SEXUAL ASSAULT FORENSIC EXAMINERS’ TRAINING AND ASSESSMENT USING SIMULATION TECHNOLOGY

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Introduction: More than 190,000 sexual assaults involving persons aged 12 years or older occur annually in the United States. For these victims, a forensic examination is the first step in the process to justice. Assessment and treatment of victims, as well as the meticulous collection and documentation of evidence, are vital for a strong case. Providing timely services 24/7 by qualified professionals can be taxing on schedules and budgets. Using in-house resources to cross-train ED personnel, we developed a program that introduced novice forensic examiners to common clinical scenarios encountered in the treatment of victims and provided a framework for the evaluation and management of each case.

Methods: Seventeen ED personnel attended statewide sexual assault nurse examination training and participated in four simulation scenarios and debriefings. Pre-tests and post-tests were administered, and a checklist was used to assess competence in performing examinations independently.

Results: The majority of participants achieved competence (≥85% on the checklist) with their first case and had statistically significant gains in knowledge between pre-test and post-test (pre-test mean score [±SE] of 69.1 ± 1.7 vs. post-test mean score of 84.4 ± 2.6, P < .001). Course evaluations were favorable, with a mean score of 91.3%.

Discussion: Our results validated the use of simulation technology and in-house resources for cross-training in a sexual assault forensic examination program, together with a checklist to assess competence in performing examinations independently. Benefits of having a sexual assault forensic examination program in the emergency department are standardized and timely care for victims, as well as enhanced evidence collection and increased reporting and prosecution of crimes.

Key words: Sexual assault; Simulation; Checklist; Competence; Cross-training

In 1994, Senator Joseph Biden introduced the landmark Violence Against Women Act. When it was signed into law by President Clinton, it provided funding for investigation and prosecution of violent crimes against women. This included funding to establish sexual assault response teams (SARTs) across the country and for sexual assault nurse examiner (SANE) training programs. The bill also mandated that states, rather than the victims, pay for forensic rape examinations. The need for continuous training and forensic examinations is significant: Every year in the United States, there are more than 190,000 sexual assaults involving persons aged 12 years or older. More than 90% of victims are females. In 2007, there were 6,151 reported sexual assaults in Florida. It is important to note, however, that only an estimated 20% of victims report an assault to authorities.

For victims of sexual assault, a forensic examination is the first step in the process to justice. Assessment and treat-
ment of victims, as well as the meticulous collection and documentation of forensic evidence, are vital for successful prosecution. Across the United States, examinations are conducted by registered nurses, advanced registered nurse practitioners, physician assistants (PAs), or physicians, as established by state and local jurisdictions. Most specially trained sexual assault forensic examiners (FEs) work in an emergency department or designated rape treatment center (RTC), where the majority of victims present themselves for initial care. Generally, examinations take approximately 1 hour to complete, with a range of 30 to 120 minutes or longer, depending on the specifics of the case.

Offering timely services around the clock can present operational challenges because the frequency of sexual assaults is not predictable. Furthermore, providing trained examiners on call 24/7 taxes ED schedules and budgets. As the only provider of sexual assault services for adolescents (12-17 years) and adults in a county of more than 2 million people, our academic tertiary-care medical center evaluates more than 700 victims each year. This is in addition to our 80,000 annual adult ED visits. The care of sexual assault victims includes prophylactic treatment and baseline testing for sexually transmitted infections (STIs), pregnancy testing and prophylaxis, and forensic evidence collection, as well as onsite counseling and victim advocacy services. Children aged less than 12 years are seen by the local Child Protection Team.

To provide the RTC with onsite trained examiners around the clock, it was necessary to devise a new staffing model. The first step was to develop a system to provide standardized and timely care for victims. However, training professionals to provide services to victims of sexual assault can be a lengthy process. This is illustrated by the fact that hospital credentialing processes for new providers can take 3 months or more. Using already established internal resources can save time and funds. Because our academic medical center does not have an emergency medicine residency program, we cross-trained advanced registered nurse practitioners (ARNPs) and PAs who work in the fast-track area of the main emergency department. These providers attended a statewide SANE program, consisting of 40 hours of lectures and hands-on sessions, as well as clinical sessions in gynecologic clinics and the RTC.

We sought to develop a program that allowed us to introduce novice FEs to common clinical scenarios encountered in the treatment of sexual violence victims and provide a framework for the evaluation and management of each scenario. To augment the SANE training program, we developed a simulation course and checklist with 4 case scenarios to use as simulator-based assessments for competence in sexual assault forensic examinations. We used simulation training as it allows learners to become competent, especially with repeated exposure to this training method.

