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EXPERIENCE REPORT

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In situ Simulation with multiple scenarios: experience report[a]

Simulação in situ com múltiplos cenários: relato de experiência

Simulación in situ con múltiples escenarios: informe de experiencia

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Abstract

Objective: to describe the planning, organization, and execution of an *in situ* simulation involving multiple critical situations in a hospital. **Method:** an experience report based on a short circuit that caused a fire, involving the following scenarios: care for a fall during work on the electrical system; care for an anxiety crisis; evacuation of a patient undergoing hemodialysis; removal of two critically ill patients from the Intensive Care Unit; and transfer of a trauma victim to another hospital. The *in situ* simulation took place in 2024, in collaboration with the Civil Defense and the university, and involved 110 participants. Structured briefing and debriefing sessions were conducted. **Results:** satisfactory results were obtained, highlighting the potential of *in situ* simulation across multiple scenarios as a training strategy for victim care, patient transport, and professional preparation in hospital settings. **Conclusions and implications for practice:** the experience demonstrated the potential of *in situ* simulation for training in crisis situations, identifying institutional weaknesses, improving care flows, and strengthening the patient safety culture.

Keywords: Fires; Hospitals; Patients; Patient safety; Simulation training.

Resumo

Objetivo: descrever o planejamento, a organização e a execução de uma simulação *in situ* com múltiplas situações críticas em um hospital. **Método:** relato de experiência decorrente de um curto-circuito que provocou um incêndio, nos seguintes cenários: atendimento a uma queda durante a manipulação da rede elétrica; atendimento a uma crise de ansiedade; evacuação de uma paciente em hemodiálise; remoção de dois pacientes graves da Unidade de Terapia Intensiva; e transporte de uma vítima de traumatismo para outro hospital. A simulação *in situ* ocorreu em 2024, em colaboração com a Defesa Civil e com uma universidade, e contou com a participação de 110 pessoas. Foram realizadas sessões estruturadas de *briefing* e de *debriefing*. **Resultados:** obtiveram-se resultados satisfatórios, evidenciando o potencial da simulação *in situ* em múltiplos cenários como estratégia para a formação em atendimento a vítimas, para o transporte de pacientes e para a preparação de profissionais em instituições hospitalares. **Conclusão e implicações para a prática:** a experiência demonstrou o potencial da simulação *in situ* para a formação em situações de crise, para a identificação de fragilidades institucionais, para a melhoria dos fluxos de atendimento e para o fortalecimento da cultura de segurança do paciente.

Palavras-chave: Incêndios; Hospitais; Pacientes; Segurança do paciente; Treinamento por simulação.

Resumen

Objetivo: describir la planificación, organización y ejecución de una simulación *in situ* con múltiples situaciones críticas en un hospital. **Método:** informe de experiencia derivado de un cortocircuito que provocó un incendio, en los siguientes escenarios: respuesta a una caída durante la manipulación de la red eléctrica; respuesta a una crisis de ansiedad; evacuación de un paciente en hemodiálisis; traslado de dos pacientes críticos de la Unidad de Cuidados Intensivos; y transporte de una víctima de trauma a otro hospital. La simulación *in situ* se realizó en 2024, en colaboración con la Defensa Civil y una universidad, y contó con la participación de 110 personas. Se llevaron a cabo sesiones estructuradas de información y análisis posterior a la simulación. **Resultados:** se obtuvieron resultados satisfactorios, destacando el potencial de la simulación *in situ* en múltiples escenarios como estrategia para la formación en atención a víctimas, transporte de pacientes y preparación de profesionales en instituciones hospitalarias. **Conclusión e implicaciones para la práctica:** la experiencia demostró el potencial de la simulación *in situ* para la formación en situaciones de crisis, la identificación de debilidades institucionales, la mejora de los flujos asistenciales y el fortalecimiento de la cultura de seguridad del paciente.

Palabras clave: Incendios; Hospitales; Pacientes; Seguridad del Paciente; Entrenamiento Simulado.

