Implementing Simulation Task Trainers in Healthcare Education to Enhance Effective Use of Personal Protective Equipment

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**Abstract**

           Coronavirus has created a climate where nosocomial infections are high, and the healthcare education community is required to reduce the spread of coronavirus by using effective donning and doffing of PPE (CDC, 2020; (WHO, 2020). Healthcare institutions have clinical practice guidelines and protocols which provide guidance in the prevention of contamination. These guidelines can be enhanced through the use of healthcare simulation. The Joint Commission advises that customers use telephonic medicine when able and healthcare facilities use screening measures to reduce the spread of active coronavirus to medical facilities (The Joint Commission, 2020). Clinical practice guidelines also establish infection control measures. However, the guidelines also require reinforcement by hospital education programs to establish and update clinical practices. Supportive educational technologies in the realm of healthcare simulation are capable of facilitating continuous educational requirements to sustain effective preventative measures (Al-Elq, 2020). Specifically, healthcare simulation programs with scenario-based education and task trainers faciltate on-site education in multiple clinical and emergent stages. Using task-based simulators that provide real-time feedback during simulation, identification of contaminated healthcare workers is supportable and reduction percentage may be enhanced. Moreover, identifying effective Covid 19 measures is also supported by the use of task trainers as educational tools in a scenario-based framework. The aligned inquiry is:

1. Which measurement tools are most effective in precautionary measures.
2. Which simulation modalities are the most effective education technologies.
3. Are there other identifiable aspects of controlling infection rates amongst essential healthcare personnel.

There are currently medical simulators that emit a simulated contamination gas that allows for the detection of contamination; a primary objective is to study how best the technology can be implemented to satisfy the above inquiries.

**Keywords List**: Donning and doffing, scenario, modality, task-based training, personal protective equipment (PPE), simulation

Introduction– Sustainment of Essential Healthcare Workers

           The continuous improvement of training methods that prevent contamination among healthcare workers is essential in the sustainment of the essential healthcare force. Education is a fundamental differentiator in improving systems. The current situation with essential healthcare workers requiring reoccurring training in donning and doffing procedures and in the clinical and emergent treatment of COVID patients is critical (WHO, 2020). In 2020, the World Health Organization recognized the criticality in the effective use of PPE . In the analysis, three contributing factors fostered the optimization of PPE availability. The elements fall into the following categories (a) appropriate use of PPE, (b) minimization, and (C) logistics. Of the above three principles, healthcare simulation may address the gap in the appropriate use of PPE, reducing the total risk of exposure (WHO, 2020).

Additionally, from February 12 - April 9, 2020, the CDC reports that of 315, 531 COVID 19 patients reported, 49,370 were essential healthcare workers (WHO, 2020). There is an alignment between the level of controlled exposure and the healthcare setting. Control of exposure through effective donning and doffing is a critical element in eliminating contamination. Simple task training and healthcare scenario technologies may facilitate initial and reoccurring education regarding donning and doffing procedures to sustain the essential healthcare force.

           Some modalities can help facilitate training opportunities based on scenario-driven education. Specifically, airway trainers and torso simulators, which are referred to as task trainers, can facilitate airway management training and resuscitation in a scenario-based learning event (7-Sigma, 2020). In that realm, 7Sigma currently manufactures an airway model that emits an aerosolized spray. The COVID 19 airway trainer is capable of facilitating advanced airway support devices that are required in resuscitative measures. This is beneficial in the identification of a. whether donning and doffing procedures are effective, b. measurement of effective donning and doffing, and c. external factors that contribute to the ineffective use of PPE.

An alternative to using the specific manikin is an airway trainer and fluid that can be seen under blacklight. Minus aerosolization, the fluid may transfer to the skin from the manikin when conducting an emergent procedure if donning isn't effective. Similarly, contamination from a gloved hand can be seen post-evaluation under a blacklight if doffing is not effective.

