Anxiety and Stress in Live Disaster Exercises

Sherry Farra, RN, PhD, CNE, CHSE

Sherrill Smith RN, PhD, CNL, CNE

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Objectives

- Define live exercises
- Describe the effects of live exercises on self reported stress levels.
- Describe the effects of live exercises on participant alpha amylase and cortisol levels

- NDHC 2018

Why should nurses care about disaster training?

- Nurses play critical roles in preparing for, responding to, and recovering from disasters.
- The Future of Nursing: nurses to assume leadership roles in preparing for and responding to disasters.[1]
- The Centers for Medicare and Medicaid (CMS)[2] mandates that health care agencies "Develop and maintain training and testing programs, including initial and annual trainings, and conduct drills and exercises or participate in an actual incident that tests the plan."
- The Joint Commission[3] standards emphasize the need to practice the emergency operations plan, which is accomplished through exercises and drills.
- Tornado

There is a high level of emphasis on the participation in live exercises and drills as a method of training for disasters,[5] which may cause anxiety and stress for participants.

- Department of Homeland Security Exercise and Evaluation Program (HSEEP)

The NLN Jefferies Simulation Theory[6]

- Simulation design: context, background, simulation design, facilitation strategies, and outcomes of simulation.
- Participants are an important consideration when developing and evaluating a simulation experience
- Anxiety levels are a participant-related variable, which affects the simulation experience and learning.

Stress Related Simulation Literature

- Stress can cause biological and psychological responses.
- Simulated experiences have specifically been found to have a positive impact on ED nurses, such as development of emergency triage skills.[10]
- Little is available to understand the level of stress in participants in a live disaster exercise and how it affects performance.
- In studies of simulated emergencies, researchers have described biomarker elevation of cortisol and alpha-amylase levels as stress response indicators and found higher levels of alpha amylase in response to the simulation experience.[10–15]

Specific Aims/Purposes

- The objective of this research was to measure and describe anxiety and stress levels of participants in a live disaster training exercise.
- The first specific aim was to measure the level of stress of exercise participants using biomarkers and pre/post self reports of anxiety (survey).
- The second specific aim was to explore the experiential effects of stress as perceived by live exercise participants through the use of focus groups.

DESIGN

This study employed a mixed methods quasi-experimental/descriptive design using quantitative dominant method (cortisol/alpha amylase levels) supplemented with qualitative methods (survey, focus groups).

Sample

- A convenience sample of undergraduate nursing students enrolled in an elective interprofessional disaster course.
- The course was run twice each academic year, with an enrollment of approximately 10 students each semester. Inclusion criteria included enrollment in the disaster course.
- The study was approved by the university Institutional Review Board (IRB), and risks to students were found to be minimal.

The Exercise

- The same case scenarios 5 times through day.
- Participants worked in teams to participate in each of the following rotations throughout the day: (1) emergency operations center, (2) triage and first aid, (3) retriage and transport, (4) surge response, and (5) sheltering. Performance in the exercises was observed and assessed by trained evaluators.

- Participant performance was measured by team performance within the exercise,
  - rubrics based on course objectives and target capabilities as developed by HSEEP.[14]
  - VIDEO

State-Trait Anxiety Inventory

- An instrument developed to assess both the state and trait of anxiety in research and clinical practice.[16]
- The scale measures the intensity of an emotional response (state anxiety) and an individual's inclination toward an anxious response (trait anxiety). The STAI is a 40-item scale (4-point Likert-type scale), using responses from “Almost Never” to “Almost Always”
- Scoring is based on a scoring rubric, with a possible score range of 20 to 40 for both the state and trait of anxiety. Higher scores are indicative of higher levels of both the state and trait of anxiety.
- Cronbach alphas range from 0.85 to 0.95. A paper-and-pencil version of the scale was administered before the disaster training and immediately after the live exercise

- **Cortisol and Amylase** measured the physiologic response to stress.

- The 2 primary systems are responsible for responding to a psychological stressor: sympatheticadrenalmedullary (SAM) system and hypothalamuspituitary-adrenocortical axis (HPA).

- The activation of the former system results in the release of salivary alpha amylase and the activation of the second leads to the secretion of cortisol.

- Cortisol is a stress hormone produced from the adrenal cortex, which can be measured in salivary cortisol is a “sensitive measure in stress research” and is described as a “convenient and reliable parameter of endocrine stress responses.”