INTRODUCTION

In situ simulation (ISS) is a relevant educational strategy in the healthcare field, characterized by the implementation of simulated scenarios within the actual care environment, using local infrastructure, equipment, and teams that are part of everyday clinical practice.[1,2]

When conducted in the real work context, ISS enhances fidelity, enabling not only the development of technical and non-technical skills but also the identification of vulnerabilities in care processes and institutional dynamics.[3]

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In this way, ISS allows real-time observation of aspects related to team response time, interprofessional communication, clinical decision-making, and coordination among different institutional sectors, elements considered essential for patient safety and quality of care.[4]

Furthermore, findings resulting from ISS application promote awareness regarding adherence to robust protocols aimed at crisis situations in hospital institutions, with a view to both the safety of patients and professionals involved and the prevention of such occurrences.[5]

Despite the growing use of ISS in healthcare services, the literature still presents limitations in the systematic description of strategies that integrate multiple scenarios within the same simulation process, especially with regard to detailing planning, implementation, and analysis of learning outcomes.

In light of the above, this study aims to describe the planning, organization, and execution of an ISS with multiple critical scenarios in a hospital.

METHOD

This is a descriptive study, of the experience report type, which presents the planning, execution, and analysis of an ISS designed based on multiple critical scenarios in a hospital setting. The activity comprised the data collection stage of an academic doctoral research project linked to the Graduate Program in Nursing at a public university located in Paraná, Brazil.

This report development followed the recommendations of the Standards for Reporting Qualitative Research (SRQR) checklist, proposed by the Enhancing the Quality and Transparency Of Health Research (EQUATOR Network) initiative, consisting of 21 items aimed at transparency and methodological quality in qualitative studies.[6]

The ISS was conducted in October 2024 in a large philanthropic hospital located in the capital of Paraná, Brazil. The institution provides low-, medium-, and high-complexity care. The study involved a multiprofessional team composed of physicians, nurses, nursing technicians and assistants, physiotherapists, maintenance staff, security personnel, and administrative staff.

The institutional coordination process began through a partnership established between the university and the municipal Civil Defense, which mediated the initial contact with hospital management. Subsequently, three meetings were held with representatives of the hospital administration, care coordination, and the institutional security team.

The activity was publicized through invitations sent via an application to institutional groups and through notices posted in the institution's corridors. Participating professionals were those present in the involved sectors at the time of the ISS, including care teams and institutional support sectors.

To preserve ISS fidelity and to observe the teams' spontaneous response to an unexpected critical situation, the nature of the simulated scenarios was not previously disclosed to the participants.

Before the start of the activity, an institutional briefing was conducted, in which participants were informed of the general objectives of the ISS, safety guidelines, and participation rules. The simulation was structured to reproduce an internal critical incident, characterized by an electrical failure followed by the onset of a fire in a hospital area, with care-related and organizational repercussions across different sectors of the institution.

From this initial event, six interdependent scenarios were developed, encompassing: (1) care for a maintenance worker who suffered a fall while working on the electrical system; (2) care for a professional experiencing an anxiety crisis triggered by the emergency situation; (3) evacuation of a patient undergoing hemodialysis; (4) containment of the initial fire outbreak; (5) removal of two critically ill patients from the Intensive Care Unit; and (6) transfer of the trauma victim to another hospital with a backup bed for the institution. The scenarios took into account the specific characteristics of the patients treated at this institution, the diversity of care contexts, and the consequences arising from a hospital fire.

The scenarios were carried out sequentially, with an average duration of approximately 10 minutes each, a period allocated for identifying the critical event, making clinical decisions, and implementing the necessary actions for risk control and the safety of patients and professionals.

At the end of the activity, a structured debriefing was conducted by the researchers, lasting approximately 20 minutes. Participants were invited to express their emotional reactions to the stress of the multiple scenarios, establishing an environment of psychological safety essential for learning. Subsequently, the facilitator guided the team in an analysis of decision-making processes and communication barriers observed. Finally, in the last stage, learning was consolidated, enabling professionals to articulate solutions to the identified failures.

