

IMPACT OF VIRTUAL INTERPROFESSIONAL COVID-19 DISASTER SIMULATION TABLETOP EXERCISE (VICTER) WORKSHOP ON DISASTER PREPAREDNESS AMONG INTERPROFESSIONAL TRAINEES IN A TERTIARY CARE TEACHING HOSPITAL IN INDIA

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ABSTRACT

INTRODUCTION: Disaster planning is of significant importance for the healthcare professional and the health-care setting. Hospital-based disaster protocols form the cornerstone of disaster response. There is a paucity of data on disaster preparedness training using the virtual tabletop exercise (VTTX) module for interprofessional education from in-hospital and prehospital settings. With the coronavirus disease 2019 (COVID-19) pandemic, we have seen a paradigm shift of education strategies to the virtual realm. Here we attempt to study the impact of an online tabletop exercise workshop on the knowledge and confidence of disaster preparedness among Interprofessional trainees.

MATERIAL AND METHODS: Interprofessional trainees from medical, dental, nursing, respiratory therapy, and paramedic domains who consented were included in this study. Institutional ethics committee approval was received and the study was registered with the clinical trials registry India (CTRI), before initiation. The VTTX module has been adapted from the World Health Organization (WHO) COVID-19 training resources. Three international experts from the disaster medicine domain validated the module, questionnaire, and feedback. Wilcoxon signed-rank test was used to compare the parameters (Knowledge and confidence level) pre and post-workshop.

RESULTS: A total of 76 candidates with a mean age was 21.67 ± 2.5 (range:19–36) were part of the workshop. Comparison of the median scores and interquartile range of confidence level and knowledge respectively before [38 (29.25–45.75), 9 (7–11)] and after [51.50 (45–60), 11 (10–12)] the workshop showed vital significance (p -value < 0.001). All participants gave positive feedback on the workshop meeting the objectives. The majority agreed that the workshop improved their self-preparedness (90%) and felt that the online platform was appropriate (97.5%).

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CONCLUSIONS: This study sheds light on the positive impact of the online VTTX based workshop on disaster preparedness training among interprofessional trainees. Disaster preparedness training using available on-line platforms may be effectively executed with the VICTEr workshop even during the COVID-19 pandemic. The VICTEr workshop serves as a primer for developing online modules for effective pandemic preparedness training in interprofessional education.

KEY WORDS: disaster preparedness; COVID-19 pandemic; simulation; tabletop exercise; interprofessional education

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INTRODUCTION

Hospitals worldwide are involved in disasters [1, 2], and hence, disaster preparedness is of significant importance for the healthcare professional. The Indian subcontinent is highly disaster-prone, and more than 80% of the terrain is vulnerable to single or multiple hazards. [3]. There is a need for a holistic all-hazards approach for optimal response to disasters [4]. For various disasters, including those involving bioterrorism, hospitals need to be prepared to accept and treat victims in large numbers [5]. Hospital-based disaster protocols emphasize the disaster response part, and there is a paucity of data on disaster preparedness training and interprofessional education (IPE).

With the COVID-19 pandemic, we have seen a paradigm shift in education strategies to the virtual realm. The impact of virtual tabletop exercises (VTTX) on hospital disaster preparedness among interprofessionals has not been assessed in the Indian healthcare setting during a pandemic. Literature reveals that VTTX positively impacted pediatric providers in the western world [6]. There are multiple studies utilizing simulation as a training mode for disaster preparedness [7, 8]. Although there are several studies on simulation-based training, the amalgamation of interprofessional collaboration and VTTX-based simulation for disaster preparedness training has not been studied [9]. Wendelboe et al. [10] had published on the impact of a tabletop exercise directed explicitly for the COVID-19 pandemic in April 2020. It has already been documented that disasters require the optimal collaboration of teams for the health and safety of stakeholders involved in a disaster [11]. The COVID-19 pandemic has affected all domains, especially healthcare systems globally. The pandemic has also revealed the lack of disaster preparedness in multidisciplinary settings. The World Health Organization (WHO)

launched a checklist on disaster preparedness using an all-hazards tool for hospital administrators and emergency managers [4]. There is a renewed focus on disaster preparedness with various strategies to train young healthcare professionals in this domain. There are studies on multimodality curriculum on disaster medicine for residency programs that incorporate various strategies, including simulation and tabletop exercises and the conventional lectures and journal clubs [13].