At our hospital, the SART (a team composed of an FE, a victim advocate, a social worker, and a law enforcement representative) is mobilized as soon as a victim enters the RTC, which is physically connected to the emergency department. The FEs provide medical care and collect forensic evidence, assess the victim for crisis intervention, and strongly recommend an onsite counseling session. This model minimizes the common limitation of patients lost to follow-up; fewer than 25% of survivors make use of a community counseling referral after a sexual assault. Research has shown that SANE-trained providers collect more effective biological evidence than non-SANE providers. In addition, with a SANE-SART model in place, cases are 3.6 times more likely to result in the filing of criminal charges.

This is a unique application of simulation technology for sexual assault FEs’ training with ARNPs and PAs. Originally developed for flight training to ensure aviation safety, simulators are used extensively in schools of nursing and medicine. Simulation training provides a controlled environment for clinicians to develop and reinforce their skills and identify common mistakes, such as in advanced cardiac life support courses, where problem solving and decision making are critical. Furthermore, knowledge gained from simulation training may be retained longer than knowledge gained from a didactic format alone. The use of videotaping and debriefing, in conjunction with simulation, offers constructive feedback on the participants’ performance, which they can then apply to future encounters, both simulated and real life.

Methods

STUDY DESIGN
A pre-test and post-test study design was used. Study participants had recently attended a SANE training course. They also attended gynecologic outpatient clinics to enhance their experience with pelvic examinations. In the RTC, they observed 10 cases with an experienced examiner and then performed 10 cases under supervision. Participants were then individually scheduled for simulation sessions according to their work shifts and the capacities of the simulation center. During their first session, learners were oriented to the center and then completed a consent form, a pre-test and baseline demographic form, and at least 1 of 4 case scenarios.

Participants performed forensic examinations on female and male simulators (mannequins) and also used pelvic task trainers (Noelle [Gaumard Scientific, Miami,
FL] and SimMan [Laerdal, Stavanger, Norway]). Pelvic task trainers (Simulaid, Saugerties, NY) were used because they are specifically designed for vaginal and rectal examinations, with features that the simulation mannequins lack. For each of the simulation sessions, the medical director and researcher either played the role of the medical assistant in the examination room with the participant or played the voice of the victim from the control room following a script. The FEs wore 2-way wireless intercom headsets enabling them to communicate with each other during the scenarios. Each scenario took 45 to 90 minutes to perform and debrief. Each participant completed a total of 4 scenarios, 1 or 2 on each visit, all conducted in the same order.

All simulation exercises were videotaped and subsequently debriefed with each participant. Debriefing has been shown to provide valuable performance feedback before proceeding to the next scenario. Debriefing occurred in a private office and consisted of reviewing the documentation and videotape, allowing time for performance feedback, as well as reflection, questions, and issue clarification. After finishing the 4 simulation sessions, the participant completed a post-test and a course evaluation form.

SETTING AND SELECTION OF PARTICIPANTS
A total of 20 ED providers were initially enrolled in the study. Three of these participants were unable to complete all sessions (2 transferred to other departments and 1 withdrew for personal reasons). The final number of participants who completed the pre-test, 4 simulation scenarios, the post-test, and the course evaluation was 17 (16 ARNPs and 1 PA). Participants were divided into 2 cohorts. Cohort 1 (n = 9) represented providers who volunteered to be in the first training group; they took the SANE course at time 1 and started simulation training approximately 5 months later. Cohort 2 (n = 8) took the SANE course at time 2 and started simulation training approximately 10 months later. The program was approved by the simulation center’s Institutional Review Board.

MEASURES
We developed a 20-question knowledge pre-test and post-test (Appendix 1) and a skills checklist (Appendix 2) for each of the cases based on information from a national professional organization’s educational guidelines, the national protocol for sexual assault medical forensic examinations, the local state attorney’s office, the local police departments and the crime laboratory, and the Centers for Disease Control and Prevention Guidelines for treatment of STIs. As sexual assault forensic examination and evidence collection are not standardized across the country, nor even across each state, readers need to appreciate that the specific measurement tools we developed and used in this study are only valid in our jurisdiction. Construct validity for the test and checklist was ensured by identifying important elements in sexual assault forensic examination training from these sources. Content validity was established by administering a draft version of the test and checklist to 2 nurse educators for review; it was subsequently revised based on their feedback regarding readability and clarification of ambiguous questions. The checklist was then administered to 2 experienced staff FEs, who achieved a score of 100%, before giving it to the participants.

The actual simulation sessions (n = 68) were developed and specifically conducted by the medical director of the emergency department and one of the researchers, both of whom are experienced FEs and serve as expert witnesses. The case scenarios were based on the most frequently encountered sexual assault cases in the RTC: an adult female, an adult male, a minor female, and an adult female with a drug-facilitated sexual assault (Appendix 3). Each of the 2 FEs scored the participant independently and simultaneously using a checklist, which allows for measurement of skill competencies. A score of at least 85% on a participant’s first case was required to be deemed competent for independent examinations. Accuracy and completeness of evidence collection and chart documentation, especially the 2 pages of sexual assault examination information, are critical in the judicial process.