To support the simulation, nine undergraduate nursing students participated as volunteers, one from a public university and eight from private institutions, enrolled between the first and seventh semesters of the program.

Of these, five acted as actors in the simulated scenarios, and four provided logistical support for the execution of the activity. All students received prior training on the roles to be performed and guidance related to the conduct and safety of the simulation. To enhance the fidelity of the ISS, real hospital equipment and moulage techniques were used, and artificial smoke was employed to simulate the fire source.

Data collection occurred throughout the entire execution of the simulation through structured direct observation carried out by trained researchers. To record the information, observation instruments previously developed for the research were used, containing indicators related to team performance in terms of interprofessional communication, clinical decision-making, compliance with institutional emergency workflows, and response time to critical situations. Additionally, field notes and audiovisual recordings of the activity were collected, with prior authorization from the participants.

The identification of learning outcomes and institutional challenges was based on the integrated analysis of the information compiled

in the observation instruments, field notes, and discussions that emerged during the debriefing. The analysis was conducted in a descriptive and interpretative manner. The indicators assessed included team response patterns, difficulties observed in scenario management, and aspects related to institutional organization in response to the simulated situation. For data analysis, qualitative triangulation was performed among checklist records, audiovisual recordings, and the content resulting from the debriefing.

The study was submitted to and approved by the Research Ethics Committee (REC), under Certificates of Presentation for Ethical Consideration (CAAE) No. 77371323.8.0000.0102 and No. 77371323.8.3001.0101, on May 15, 2024, and July 19, 2024, respectively. All participating professionals signed the Free and Informed Consent Term (FICT), as well as the Authorization for the Use of Image and Voice for research purposes, in accordance with current legislation.

RESULTS

A total of 110 professionals from the institution participated in the ISS, belonging to different care and support areas, including fire brigade members, the medical team, the nursing team, security personnel, and the maintenance team. Before the start of the activity, participants were taken to a room where the briefing took place, during which general instructions for the simulation and the location of the institutional assembly point to be used after evacuation were presented. The simulation was carried out during regular working hours, without interruption of the institution's care workflows.

The scenarios began at 3:40 p.m., after authorization from the occupational safety team and activation of the fire alarm, which served as the trigger for the simulated emergency. The initiating event was an electrical short circuit that caused a fire and triggered the subsequent scenarios. In total, six interdependent scenarios were carried out, conducted sequentially (Chart 1).

Scenario description

Scenario 1: Electrical accident with trauma in a maintenance worker

The first scenario simulated an electrical accident, followed by a fall from approximately 1.5 meters in height, involving a maintenance worker. The patient presented with facial trauma and a lower limb fracture, requiring immediate assessment and stabilization. Six fire brigade members and three members of the Rapid Response Team (RRT), including the healthcare team, directly participated in the care.

Chart 1. Operationalization of ISS scenarios, Curitiba (PR), Brazil.

Scenario	Learning Objectives	Participants	Execution time	Fidelity / Resources
Trauma in maintenance	Primary/secondary assessment and stabilization of fracture/fall.	Fire brigade members, nurses, nursing technicians, and physicians	15 min 17s	Moulage (facial injury and fracture) and rigid backboard.
Anxiety crisis	Management of emotional crisis in staff under stress.	Nurse, security personnel (fire brigade members).	8 min 20s	Actor with psychomotor agitation.
Evacuation during hemodialysis	Safe disconnection of dialysis therapy and rapid evacuation.	Nursing technicians.	11 min 39s	Simulated arteriovenous fistula and wheelchair.
Fire containment	Containment of initial fire outbreak and use of extinguishers.	Fire brigade.	Simultâneo	Artificial smoke and real extinguishers.
ICU removal (PTE)	Critical transport of a patient on mechanical ventilation.	Nurse, nursing technicians, and fire brigade members.	04 min 20s	Critically ill patient with invasive devices, mechanical ventilator, and infusion pumps.
ICU removal (PO)	Evacuation of a postoperative patient with drains and access devices.	Nurse, nursing technicians, and fire brigade members.	08 min 24s	Thoracic moulage, venous and arterial catheters, chest drain, and (PO).
Interhospital transfer	Organization of interhospital transport and documentation.	Paramedic, nursing technician.	18 min	Ambulance, stretcher, and transfer records.