In this study, we attempted to evaluate the impact of a VTTX workshop on knowledge and confidence among interprofessional trainees on disaster preparedness in the prehospital and in-hospital settings.

Objectives

1. To evaluate the baseline knowledge and confidence level on disaster preparedness among interprofessional (IP) stakeholders.
2. To evaluate the knowledge and confidence level on disaster preparedness among interprofessional (IP) stakeholders after a virtual interprofessional COVID-19 disaster simulation tabletop exercise (VICTEr) module.

MATERIAL AND METHODS

This is a Pretest/Posttest (without control) interventional design (experimental, epidemiological study) conducted after approval from the Institutional Research Board/Institutional Ethics Committee (Registration No. ECR/146/Inst/K/2013/RR-19) (DHRRegistration No. EC/NEW/INST/2019/374) IEC:492 – 2021, dated — 14/07/2021. The Clinical Trials Registry-India (CTRI) registration number of the study is CTRI/2021/08/035710. Informed consent was obtained from all subjects who participated in the study.

Tools used

The tabletop exercise workshop was adapted from the WHO COVID-19 training resources [12] and validated by three international experts from the disaster medicine domain. Three international experts validated the questionnaire used for assessment. The knowledge part was assessed with Multiple Choice Questions (MCQs) with a single best answer (maximum score 15, minimum 0), and confidence assessment based on a 5-point Likert scale where 1 = least/not at all confident and 5 = most/extremely confident (maximum score 75, minimum — 15) (Tab. 1, 2). The post-intervention assessment was collected one month after the intervention.

A detailed description of procedure/processes

After consenting to the study, the participants answered the baseline questionnaire via google forms. Post-completion, they entered the online workshop designed on the COVID-19 pandemic through the Microsoft teams platform. The workshop was conducted in 4 sessions. First session was an interactive lecture and discussion in one hall. The participants were divided into six groups based on a pre-prepared list and directed to six designated breakout rooms with a separate facilitator/supervisor in each room. After two separate sessions in the breakout rooms, they were directed back to the main room as a large group for debriefing and discussion guided by the primary investigator. Post the workshop; the participants completed a post-workshop questionnaire and feedback form via google form one month after the intervention.

Inclusion and exclusion criteria

Inclusion criteria: All final-year students (from the selected professions) consented to be part of the study. The selected professions are medicine (MBBS), nursing (BSc & MSc Nursing), respiratory therapy (BSc RT Respiratory therapy), emergency medicine technology (BSc EMT), and dental (BDS) students who are in their final year/ internship. **Exclusion criteria:** non-availability of consent from the participants.

Statistical methods

Wilcoxon signed-rank test was used to compare the parameters (Knowledge and confidence level) pre and post the workshop (intervention). The software used for statistical analysis was IBM SPSS version 20.0.

Sample size calculation

$$n = \frac{[Z_{1-\alpha/2} + Z_{1-\beta}]^2}{\Delta^2}$$

n = sample size

$Z_{1-\alpha/2} = 1.96$ at 5% level of significance

$Z_{1-\beta} = 0.84$ at 80% power

$\Delta = \text{effect size} = 0.5$ (moderate effect)

A level of significance of 5% and power of 80% was considered. There were no previously published similar studies; we used an effect size of 0.5 for the sample size computation. Using the above-stated inputs, the sample size was determined to be 32. After accounting for a dropout rate of 10%, the final sample size was 35. However, we involved all trainees who were consenting to the study to have 76 participants who completed the study.

RESULTS

A total of 76 candidates (after excluding incomplete responses in the pre-post session) consented to be part of the study and were evaluated pre and post-workshop. The mean age was 21.67 ± 2.5 (range: 19–36). (Tab. 3). The median scores (pre-session/post-session) of confidence level (38/51.5) and knowledge (9/11) pre and post-intervention show a significant difference (Fig. 1, Tab. 4, 5). Almost all participants reacted positively to the VTTX (Tab. 6). The majority also responded positively to the workshop, improving their self-preparedness and a better understanding of their roles and responsibilities. Apart from 2 participants, the rest felt that the online platform was appropriate and that the simulation was well facilitated (Tab. 6).