Each item on the checklist was equally weighted. The scoring scale used was as follows: 0 indicated no attempt/done incorrectly; 1, partially performed or out of sequence; and 2, completely/correctly performed. For each of the scenarios, participants were required to conduct an interview and perform a physical examination, collect forensic evidence specific to the case, and document the case, including “bagging” the evidence, maintaining the chain of custody, and turning evidence over to a “police detective.” After successfully completing 4 scenarios, participants were given a post-test and course evaluation survey.

DATA ANALYSIS
Descriptive statistics were used for demographic data. Within-subject differences from pre-test to post-test were analyzed by use of paired t tests. The procedure checklist items were analyzed with a general linear mixed model to perform a within-subjects repeated-measures analysis of variance. Planned comparisons were made among the 4 cases. All analyses were performed with SAS statistical software (version 9.2; SAS Institute, Cary, NC) with statistical significance at P < .05. The participants evaluated the program using a 5-point Likert-type scale.
Results

In total, 17 participants (16 ARNPs and 1 PA) completed all phases (pre-test, 4 case scenarios, post-test, and course evaluation) of the study. On the knowledge test, there was a significant improvement from pre-test to post-test scores (pre-test mean score [±SE] of 69.1 ± 1.7 vs. post-test mean score of 84.4 ± 2.6, \( P < .001 \)). We evaluated the pre-test and post-test knowledge and performance checklist scores for significant differences between the 2 cohorts. Finding no significant differences for any of the variables, we analyzed the combined data. Mean performance checklist scores by case are illustrated in Table 1. Every participant in cohort 1 achieved 85% or greater for the first case, thus achieving competence for independent examinations. In cohort 2, only 50% of the participants achieved competence (≥85%) with the first case, but all met competence criteria by their second case. Inter-rater reliability between the 2 examiners for each case ranged from 0.93 to 0.97; therefore, checklist item scores were averaged for the 2 raters. There were no significant differences between the 2 cohorts on individual checklist items. Analysis of individual checklist items showed that participants consistently performed several of the items in each case, including obtaining consents for examination, pregnancy prophylaxis, STI screening and treatment; vital signs review, self-introduction to the patient, and explanation of the steps in the physical examination. There were several items that participants did not perform as consistently, such as hand washing before each case, documenting on both the sexual assault form and nursing flow sheet, appropriately collecting oral smears, obtaining a personal health history, and identifying allergies and current medications.

Before their initial simulation session, the participants rated their confidence and competence as an FE using a 5-point Likert-type scale, with 5 being the most confident or competent. The mean self-rated score was 2.7 for confidence and 2.8 for competence. At the end of each case scenario, the FE rated each participant on self-confidence and self-competence (Table 2).

The group included 14 women and 3 men. The mean number of years in nursing was 22.2; the mean number of years in emergency care was 13. The lone PA in the study had more than 10 years of emergency care experience. Participants rated the program highly on their course evaluations, with a mean score across the 12 satisfaction questions of 91.3%.

Discussion

This is the first study that describes sexual assault FE training and assessment using simulation technology with ARNPs and PAs. This approach was used to maximize internal resources and address budget constraints. In our study we found that the use of simulation augmented SANE training, increased the knowledge and skills of participants in 4 case scenarios, and allowed us to assess participant readiness to independently perform sexual assault forensic examinations.

Both cohorts in this study had statistically significant gains from pre-test to post-test, suggesting that the participants gained knowledge from the simulation scenarios and subsequent debriefings. All members of cohort 1 achieved competence with case 1, defined as 85% or greater on the case checklist, as compared with 50% of members in cohort 2. The time interval between initial SANE training and simulation training was approximately 5 months for cohort 1 and 10 months for cohort 2. The time interval difference was related to participants’ work schedules and personal leave time, as well as completion of their observed and supervised performance in the RTC before participating in the simulation scenarios. For optimal learning experiences, our results suggest that future participants would benefit from a shorter interval between initial SANE training and simulation sessions.

Use of a checklist provided an objective measure of sexual assault forensic examination competence during simulator-based assessments. Across the 4 cases, the participants consistently and correctly completed checklist items such as consent for examination, testing and treatment, and.

