patient care." (RT)
 - "There some things we don't do like hyper oxygenating that patient. The vent doesn't give you the chance. This one is kind of new. The older vent we had you have to hyperoxygenate." (RT)

4 Results

The human factors analysis of tracheostomy and stoma care revealed three steps in policy with the highest risk priority numbers (RPNs), indicating an increased risk of a HCW compromising patient safety if the step is incorrectly done. These three steps include: donning clean gloves (RPN= 270), hand hygiene (RPN=252), and intermittently suctioning as the suction catheter is withdrawn (RPN=192). Strategies for risk mitigation were determined using the SEIPS model for each step

- Donning gloves
 - Conveniently stocking gloves in each room
 - Incorporating a designated glove restocking system
- Hand hygiene:
 - Conveniently placing hand sanitizer outside of rooms
 - Peer to peer reinforcement of hand hygiene policies
- Suctioning:
 - Modify organizational policy to allow only trained healthcare workers to perform this task
 - Implement in-service training with staff feedback
 - Engage and train family on suctioning procedures

Failure Modes						Contributing Factors
Step	Failure Mode	Severity	Probability	Detectability	RPN	
1.4 Don Clean Gloves	Gloves not worn, sterile gloves not consistently used with patients with an open trach	8	4.5	7	270	Person: perception of importance Organization: material availability Environment: inconvenient location Task: Time pressure
1.3 Hand Hygiene	Hands not sanitized or washed prior to room entry	7	4.5	8	252	Person: perception of importance, knowledge deficit, perception of time needed for task Tools/Tech: hand sanitizer availability Organization: not a part of culture Environment: inconvenient location Task: competing duties, time constraint
2.2 Intermittently suction as catheter is withdrawn	Suction applied for >15 sec, incorrect suction pressure applied, catheter advanced rather than continuous	3	8	9	192	Person: knowledge deficit on suction pressures, forcibly inserting catheter with resistance, patient preference for higher pressure Organization: No training with new equipment Environment: clutter in the way of suction button, family distractions prolonging suctioning time Task: Complex conditions

5 Conclusions

Of the top steps risking patient safety if incorrectly performed or not done, errors in patient protective equipment (PPE) (donning gloves and hand hygiene) were risk scores than tracheostomy care specific steps. This may suggest that the most important initial targets to minimize infection in LTC include clarifying PPE practice guidelines during tracheostomy and stoma care.

6 Future Directions

Further research should be directed towards implementing the interventions identified in this analysis to determine if this has an impact on infection transmission and patient safety in the LTC setting.

7 References

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