Focus Group Interview Guide

- Developed by the researchers, based upon the NLN Jeffries Simulation Theory[6]
- Elicit participant responses related to the participant exercise experience.
- 10 open-ended questions and were followed with additional questions, as needed, to clarify participant responses.

Setting

- The study was conducted at the university's National Center for Medical Readiness (NCMR), a 50-acre former cement plant that has been transformed into a disaster-preparation training complex.

Participants

TABLE 1
Demographics

Gender	Number	Age Mean	Age Range	Students
Female	15	23.2	21-30	16
Male	5	24.8	23-26	6
Total	22*			2

On the first day of on-site training at NCMR

- all participants were provided an overview of the study and invited to participate in the study by the coinvestigator
- Consented participants completed a paper-and-pencil version of the 40-item STAI16 that included collection of limited demographic characteristics.
- On day 3 following completion of the live exercise triage station on the final day of on-site training, participants again completed the STAI and provided saliva specimens for measurement of cortisol and alpha amylase.
- Because of the early start time of the disaster exercise, an initial specimen was not collected so as to avoid high levels encountered during the CAR response. Instead, comparison with laboratory norms were used.

Quantitative Responses

TABLE 2
Results

Measurement	Pretest Mean/Range	Post-Test Mean/Range	Standard Deviation	95% CI Lower/Upper	t Value	t Test Com-parison Pre/Post P Value	College-Age Population Norms
Y-1 State	31.18 (20-56)	41.09 (20-60)	11.71	–15.21 –4.60	-3.822	0.000861*	Mean 38.76 women +/- 11.95 SD Mean 36.47 men +/- 10.02 SD
Y-2 (Trait)	33.45 (20-56)	35.36 (20-58)	6.42	–4.76 .957	-1.40	0.1777	Mean 38.30 men +/- 9.18 Mean 40.40 women +/- 10.15
Amylase	N/A	93.4 μ/mL Range (4.6-259.8)				N/A	Range 3.1-423.1 μ/mL
Cortisol	N/A	0.279 μg/dL Range 0.062-1.241 μ/mL				N/A	Range 0.112-0.743 μg/dL men Range 0.272-1.348 μg/dL women

CI, confidence interval; *SD*, standard deviation.
* Indicates significance at $P < 0.05$.

Interpretation

- Significantly elevated STAI indicates higher levels of stress
- Alpha amylase and cortisol within normal ranges

Results Boudarene et al, who postulated that demonstration of state anxiety is the “first stress response and primary protest.” State anxiety is exhibited until it obtains a plateau level and then is stable. At this point, the stress response becomes biological with increased cortisol levels as “second protest,”

Discussion

- Based on the NLN Jeffries Simulation Theory,[6] participant's experience must be understood and considered to design and implement an effective simulated experience.
- Although some anxiety is beneficial in simulation, higher levels may impede ability to focus on tasks and affect learning. It is up to the exercise director/educator to evaluate levels of stress and effects on performance.

Qualitative Results

- Exercise was “nerve-wracking” and difficult in terms of decisions for individual patients and as a leader of a team.
- Participants commented that they knew they were not in actual danger and that they were aware that many patients were mannequins, not real patients, indicating the levels of stress may not have been overwhelming in this case

- Decisions made during exercise were stressful, such as triaging a casualty as “dead” rather than attempting to resuscitate.
- Having opportunities to practice the decision making of mass casualty triage is an important component to include in any disaster-training exercises.
- The participants discussed the importance of having a realistic training exercise.
- Realism was an important component of the exercise that facilitated learning

- Participants emphasized the importance of preparation for the multicasualty disaster training exercise.
- Participants articulated how they were prepared or not prepared to take on the challenges of the simulated event effected levels of stress

Discussion

- Simulation standards, like those from INACSL, should be used to design and implement a live disaster exercise simulation to implement the desired training objectives.
- Ensure that participants have adequate prebriefing to prepare them for the simulation, support during the simulation appropriate to the participants and objectives
- Evidence-based debriefing post-training that may have significance in preventing high levels of stress during training exercises.

Conclusions

- Student participants experience stress during disaster exercises.
- The experiences of study participants was reported to be affected by preparation, uncertainty, team performance, realism, and decision making.
- Further research is needed to understand how these factors can manage stress levels for optimal learning during live exercise

Limitations

- This study is limited by the small sample size from 1 public nursing program, which may affect the generalizability of findings.
- Study participants were undergraduate nursing students; therefore, their responses may not be the same as those practicing nurses.
- Physiological measurements were limited to amylase and cortisol levels, which were measured post-training

Questions?????