### Table 1
**Mean performance checklist scores by case**

<table>
<thead>
<tr>
<th>Case</th>
<th>Mean ± SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>88.3 ± 1.6</td>
</tr>
<tr>
<td>2</td>
<td>90.4 ± 1.2</td>
</tr>
<tr>
<td>3</td>
<td>91.9 ± 1.2</td>
</tr>
<tr>
<td>4</td>
<td>93.3 ± 1.0</td>
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</table>

### Table 2
**Mean scores for confidence and competence by case as rated by FEs**

<table>
<thead>
<tr>
<th>Case</th>
<th>Confidence</th>
<th>Competence</th>
</tr>
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<tbody>
<tr>
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<td>3.4</td>
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<tr>
<td>4</td>
<td>4.5</td>
<td>4.8</td>
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vital signs review. These are all procedures participants routinely perform as part of their ED employment. However, an incidental finding showed that the majority of treatment consents participants obtained during the simulation scenarios did not fully meet informed consent criteria. For example, participants did not inform the patient about potential medication side effects and their treatments. Checklist items related to the forensic examination (documentation of sexual assault forms and evidence bagging) received lower scores, reflecting that these are newly acquired skills. On the other hand, there are several items such as performing hand hygiene, obtaining a personal health history, and identifying allergies and current medications that should be established health care provider behaviors evident in every patient interaction. These issues can all be addressed in future educational sessions.

The range of inter-rater reliability between the 2 examiners for each case checklist was acceptable. Course evaluations were overwhelmingly positive, with a mean score of 91.3%. The lowest scoring category was related to the benefits of additional sessions; only 80% agreed that additional sessions would be beneficial. Self-rated participant confidence and competence were only assessed at baseline. Therefore, we could not compare self-rating changes. A post-test participant confidence and competence assessment would be included in future courses. The FEs, however, rated participant confidence and competence at the end of each case scenario, and the mean values increased with each scenario (Table 2).

Simulations reinforce and help learners integrate knowledge, yet they are labor and resource intensive.10 To this end, we selected 4 scenarios that best represented the population of victims seen at our designated RTC. Other areas of the state and country may very well have quite different populations, and the number and content of the simulation scenarios should be tailored accordingly.

Given the unique nature of these examinations, there are a finite number of professionals in this county who are qualified to perform sexual assault forensic examinations on adolescents and adults. The nature of dealing with sexual violence can be emotionally draining on professionals, as evidenced by attrition rates. Therefore, conducting training sessions on a regular basis may be required to maintain and retain sufficient numbers of qualified personnel who can provide around-the-clock services to victims of sexual assault.6,18 Our training model can be used in emergency departments and designated RTCs across the country.

Programs using the SANE-SART model have decreased wait time for victims—contributing to overall victim well-being—and have had a major impact on forensic DNA evidence collection.19 Changing our staffing model to provide in-house, 24/7 coverage enabled the RTC to cut FTEs by 70%, a substantial cost savings to the organization. In addition, FEs can order any further testing that might be warranted by a victim’s physical injuries (eg, radiographs) and can perform wound care without requiring the victim to wait in the main emergency department.

Limitations
The limitations of this study include a small sample size, which restricts the ability to generalize our results. Nonetheless, this is highly specialized training, and numbers historically run about 20 participants per region every few years. For example, in our county, with a population of more than 2 million people, there are currently only 24 experienced FEs to care for adolescent and adult victims, yet the volume of victims increases dramatically during tourist season and college spring breaks.

In our study, although the participants’ mean years in nursing (22; range, 10-33 years) and in the emergency department (13; range, 3-25 years) have prepared them to assess and manage issues of sexual violence, personnel in other emergency departments may benefit from different simulation scenarios based on their departmental longevity and typical patient population. This study did not assess related patient and legal outcomes; these important issues may be examined in future research.

Implications for Emergency Nurses
There are numerous patient simulators in hospitals and in nursing and medical schools across the country. Many emergency departments are located in rural areas or cities with low populations and a low annual volume of sexual assault cases. Simulation to augment SANE programs could provide an opportunity for novice FEs to practice common clinical scenarios encountered in the treatment of sexual violence victims and provide a framework for the evaluation and management of each scenario. With more than 600 SANE programs in operation today,18 this simulation-based training model could be used in multisite studies, contributing to checklist tool reliability and validity statistics.20,21 Added benefits of a SANE program in the emergency department include standardized and timely care for victims, as well as enhanced evidence collection, which can lead to increased reporting and criminal prosecution.22

Conclusions
Our results validated the use of simulation technology and in-house resources for cross-training in a sexual assault forensic examination program and a checklist to assess com-
petence in performing examinations independently. This is the first study that describes sexual assault FEs’ training and assessment using simulation technology with ARNPs and PAs. Simulation education should occur within a short time interval after initial SANE training. Use of a checklist provides an objective measure of sexual assault forensic examination competence that may be used with simulator-based assessments.

REFERENCES