           In theory, simulation education using task trainers may be accomplished using two different frameworks. One is simple task training, where the focus is on performing task-based training on the simulator to prefect skills like donning and doffing procedures. The objectives are limited to following correct steps in accomplishing a procedure. This is less desirable because the real-world application of a team-based setting is absent from the experience. A post-evaluation or assessment is feasible, but learning outcomes are limited to procedures, and behavioral objectives are typically not capable of being implemented in an isolated training event. The other is in a scenario-based learning event where learning objectives are embedded in the scenario. The development is more complicated. The overarching framework for a scenario-based event is typically the experiential learning model where a process of learning is centered around a scenario-based experience (Al-Elq, 2020). Following the scenario, debriefing that attempts to engage learning objectives occurs (Fanning et. al, 2007).

           The scenario begins as Fanning et. al, (2007) prescribes, with a pre-brief or orientation to the environment, then the scenario execution occurs, and a debrief. Task trainers act as a tool where procedures are being accomplished in a team-based environment (Al-Elq, 2020).The study should allow for one to two scenarios where the medical treatment team engages a patient with COVID 19. Scenario 1 should consist of patients displaying symptoms synchronous with the presentation of coronavirus. The patient is admitted into the emergency room through triage due to deteriorating patient conditions (Madhok et. al, 2020). Cognitive and psychomotor objectives that align with effective handling of the potential COVID 19 patient are embedded in the scenario through scenario checklists and hospital processes. Other than airway stabilization interventions, clinical labs, and x-rays are also ordered as the virus may transfer during critical tests. Finally, Children's (2020), suggests that measurement should be based on clinical practice guidelines, which involve time, setup, assessment of the patient, movement, triage, registration labs, image, respire treatments, protocols, disposition, admissions, and communication to supporting medical units. In this emergent scenario, multiple objectives are addressed; however, the critical element of appropriate donning and doffing for all involved parties is paramount. Other learning objectives may be implemented depending on institutional requirements. The supporting educational technology is the airway task trainer that facilitates and supports the identification of effective donning and doffing. Another supporting technology is the simulated environment, such as the mock emergency room setting or method in which learning tools are applied.

Debriefing Donning and Doffing

 The facilitator should engage learners using a debriefing framework based on Kolb's learning cycle (Kolb, 2011) in the process of recognition, facilitator engagement, access & assessment, closing, and summary of the scenario. The learner should then be allowed to hypothesize changes that may contribute to a better outcome next simulation or patient engagement. Recognition is simply a process of reflection where open-ended questions are asked to allow the learner to reflect on the experience (Kolb et. al, 2011). This will enable the learner to internal dialogue that fosters reflection involving actions taken during the scenario. Following the recognition phase, the facilitator must connect the learner with scenario objectives through more narrowly ended questions. In this instance, objectives are related to the process of patient triage, intake, donning and doffing, transfer, and the actual care given. In this phase, the gap is closed between the learner and content with the theme of self-realization. This concept replaces the facilitator presenting the information through performance feedback(Fanning et al., 2007). The following assessment phase facilitates the element of access to knowledge gained by the student. In this scenario, a verbal check on learning is advisable due to the team's interprofessional dynamic, which reinforces critical content. Finally, the instructor may close the session with a summary as stated, and experimentation through learner hypothesis may begin.

The Study Moving Forward

The critical element in moving forward is to develop and implement a learning strategy that addresses ongoing education for the current COVID19 pandemic. While donning and doffing scenarios are isolated to the element of reducing exposure amongst healthcare workers, other contexts like ventilated patient management and breaking bad news to family members may also be addressed. However, this study will primarily focus on implementing the COVID19 scenario and debriefing tool amongst interprofessional teams in a staged emergent setting. The teams may have a variable of nurses, physicians, residents, or medics but must have a minimal Basic Life Support or Advanced Life Support element. The overarching goal is to measure the effectiveness of proper donning and doffing procedures amongst a static measurement tool and local protocol.

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