

Comparative Effectiveness of Hands-on Versus Computer Simulation–Based Training for Contrast Media Reactions and Teamwork Skills

Carolyn L. Wang, MD^a, Sankar Chinnugounder, MD^b, Daniel S. Hippe, MS^a, Sadaf Zaidi, MD^a, Ryan B. O'Malley, MD^a, Puneet Bhargava, MD^a, William H. Bush, MD^a

Abstract

Purpose: To assess the performance of interprofessional teams of radiologists, technologists, and nurses trained with high-fidelity hands-on (HO) simulation and computer-based (CB) simulation training for contrast reaction management (CR) and teamwork skills (TS).

Methods: Nurses, technologists, and radiology residents were randomized into 11 teams of three (one of each). Six teams underwent HO training and five underwent CB training for CR and TS. Participants took written tests before and after training and were further tested using a high-fidelity simulation scenario.

Results: HO and CB groups scored similarly on all written tests and each showed improvement after training ($P = .002$ and $P = .018$, respectively). During the final scenario test, HO teams tended to receive higher grades than CB teams on CR (95% versus 81%, $P = .17$) and made fewer errors in epinephrine administration (0/6 versus 2/5, $P = .18$). HO and CB teams scored similarly on TS (51% versus 52%, $P = .66$), but overall scores were lower for TS than for CR skills in both the HO ($P = .03$) and CB teams ($P = .06$). HO training was more highly rated than CB as an effective educational tool ($P = .01$) and for effectiveness at teaching CR and team communication skills ($P = .02$).

Conclusions: High-fidelity simulation can be used to both train and test interprofessional teams of radiologists, technologists, and nurses for both CR and TS and is more highly rated as an effective educational tool by participants than similar CB training. However, a single session of either type of training may be inadequate for mastering TS.

Key Words: Interprofessional team training, high-fidelity simulation, contrast reaction management, teamwork skills, computer-based simulation, contrast media

J Am Coll Radiol 2016;■:■-■. Copyright © 2016 American College of Radiology

INTRODUCTION

Recent estimates suggest that at least 210,000 Americans die annually from preventable medical errors [1,2]. Communication errors are frequently identified as the root cause of a sentinel event, as reviewed by The Joint

Commission [3]. Recognizing the significant role that communication and teamwork play in patient safety, the Agency for Healthcare Research and Quality and the Department of Defense developed a publicly available evidence-based teamwork program, TeamSTEPPS (Strategies and Tools to Enhance Performance and Patient Safety), to optimize patient outcomes by improving communication and teamwork skills among health care professionals [4].

There is considerable evidence that radiology staff members mismanage severe contrast reactions, irrespective of their level of training [5-7]. For example, Nandwana et al demonstrated that 71% of respondents (attending, fellows, residents, and nurses) incorrectly identified the

^aDepartment of Radiology, University of Washington, Seattle, Washington.

^bDepartment of Internal Medicine, Saint Vincent Hospital, Worcester, Massachusetts.

Corresponding author and reprints: Carolyn L. Wang, MD, University of Washington, Department of Radiology, Box 357115, 1959 NE Pacific Street, Seattle, WA 98195-7115; e-mail: wangcl@uw.edu.

Funding: RSNA Education Scholar Grant; The Society of Uroradiology Research Award. The authors have no conflicts of interest related to the material discussed in this article.

dose and rate of administration of intravenous epinephrine and 48% incorrectly identified the dose of intramuscular epinephrine for a severe anaphylactic contrast reaction [8]. Because moderate and severe contrast reactions are now infrequently encountered, radiologists are less prepared to manage them and have fewer opportunities to establish their skills. As such, simulation-based training is an effective surrogate for real-life experience and has been shown to be an effective assessment and training tool for contrast reaction management (CR) skills and improving behavior scores [9-14]. However, simulation training is more expensive and time-consuming than standard didactic lecture [15,16]. Insufficient availability, access, cost, lack of training, and lack of time have also prevented widespread adoption in radiology [13,17].

Contrast reaction research to date has focused on the radiologist or technologist, which does not adequately assess how contrast reactions are managed in most radiology departments: by interprofessional teams that include radiologists, radiology nurses, and technologists. A recent study demonstrated that participants who managed two high-fidelity simulated adverse contrast reactions as an interprofessional team subjectively reported significant improvement in their ability to manage anaphylactic reactions and ability to work as a team [18]. However, there was no direct objective assessment of the effectiveness of their training.

Effective CR relies on effective teamwork, interprofessional communication, and knowledge of a simple management algorithm, all of which can be objectively assessed using simulation training. The purpose of our study was to develop an interprofessional team-based high-fidelity simulation program based on TeamSTEPPS to teach CR and teamwork skills (TS) simultaneously and to directly compare its effectiveness to an individualized computer-based training program.

METHODS

Study Participants and Training Groups

Registered nurses, radiology residents (postgraduate year 2), and technologists from our institution were recruited. The study was approved by the institutional review board and was HIPAA compliant. Participation was voluntary and written informed consent was obtained from all participants. Forty participants were enrolled: 13 nurses, 12 residents, and 15 technologists.

All participants attended a didactic lecture about CR and TS (1 hour each) that occurred between 1 month and 6 months before the intervention. Participants were then randomized to the hands-on team simulation (HO) or

individualized computer-based simulation (CB) training groups. Initially, 18 subjects were randomized to the HO group (6 of each type, limited by high-fidelity simulation laboratory capacity) and 22 to the CB group. Within the HO group, teams of three (a nurse, resident, and technologist) were randomly assigned for the HO training session, constrained by participant availability. Participants in the CB group all trained independently. Immediately before the intervention, a written pre-test and questionnaire were used to record baseline knowledge and experience. Immediately after attending a single training session, participants took an immediate post-test to measure improvement in knowledge. Four months after completing training, participants within each training group were assigned to newly randomized teams of three and underwent the high-fidelity final scenario test. The final HO group teams were restricted such that no participant was assigned to a final group with another participant with whom he or she had previously trained. After dropouts and limitation in the number of residents, there were ultimately six teams in the HO group and five teams in the CB group (Fig. 1). Participants completed a third written post-test immediately before the high-fidelity final scenario test. All three written tests (pre-test, immediate post-test, and delayed post-test) tested the same core concepts with 15 unique questions.

Teamwork Skills

Several members of the research team, including the principal investigating radiologist, critical care medicine physician, nurse, and technologist, attended a 2-day national TeamSTEPPS masters training course and met after the course to identify the key learning points of TeamSTEPPS (Online Table 1). TeamSTEPPS was the program chosen because it is evidence-based; it is rooted in 3 decades of research by the Department of Defense Patient Safety Program, in collaboration with the Agency for Healthcare Research and Quality; and the entire curriculum is publicly available for all institutions [4]. With the help of local TeamSTEPPS master trainers and the simulation laboratory, a teamwork learning video was created that demonstrated a contrast reaction scenario with communication breakdown.

Five simulation scenarios previously created for CR key learning points were adapted to include training on at least one teamwork skill (Online Tables 1 and 2) [14].

Hands-on Training Methods

Each interprofessional team underwent a 2-hour training session at the simulation laboratory, starting with a

Download English Version:

<https://daneshyari.com/en/article/5726470>

Download Persian Version:

<https://daneshyari.com/article/5726470>

[Daneshyari.com](https://daneshyari.com)