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Simulation-based Clinical Systems Testing in the Pediatric Emergency Department to Prepare for the COVID-19 Pandemic

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Introduction and Objective

The emergence of the highly transmissible COVID-19 disease resulted in major challenges to our global health systems. In response to the accelerated deployment of hospital-wide protocols to prevent SARS-CoV-2 transmission, we integrated simulation based clinical systems testing (SbCST) with rapid cycle deliberate practice concepts to identify latent safety threats (LSTs) in the new workflows and provide recommendations for mitigation. We evaluate this novel approach of training and testing staff for feasibility and utility based on staff assessments.

Methods

This study took place in a tertiary care children’s hospital ED and was approved by the IRB as non-human subject research. We used Gaumard™ mannequins, and portable monitors (SimMon™).

Scenario Flow:

Our simulation-based clinical systems tests were designed to take place in situ in the ED and last 60 to 90 minutes. Each simulation consisted of five phases:

1) Pre-briefing (5 minutes): The most recent hospital guidelines regarding COVID-19 and PPE were reviewed.

2) Developed case for testing (5-15 minutes): Length of scenario depended on complexity and testing needs.

3) Debrief (15-20 minutes): Scripted “debrief to improve” approach.

4) Repeated case (10 minutes): The most recent hospital guidelines regarding COVID-19 and PPE were reviewed.

5) Final debrief (10 minutes): Final summary and evaluation survey.

Study design and setting:

Our work was adapted from methods described by Colman et al in “Simulation-based clinical systems testing for healthcare spaces: from intake through implementation.” We reconfigured the SbCST framework to include questions for debriefing that focused on the challenges presented by the new system modifications and PPE usage. Each case used “tipping points” to test workflow. Short scripted debriefs reviewed guidelines, staff input, and the simulation was repeated. Participants evaluated the SbCST with a survey. Three sim staff collected observations on a standardized form for which process was tested, staff response collected, and LSTs identified. High priority LSTs were reported directly to the ED COVID response team.

Results

A total of 76 ED staff participated in 44 trainings conducted over 35 days. Participant data is presented in Table 1. In all, 65 participants filled out the post debriefing survey. Participants identified 103 LSTs. These LSTs are presented by themes and frequency in Table 2. Examples of common LSTs by category and associated recommendations and actions are listed in Table 3.

Discussion

We found that in situ simulation is a good way to test the development of new protocols. The SbCST format enabled us to identify LSTs and address unexpected problems with protocols. These in situ simulations observers identified 103 LSTs, including: inadmissible equipment, inappropriate positioning of personnel and equipment, and unreliable communication with those outside of the treatment room. The testing of the newly developed clinical protocols/processes allowed for changes and improvements to be made without risk to the patient or infectious risk to the staff. Based on the staff perceptions from the post debriefing surveys this method was highly rated and worth the time it took. This would indicate that this method could/should be strongly considered whenever a highly complex degree of change is being developed.

Conclusion

This study showed that SbCST methods are adaptable for preparedness evaluation and training. By combining SbCST with Rapid cycle deliberate practice methods, many LSTs were quickly remediated prior to patient care. Participant evaluations revealed a high regard for this method. This work highlights a new application of SbCST that could increase system preparedness and reduce errors. This approach is applicable in diverse clinical settings for designing, evaluating and training staff in new protocols and procedures.