Legend: Intensive Care Unit (ICU); Pulmonary Thromboembolism (PTE); Postoperative (PO); Indwelling Urinary Catheter (IUC).

After the initial assessment, cervical immobilization, positioning on a rigid backboard, and fracture stabilization were performed. Following the initial care, the victim was taken to the Emergency Department, where a secondary assessment was carried out, involving seven additional professionals in the scenario. Subsequently, the victim was transferred to a trauma referral hospital. To enhance the fidelity of the scenario, moulage techniques were used to simulate the facial injury and lower limb fracture.

Scenario 2: Anxiety crisis

The second scenario simulated an acute anxiety crisis in a staff member of the institution, triggered after witnessing the accident in the previous scenario. The situation was characterized by intense crying and emotional agitation. Initial care was provided by two fire brigade members: a nurse and a member of the institutional security team. Shortly after the initial approach and emotional stabilization, the staff member was referred to the Emergency Department for evaluation.

Scenario 3: Removal of patients undergoing hemodialysis

As a result of the power outage, a scenario was simulated involving a patient undergoing a hemodialysis session who needed to be disconnected from the machine and urgently evacuated. The simulated patient was removed by two nursing technicians, who interrupted the dialysis therapy and transported the patient in a wheelchair to the institutional assembly point. For this scenario, a simulated arteriovenous fistula was created, which increased the realism of the situation.

Fire containment: in parallel with the initial care, the institution's fire brigade identified the source of the fire after the alarm was triggered. The teams immediately initiated containment procedures, using firefighting equipment available in the institution, including fire extinguishers located in the ICU.

Scenarios 4 and 5: Removal of critically ill patients from the ICU

The most complex scenarios involved the removal of two critically ill patients admitted to the ICU, located near the fire source. In scenario 4, the patient presented with pulmonary thromboembolism and was on mechanical ventilation. In scenario 5, the patient was in the intermediate postoperative period following cardiac surgery, with thoracic and lower limb dressings.

The patients were characterized using moulage techniques and invasive devices, including orotracheal intubation, peripheral and central venous access, chest drains, a nasogastric tube, and an indwelling urinary catheter, in addition to equipment such as mechanical ventilators and infusion pumps.

Each scenario involved a care team composed of one nurse and two nursing technicians, as well as two fire brigade members responsible for assisting with evacuation. Both patients were removed to a safe area within the institution without complications during transport.

Scenario 6: Interhospital transfer of the trauma victim

The final scenario consisted of the interhospital transfer of the trauma victim from the first scenario. The patient was taken to the ambulance on a stretcher, using a rigid backboard, a cervical collar, and immobilization of the fractured limb. Transport was carried out by a paramedic and a nursing technician, involving the preparation of transfer documentation, communication between units, and the organization of assisted transport. In addition to temporal indicators, observation of the activity allowed the identification of vulnerabilities and opportunities for improvement.

DISCUSSION

The implementation of multiple scenarios in the ISS enabled the reproduction of different situations associated with a hospital critical event, allowing observation of the institution's responses to situations that required rapid decision-making, interprofessional coordination, and simultaneous management of multiple occurrences.

Conducting the activity in the actual work environment, using the institution's resources and infrastructure, contributed to greater environmental fidelity of the scenarios, promoting responses closer to real clinical practice and greater participant engagement.[7,8]

The data observed during the simulation indicated aspects related to team performance, such as the time required to remove critically ill patients, which ranged from four minutes and 20 seconds to eight minutes and 24 seconds, with an average of six minutes and 22 seconds. These findings enabled analysis of the institution's response capacity in emergency situations.