DISCUSSION

With the COVID-19 pandemic precipitating a rise in the use of online modalities for teaching/learning globally, it was only a matter of time before virtual training modules for disaster preparedness would claim a significant stake in the training realm.

Virtual tabletop exercise (VTTX) as a modality to promote awareness and planning in disasters has been used by the Federal Emergency Management Authority (FEMA) earlier. The effective use of VTTX may lead to identifying gaps in disaster preparedness, response, and recovery plans [6]. This eventually leads to improved strategies and impact policymaking. Simulation as a modality for

Table 1. Knowledge assessment	
Knowledge Assessment	
1. Which of the following is not a part of the Disaster Cycle?	
A. Preparation	
B. Mitigation	
C. Response	
D. Recovery	
E. Resilience	
2. Hazard Vulnerability Analysis is a strategy used for Disaster Preparedness?	
A. True	
B. False	
3. Preparation is the first phase of a disaster	
A. True	
B. False	
4. Which of the members are not a part of the Hospital Incident Command Chain?	
A. Liaison officer	
B. Public Information officer	
C. Security Officer	
D. Medical Superintendent	
E. Receptionist	
5. Disaster cycle has how many phases?	
A. 1	
B. 2	
C. 3	
D. 4	
E. 6	
6. Setting up of NDMA and the creation of an enabling environment for institutional mechanisms at the State and District levels is mandated by the	
A. Disaster Management Act 2005	
B. Sendai Framework for Disaster Risk Reduction — SFDRR	
C. United Nations Framework UNFCC	
D. WHO guidelines	
7. HVA takes into account	
A. Probability of the event	
B. Economic Impact of the event	
C. Preparedness	
D. A&B	
E. All	

Table 1. cd. Knowledge assessment	
Knowledge Assessment	
8. Which of the following is not considered a basic component of Surge Capacity system?	
A. Staff	
B. Stuff	
C. Safety	
D. Structure	
9. Which is not a part of the Hospital Incident Command System	
A. Operations Section	
B. Finance Section	
C. Logistics Section	
D. Planning Section	
E. None	
10. The nodal ministry in charge of matters pertaining to Disaster Management	
A. Ministry of Defense	
B. Ministry of Home Affairs	
C. Ministry of Health	
D. Ministry of Urban Development.	
11. Are tabletop Exercises and Operations Based Exercises are the same?	
A. True	
B. False	
12. Drills are a part of the Operations Based Exercise?	
A. True	
B. False	
13. Which is the weakest/most vulnerable link in Disaster Plan from the options given below?	
A. Interdepartmental Planning	
B. Resource Management	
C. Communication	
D. Command structure	
E. Safety and Security	
14. Surge Capacity and Surge Capability are the same for hospital-based disasters?	
A. True	
B. False	
15. Communications during hospital-based disasters are categorized as convergent and divergent?	
A. True	
B. False	

disaster training has effectively improved confidence and satisfaction among nursing students [14]. It has been proven even recently that workshops, in-

cluding tabletop exercises, improve the confidence levels of resident doctors in emergency departments [15]. Tabletop exercises for disaster preparedness

Table 2. Confidence assessment					
1. The following questions assess your confidence in the topic <i>Please complete the following questionnaire on a scale of 1–5: 1 = Not at all confident; 2 = Slightly confident; 3 = Confident; 4 = Very Confident; 5 = Extremely Confident Please circle your response to each statement</i>	Not at all confident	Slightly confident	Confident	Very confident	Extremely confident
Kindly ensure that all questions are answered:					
1. Are you confident in your understanding of the Disaster Cycle?	1	2	3	4	5
2. How confident are you on the general topic — Disaster Preparedness?	1	2	3	4	5
3. Are you confident in activating the disaster response plan in your department?	1	2	3	4	5
4. Are you confident about working as a team member for Disaster Preparedness planning in your hospital?	1	2	3	4	5
5. Are you confident with the concept of Surge Capacity during a disaster?	1	2	3	4	5
6. How confident are you with your understanding of Hazard Vulnerability Analysis (HVA) in Disaster Planning	1	2	3	4	5
7. Are you confident about doing a Hazard Vulnerability Analysis (HVA) for your hospital?	1	2	3	4	5
8. How Confident are you in incorporating the HVA into your hospital's Disaster Preparedness plans?	1	2	3	4	5
9. How confident are you in understanding the Incident Command Chain structure?	1	2	3	4	5
10. How confident are you in preparing an action plan as part of disaster preparedness?	1	2	3	4	5
11. How confident are you in communicating with your team in a timely, well-coordinated and effective manner during a disaster?	1	2	3	4	5
12. How confident are you in your understanding of modes of communication during a disaster?	1	2	3	4	5
13. Are you confident of fulfilling your role in the Hospital Incident Command System (HICS)?	1	2	3	4	5
14. Are you confident to plan for a media response during/after a disaster?	1	2	3	4	5
Are you confident that a virtual tabletop exercise can help in Disaster Preparedness training?	1	2	3	4	5

and pandemic preparedness have improved planning and coordination among healthcare professionals [16, 17]. Strategies using tabletop exercises to train participants in disaster medicine have been proven to be efficient and effective [18–22]. Although drills and field exercises are more visually influencing and essential facets of disaster training, tabletop exercises are equally crucial in adding a different perspective to disaster training. Smaller groups can take part in this form of cost-effective training [20]. Disaster training for emergency medical technicians with tabletop exercises have proved to overcome some deficiencies noted with field operations exercises like adapting to different responsibilities or

linking the results of disaster exercise with changes in training, resources, and planning [22]. Pandemic preparedness training among nurses through distance learning utilizing small group problem-solving tabletop exercises was done more than a decade back. It was an innovative and effective strategy to train multi-professionals in the learning network [23]. The use of online modules to train medical and non-medical hospital personnel in pediatric disaster preparedness has yielded positive results earlier [24].

The VTTX used as part of the intervention in our study has been adapted from the WHO COVID-19 training resources [12] and has been validated by three international experts from the disaster

Table 3. Distribution of interprofessional trainees

Department	Number (n)	Percentage (%)
BDS	12	15.8
BSc EMT	14	18.4
BSc Nursing	4	5.3
BSc RT	35	46.1
MBBS	8	10.5
MSc Nursing	3	3.9
Total	76	100.0

BDS — Bachelor of Dental Surgery, BSc EMT — Bachelor of Science in Emergency Medicine Technology, BSc Nursing — Bachelor of Science in Nursing, BSc RT — Bachelor of Science in Respiratory Therapy, MBBS — Bachelor of Medicine and Bachelor of Surgery, MSc Nursing — Master of Science in Nursing

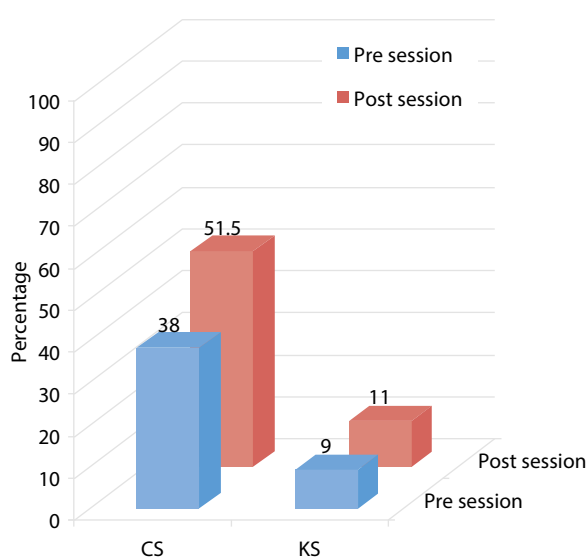


FIGURE 1. Comparison of the median scores of confidence and knowledge level before and after the intervention; CS — confidence score; KS — knowledge score

medicine domain. The workshop emphasized disaster cycle, hazard vulnerability assessment (HVA), hospital incident command chain (HICC), teamwork, and risk communication. Simulation exercises have proven to identify strengths and weaknesses in communication during a disaster and facilitate improvement [25]. The participants from different clinical domains had never been part of an interprofessional team to date (Tab. 3), making his study unique in evaluating impact among interprofessionals. The VTTX was conducted using the Microsoft Teams platform. After the initial interactive discussion, the participants were divided into 6 subgroups for small group sessions in in the break-out rooms, and the debriefing was done after each VTTX session in the main room as a large group. The post-session feed-

Table 4. Comparison of total confidence level pre and post-intervention

Confidence score pre-session (N = 76)	Confidence score post-session (N = 76)	p-value
Median (IQR)	Median (IQR)	
38 (29.25–45.75)	51.50 (45–60)	* < 0.001
*Significant		

Table 5. Comparison of knowledge level pre and post-intervention

Knowledge level pre-session (N = 76)	Knowledge level post-session (N = 76)	P-value
Median (IQR)	Median (IQR)	
9 (7–11)	11 (10–12)	* < 0.001
*Significant		

back was collected immediately after the session, and a post-session questionnaire was given one month after the intervention (Tab. 4, 5). There was a significant difference in the mean scores for knowledge and confidence (Fig. 1).