In this sense, the time difference between scenarios 4 (4 min 20 s) and 5 (8 min 24 s) in the ICU reveals, from the perspective of James Reason's Theory, that team performance was influenced by latent system design failures. The greater complexity of invasive devices in scenario 5 was identified as a "hole in the Swiss cheese model", exposing organizational limitations, such as the absence of prioritization protocols and rapid disconnection procedures for critical evacuations.[9]

The measurement of these times was important, as delays in the evacuation of critically ill patients may compromise care safety during critical events, reinforcing the importance of team training.

In addition to temporal indicators, structured observation made it possible to identify operational difficulties, mainly related to communication between teams, the definition of responsibilities during evacuation, and the identification, by some participants, of the institutional assembly point. Recognizing such gaps reinforces the potential of ISS not only as an educational tool but also as an evaluative one, allowing the review of care workflows and institutional protocols.[1,10]

ISS was evidenced as an instrument for institutional change through the immediate corrective measures implemented after the debriefing. Notably, a report was subsequently prepared and sent to the institution, outlining the positive and negative aspects identified and describing latent failures, which enabled hospital

management to revise the evacuation protocol for critical areas. Corroborating the study findings, scholars have argued that safety lies not only in the absence of errors, but in the ability to adapt and ensure that things go right under varying conditions.[11]

Although the exercise demonstrated high physical fidelity through the use of realistic resources, its main strength lay in psychological fidelity. The nature of the multiple scenarios provided an approximation to the real stress of emergencies.

Regarding professional competencies, the simulation promoted the development of both technical and non-technical skills, such as effective communication, situational leadership, and decision-making under pressure. Thus, the observed data are recognized as fundamental for team performance in crisis scenarios. It is noteworthy that leadership and trust among team members are determining factors for the effectiveness of institutional responses in simulated critical events.[12]

The variety of scenarios presented also made it possible to explore different dimensions of care practice in hospital emergencies, including clinical management of trauma, evacuation of technology-dependent patients, emotional support for professionals exposed to critical situations, and organization of interhospital transfers. In this sense, ISS scenarios integrating different critical events make it possible to simulate complex situations that require coordination between sectors, clinical reasoning, and rapid response, providing more comprehensive and realistic training.[13]

This approach indicates that the diversity of simulated events enhances the development of interprofessional competencies and promotes understanding of the complexity of care in emergency situations.[14]

Another relevant aspect was the participation of the fire brigade and integration with institutional support sectors, highlighting the importance of intersectoral coordination in the management of hospital incidents. As noted by other authors, effective responses to emergencies depend on coordination among different sectors of the institution, prior planning, and the availability of adequate resources.[15] It is also emphasized that the success of ISS is directly related to careful planning, leadership engagement, and integration with safety and quality committees.[1,16]

CONCLUSION AND IMPLICATIONS FOR PRACTICE

ISS, structured based on multiple scenarios, demonstrated potential to evaluate the institutional response to critical situations, enabling the observation of objective performance indicators, such as response times and team organization during patient evacuation.

Besides promoting the development of technical and non-technical competencies, the strategy made it possible to identify difficulties related to interprofessional communication, the definition of responsibilities, and the organization of institutional workflows during hospital emergencies.

However, despite the observed results, some limitations must be considered. The evaluation of team performance was based primarily on structured observation, measurement of evacuation time to the backup area, simulation records, and debriefing sessions.

Furthermore, conducting the simulation in a single institution limits the generalization of the results to other hospital contexts, as factors such as organizational culture, availability of resources, and the teams' prior experience may influence the observed performance.

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DATA AVAILABILITY RESEARCH

The data underlying the research text are contained within the article.

CONFLICT OF INTEREST

No conflict of interest.

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