The results are similar to the previous studies where there was a significant increase in the knowledge and confidence of the participants on disaster preparedness following training utilizing a tabletop exercise strategy [3, 6, 16, 26, 27] II, and III. For administrative purpose, we included all paramedical students, and our sample size was 119. The baseline assessment of knowledge and attitude of paramedic students was done by a pretested questionnaire (Observation 1 It is, however, unique to the current study that the participants were from different clinical domains, including prehospital domains (Tab. 3). The participants worked in synchrony throughout the exercise and demonstrated excellent team dynamics, and showed significant improvement in confidence in working as a team after the exercise. Evidence on disaster preparedness training and interprofessional education using a VTTX session is rare in the Indian healthcare setting, and this study may be a primer for further evaluation of the same. The feedback from the participants reaffirms the positive impact of conducting a VTTX with a commonly available virtual platform among interprofessionals (Tab. 6).

The limitation of the current study is the non-uniformity in the number of participants from the different clinical domains. Future research should

Table 6. Four-point Likert scale Feedback results from the interprofessional virtual tabletop exercise workshop

Feedback question	Strongly agree N (%)	Agree N (%)	Disagree N (%)	Strongly disagree N (%)
Meet the Simulation objectives	38 (50%)	38 (50%)	0	0
Self-Preparedness	36 (47%)	39 (59%)	1 (1%)	0
The online platform was appropriate	28 (37%)	46 (60%)	2 (2.5%)	0

also consider qualitative assessment methods from the end-users after using online modules for disaster preparedness training.

CONCLUSIONS

This is a first-of-its-kind study on the impact of a VTTX among IP trainees on COVID-19 pandemic disaster preparedness. The VICTEr workshop has significantly improved the knowledge and confidence of the interprofessional trainees who participated in the workshop and thus positively influenced interprofessional education. Most of the participants gave positive feedback on the training strategy to achieve the objectives and felt that the virtual platform was appropriate. This study sheds light on the usage of VTTX for disaster preparedness training in in-hospital settings. It may act as a primer for developing online modules for pandemic preparedness training among interprofessionals.

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Author contributions

We confirm that everyone who has contributed to this manuscript is listed as author. Conceptualization — VK, TA, CAM; Data curation — VK, TA, CAM, SA, WW; Formal analysis — VK, TA, CAM, SA, WW; Investigation — VK, TA, CAM, SA, WW; Project administration — VK, TA, CAM, SA, WW, JMB, SKR; Resources — VK, SA, WW, JMB, SKR; Software — VK, SA, WW; Supervision — VK, TA, CAM, SA, WW, JMB, SKR; Validation — VK, TA, CAM, SA, WW, JMB, SKR; Visualization — VK, TA, CAM; Writing — review & editing — VK, TA, CAM, SA, WW, JMB, SKR; Writing — original draft — VK, TA, CAM. (VK — Vimal Krishnan; TA — Teddy Andrews; CAM — Ciraj Ali Muhammed; SA — Sanjan A; WW — William Wilson; JMB — Jayaraj Mymbilly Balakrishnan; SKR — Sharath Kumar Rao).

Ethical approval and consent to participate

All methods were carried out in accordance with the Declaration of Helsinki. All experimental protocols were approved by the Institutional Ethics Committee, Kasturba Medical College, Manipal, Manipal Academy of Higher Education (MAHE), Manipal (Registration No. ECR/146/Inst/KA/2013/RR-19) (DHRRegistration No. EC/NEW/INST/2019/374) IEC:492 — 2021, 14/07/2021. The Clinical Trials Registry-India (CTRI) registration number of the study is CTRI/2021/08/035710, 17/08/2021. Informed consent was obtained from all subjects who participated in the study.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Conflict of interest

All authors declare no conflict of interest.

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